

Evaluated Bimolecular Ion-Molecule Gas Phase Kinetics of Positive Ions for Use in Modeling Planetary Atmospheres, Cometary Comae, and Interstellar Clouds

Cite as: Journal of Physical and Chemical Reference Data **22**, 1469 (1993); <https://doi.org/10.1063/1.555940>

Submitted: 01 December 1992 . Published Online: 15 October 2009

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Evaluated Bimolecular Ion-Molecule Gas Phase Kinetics of Positive Ions for Use in Modeling Planetary Atmospheres, Cometary Comae, and Interstellar Clouds

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Received December 1, 1992; revised manuscript received May 14, 1993

Recommendations of reaction rate coefficients and product distributions for bimolecular positive ion-molecule reactions of importance in planetary atmospheres, cometary comae, and interstellar clouds are presented. Two publications Anicich and Huntress, *Astrophys. J. Suppl. Ser.* **62**, 553 (1986) and Anicich, *Astrophys. J. Suppl. Ser.* **84**, 215 (1993) served as the basis for this evaluation, which covers the literature from 1965 through 1991 with some additional citations missed in the original surveys.

Key words: evaluated results; ion-molecule reactions; positive ions; product distributions; reaction rate coefficients.

Contents

1. Introduction	1470	C ₃ H ₄ ⁺ , CH ₂ CCH ₂ ⁺ , CH ₃ CCH ⁺ , C ₃ H ₅ ⁺ , C ₃ H ₇ ⁺ , C ₄ ⁺	1495
2. This Evaluation	1470	C ₄ H ⁺ , C ₄ D ⁺ , C ₄ H ₂ ⁺	1496
3. Bimolecular Reactions	1471	C ₄ H ₃ ⁺ , C ₄ H ₄ ⁺	1497
4. Termolecular Reactions	1471	<i>l</i> -C ₄ H ₄ ⁺ , <i>c</i> -C ₄ H ₄ ⁺ , C ₄ H ₅ ⁺ , C ₄ H ₆ ⁺ , C ₄ H ₇ ⁺ , C ₄ H ₉ ⁺ , C ₅ ⁺	1498
5. Notes on the Tables	1472	C ₅ H ⁺ , C ₅ D ⁺ , C ₅ H ₂ ⁺ , C ₅ H ₃ ⁺ , C ₅ H ₄ ⁺ , C ₅ H ₅ ⁺ , C ₆ ⁺	1499
6. Acknowledgement	1472	C ₆ H ⁺ , C ₆ H ₂ ⁺ , C ₆ H ₃ ⁺ , C ₆ H ₄ ⁺	1500
7. References	1472	C ₆ H ₅ ⁺ , <i>ac</i> -C ₆ H ₅ ⁺ , <i>c</i> -C ₆ H ₅ ⁺ , <i>c</i> -C ₆ H ₆ ⁺ , C ₆ H ₇ ⁺ , <i>c</i> -C ₆ H ₇ ⁺ , C ₇ H ₃ ⁺ , C ₇ H ₇ ⁺ , <i>c</i> -C ₇ H ₇ ⁺ , CH ₃ C ₆ H ₅ ⁺ , C ₉ H ₇ ⁺ , C ₁₀ H ₈ ⁺	1500
8. Table of Reactions	1473	N ⁺	1502
H ⁺ , D ⁺ , H ₂ ⁺	1473	NH ⁺	1504
D ₂ ⁺	1474	NH ₂ ⁺	1505
H ₃ ⁺	1475	NH ₃ ⁺	1505
H ₂ D ⁺	1476	ND ₃ ⁺ , NH ₄ ⁺	1506
HD ₂ ⁺ , D ₃ ⁺ , He ⁺	1476	NH ₃ D ⁺ , NHD ₃ ⁺ , ND ₄ ⁺ , N ₂ ⁺	1507
HeH ⁺ , He ₂ ⁺	1479	N ₂ H ⁺	1508
B ⁺ , C ⁺	1479	N ₂ D ⁺	1509
CH ⁺	1481	O ⁺	1509
CH ₂ ⁺	1482	OH ⁺	1510
CH ₃ ⁺	1483	OD ⁺ , H ₂ O ⁺	1511
CH ₂ D ⁺ , CHD ₂ ⁺ , CD ₃ ⁺ , CH ₄ ⁺	1485	D ₂ O ⁺ , H ₃ O ⁺	1513
CD ₄ ⁺ , CH ₂ ⁺	1486	D ₃ O ⁺ , O ₂ ⁺	1514
CD ₅ ⁺ , C ₂ ⁺ , C ₂ H ⁺	1487	HO ₂ ⁺ , DO ₂ ⁺ , H ₂ O ₂ ⁺	1515
C ₂ D ⁺ , C ₂ H ₂ ⁺	1488	F ⁺	1516
C ₂ HD ⁺ , C ₂ D ₂ ⁺ , C ₂ H ₃ ⁺ , C ₂ H ₄ ⁺	1490	Ne ⁺	1517
C ₂ H ₃ ⁺	1491	NeH ⁺ , Na ⁺ , Mg ⁺	1518
C ₂ H ₆ ⁺ , C ₃ ⁺	1492	Al ⁺ , Si ⁺	1518
C ₃ H ⁺	1493	SiH ⁺	1520
<i>l</i> -C ₃ H ⁺ , C ₃ D ⁺ , C ₃ H ₂ ⁺ , <i>c</i> -C ₃ H ₂ ⁺ , <i>l</i> -C ₃ H ₂ ⁺	1494	SiD ⁺ , SiH ₂ ⁺ , SiH ₃ ⁺	1520
C ₃ H ₃ ⁺ , <i>c</i> -C ₃ H ₃ ⁺ , <i>l</i> -C ₃ H ₃ ⁺	1495	SiD ₃ ⁺ , Si ₂ ⁺ , Si ₂ D ₂ ⁺ , Si ₂ H ₅ ⁺ , Si ₂ D ₅ ⁺ , Si ₃ D ₇ ⁺	1522
P ⁺	1522	P ⁺	1522
PH ⁺ , PH ₂ ⁺	1523	PH ₃ ⁺	1524
PH ₃ ⁺	1524	PH ₄ ⁺ , S ⁺	1525

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HS ⁺	1526
H ₂ S ⁺	1527
H ₃ S ⁺ , S ₂ ⁺ , S ₂ H ⁺	1527
S ₂ H ₂ ⁺ , Cl ⁺ , HCl ⁺	1528
H ₂ Cl ⁺ , Ar ⁺	1529
ArH ⁺	1531
ArD ⁺ , ArH ₂ ⁺ , ArHD ⁺ , ArD ₂ ⁺ , ArH ₃ ⁺	1531
Ar ₂ ⁺ , K ⁺ , Ca ⁺ , Sc ⁺ , Ti ⁺	1532
V ⁺ , Cr ⁺	1533
Mn ⁺ , Fe ⁺ , FeH ⁺ , Fe ₂ ⁺ , Fe ₃ ⁺	1533
Co ⁺ , Ni ⁺ , Cu ⁺	1534
Zn ⁺ , Br ⁺ , HBr ⁺	1535
Kr ⁺	1536
KrH ⁺ , Zr ⁺ , Ag ⁺ , Xe ⁺	1537
Ba ⁺ , CN ⁺	1538
HCN ⁺	1540
HNC ⁺ , HCNH ⁺ , CH ₂ NH ₂ ⁺	1541
CH ₃ NH ₂ ⁺ , CH ₃ NH ₃ ⁺ , CNC ⁺	1542
CCN ⁺ , CH ₂ CNH ⁺ , CH ₃ CNH ⁺ , (CH ₃) ₂ NH ⁺ , (CH ₃) ₂ NH ₂ ⁺	1543
C ₂ N ₂ ⁺ , HC ₂ N ₂ ⁺ , C ₃ N ⁺ , CHCCN ⁺	1543
CHCCNH ⁺ , CH ₂ CHCN ⁺	1544
(CH ₃) ₃ N ⁺ , C ₄ N ⁺ , C ₅ N ⁺	1545
HC ₅ N ⁺ , C ₆ N ⁺ , HC ₆ N ₂ ⁺ , H ₂ C ₆ N ₂ ⁺ , CO ⁺	1546
HCO ⁺	1547
DCO ⁺ , HOC ⁺	1548
DOC ⁺ , H ₂ CO ⁺ , CH ₂ OH ⁺	1549
CH ₃ OH ₂ ⁺ , CH ₃ CHO ⁺ , CH ₃ CHOH ⁺ , (CH ₃) ₂ OH ⁺ , (CH ₃) ₂ COH ⁺ , CO ₂ ⁺	1550
HCO ₂ ⁺ , CH(OH) ₂ ⁺	1551
CS ⁺ , HCS ⁺ , CS ₂ ⁺ , HCS ₂ ⁺	1551
CCI ⁺ , HCCI ⁺ , CH ₂ Cl ⁺	1552
NO ⁺ , HNO ⁺	1553
NO ₂ ⁺ , N ₂ O ⁺ , HN ₂ O ⁺ , HNNO ⁺	1554
NNOH ⁺ , MgO ⁺ , MgOH ⁺ , SiNH ₂ ⁺ , SiO ⁺ , SiOH ⁺	1555
SiO ₂ ⁺ , SiO ₂ H ₃ ⁺ , SO ⁺ , SO ₂ ⁺	1556
HSO ₂ ⁺ , CrO ⁺ , FeO ⁺ , ZrO ⁺ , SiS ⁺	1557
SiSH ⁺ , COS ⁺ , HCOS ⁺	1557
9. References Used in the Table of Reactions	1559
10. Notes on the Reactions	1567

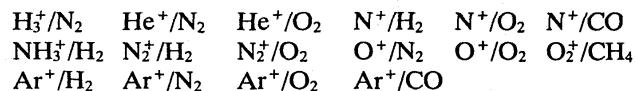
1. Introduction

Anicich and Huntress¹ published a comprehensive survey of bimolecular ion-molecule reaction kinetics in 1987, for use in modeling the chemistry of planetary atmospheres, cometary comae, and interstellar clouds. Then Anicich² published a supplement to that original survey of ion-molecule reaction kinetics, which extended the survey's coverage to include published data through 1991.

While these surveys cover a wide range of chemical species, the surveys are not complete. The chemical species reported were limited to those thought to be present as a result of ionic processes taking place in planetary atmospheres, cometary comae, and interstellar clouds. They also were limited to bimolecular positive ion-molecule reactions occurring at thermal energies below

1000 K. Over the years the number of species of interest has expanded. This reflects the increasing complexity of ions and neutrals that models and observations have shown to be present in these environments.

In the original surveys no attempt was made to evaluate the data on each reaction. The surveys included all citations on each reaction of interest. The majority of reactions have been reported only a single time. Thirty two percent of the reactions have been measured on the average of 3.17 times each. The following list of reactions have been measured more than ten times each.



This illustrates the importance of these sixteen reactions in the Earth's atmosphere. Even in heavily studied reactions, there are many disagreements between the various investigations.

2. This Evaluation

The intent of this compilation is to present a ready source of *evaluated* gas phase kinetics data on bimolecular reactions between positive ions and neutrals. It is expected that this will be of interest to those researchers that only want a single set of data, without multiple entries. An example would be a modeler that needs a data base of kinetic data. Another example is a researcher that would like a short listing of the data without having to read over the whole history of the reactions measurements. The Table of Reactions lists the reactants and their products, ordered by reactant ions. It includes the total reaction rate coefficient, product distributions (branching ratios), and references for each reaction. Since the two Surveys^{1,2} are the basis for the Table of Reactions, this compilation is therefore restricted to the same limited number of species as the data base used for input. For most reactions a simple average of the existing data gave a mean of the reaction rate coefficients where none of the individual measurements were significantly different from that average value. In these cases the percent error is the statistical value. There were many cases where it was important to consider the following additional information:

- (1) accuracy of the measuring technique
- (2) thermodynamics of the reaction
- (3) characteristics of the ion source
- (4) energetics of the ion optics
- (5) history of the research field.

A few reactions required special comments, which are presented in "Notes on the Reactions" for all cases where a value is reported that is not a simple average of all of the data. Reactions that have notes in "Notes on the Reactions" have a superscript b (b) in the footnotes column.

The Table of Reactions then is a comprehensive source for the reported results of positive ion-molecule bimolecular kinetics. For all reactions that show more than one reference in the Table of Reactions the reported numbers are 'evaluated' results. There are one thousand nine hundred and six reactions listed, of which seventy seven percent had measured rate coefficients and twenty percent had only upper limits to rate coefficients.

For reactions involving more exotic species that are not covered in the present evaluations, the reader is referred to the compilation by Ikezoe *et al.*³ The Ikezoe listing includes bimolecular and termolecular reaction rate coefficients for both positive and negative ions, but no recommendations were presented where multiple measurements for a single reaction are reported in the literature.

The reader is cautioned that the neutral products reported are not directly observed in these experiments. Neutral products are inferred from atomic balance considerations and the assumption that the reactions are exothermic.

3. Bimolecular Reactions

Since the scope of this compilation is bimolecular reactions, some definitions are required. The word "bimolecular" in this study refers to second-order reactions in the zero pressure limit. This excludes the "pseudo-bimolecular" process which is sometimes observed in flow tube and drift tube experiments that operate at the relatively high pressures between 0.2 and 0.8 Torr. 'Pseudo-bimolecular' processes have the same concentration dependence as bimolecular processes, but are actually saturated termolecular processes (high pressure limit). The termolecular process becomes saturated when the pressure of the neutrals gets so high that the lifetime of the collision complex is longer than the time between collisions. Then the collision complex will always suffer a collision with a third body and be stabilized before dissociation of the collision complex can occur. This has the effect of reducing the order of the reaction from third to second. By comparing low pressure results and high pressure results, several "pseudo-bimolecular" processes were identified and eliminated from the Table of Reactions. Due to the lack of published measurements, there probably still are "pseudo-bimolecular" processes remaining in the Table of Reactions. Moreover, the radiative association reaction, a true bimolecular process, is very similar to the saturated collision-stabilized association reaction. Flow tube measurements cannot distinguish between the former and the latter. Where there are results from other techniques that operate at lower pressures this ambiguity can be resolved. At the present time radiative association reactions have not been clearly detected under the conditions of flow tube experiments. Consequently, where no lower pressure experiments have been performed, flow tube association reactions have been included in the Table of Reactions for comple-

teness. This covers the possibility of the reaction being a fast radiative association reaction which has no competing termolecular process.

4. Termolecular Reactions

There are several environments in the solar system in which termolecular reactions will be competitive with bimolecular reactions. Recent laboratory results⁴⁻⁶ have shown that termolecular reactions can be important in ion-molecule chemistry, down to a pressure regime of about 10^{-5} Torr, i.e. have reaction rate coefficients as large as $10^{-21} \text{ cm}^6/\text{s}$. Therefore, users of the Table of Reactions may need to know which ion-molecule reactions have known termolecular channels. While this evaluation does not cover termolecular processes, the Table of Reactions has been annotated to indicate the existence of known termolecular reactions.

For estimating the importance of termolecular reactions in a given chemical system, it would be interesting to know, how prevalent are termolecular reactions compared to bimolecular reactions? As a preliminary indication we can compare the numbers of reported reaction rate coefficients. In the 1987 survey of Ikezoe *et al.*³ of both bimolecular and termolecular reactions between positive ions and neutrals, less than one fourth of the reactions reported have reported termolecular channels. Of the reaction set listed in the Table of Reactions that are important to modeling of planetary atmospheres, etc. only one sixth have termolecular channels.

There is a known statistical problem with this comparison. The termolecular reactions listed by Ikezoe *et al.*³ have reported reaction rate coefficients in the range of 7×10^{-23} to $2 \times 10^{-32} \text{ cm}^6/\text{s}$. The major source of these data is flow-tube experiments, which have an upper limit of $10^{-26} \text{ cm}^6/\text{s}$ for measuring three body processes. This is a result of the pressure regime and the flow time. Termolecular reactions that have reaction rate coefficients faster than $10^{-26} \text{ cm}^6/\text{s}$ appear to have only bimolecular pressure dependence with the flow-tube technique. These are then the "pseudo-bimolecular" or saturated reactions. The flow tube experimental papers report many "pseudo-bimolecular" rate coefficients. One hundred and six reactions of this type can be found in the 1986 survey¹ and the 1993 supplement,² that have adducts as products and were measured using a flow tube technique. The majority of these have been included in the Table of Reactions as termolecular reactions. These one hundred and six reactions represent three body reactions whose rate coefficients are greater than $10^{-26} \text{ cm}^6/\text{s}$. When these reactions are included the rate coefficient distribution will be changed, but the increase in number of termolecular channels will only be about thirty three percent. The rough conclusion then is, relatively fast termolecular reactions are less than one twelfth as abundant as the bimolecular reactions.

In summary, three-body processes can be fast enough to be competitive with two-body processes in some plan-

etary and cometary environments where pressures of 10^{-5} Torr are reached. Pressures are always too low in interstellar clouds to make three-body processes competitive.

5. Notes on the Tables

The ordering of chemical species used in this work can be seen in the Table of Contents listing of ions in the Table of Reactions. The elements and their hydrides are listed first, in *ascending order of their atomic numbers*. This includes more than three-quarters of the entries. The combinations of the elements are listed next. The lowest atomic number (other than hydrogen) is used for the primary ordering. The next lowest atomic number in the species is taken as the secondary ordering criteria, etc. This ordering form is found to be convenient in dealing with astrophysical problems. In this form the more abundant species are in the front of the listing. Also, in following a progression of chemical reactions it does not require as much flipping around as an alphabetical listing.

Isotopic exchange reactions are noted explicitly in the Table of Reactions when the chemical notation is simple. Other isotopic studies are noted as symmetric reactions, in which, the reactants and products are the same. To distinguish these from the other reactions they have been preceded by an asterisk (*). The referenced works identify the isotopes used in these studies.

The existence of measured termolecular reactions involving reaction pairs of interest to this work are reported in the Table of Reactions. These termolecular reactions are recognized by the reaction arrows that have a capital M written above them, indicating M as the third body. It was thought that it would be of interest to the reader how many of the reactions in the Table of Reactions had measurable three-body reaction rate coefficients. Usually, three-body reactions have measurable rates in the flow tube experiments only when there is not a measurable two-body reaction. The converse is also true, two-body reactions have measurable rates in the flow tube experiments only when there is not a measurable three-body reaction. Since the three-body reaction rate coefficients are very dependent on the third body, no attempt was made to report a value of the rate coefficients of the three-body reactions.

The temperature of all data are referenced to 300 kelvins. A few data are for other temperatures. The temperature of these reactions are noted in the Footnotes

column. If the data were reported for a range of temperatures, a superscript a (°) has been placed in the Footnotes column. The references that contain the temperature studies have been underlined for identification. There are other energy studies in the literature besides these temperature studies which are not recognized here. These other studies involve reactant ion translational energies and maybe of interested to some.

The references in the Table of Reactions have been assigned a four digit number. The first two digits of the reference number are the last two digits in the year of its publication. The second two digits are a reference number for the year. For example, 7809 is the ninth reference in the list of publications appearing in the year 1978. The full citation for the reference numbers used in the Table of Reactions are listed in the List of References numerically by the reference number. If a set of measurements are cited in more than one place, the various references have been listed under a single reference code.

Reactions that have notes in "Notes on the Reactions" have a superscript b (b) in the footnotes column.

6. Acknowledgment

This paper presents the results of one phase of research carried out at the Jet Propulsion Laboratory, California Institute of Technology. It conducted under Contract No. NAS 7-918, sponsored by the National Aeronautics and Space Administration.

The Author wishes to thank M. Allen for his helpful ideas and encouragement. Also, the Author thanks his colleagues for their openness about their experimental work.

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8. Table of Reactions

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
H ⁺	+ H ₂	→ <u>M</u>	No Reaction Adduct		<1.00×10 ⁻¹²	7107 8632			
H ⁺	+ HD	→	D ⁺	+ H ₂	1.00	1.70×10 ⁻¹⁰	±20%	<u>8109</u>	a
H ⁺	+ D ₂	→	D ⁺	+ HD	1.00	3.60×10 ⁻¹⁰	±20%	8212 <u>8109</u> <u>7421</u>	a
H ⁺	+ Na	→	No Reaction		<1.00×10 ⁻¹⁰	8919			
H ⁺	+ CH ₄	→	CH ₃ ⁺	+ H ₂	0.82	4.15×10 ⁻⁹	±10%	8421 7401	b
			CH ₄ ⁺	+ H	0.18				
H ⁺	+ C ₂ H ₆	→	C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺	+ H ₂ + H ₂ + H ₂	3.90×10 ⁻⁹	±20%	8117		
H ⁺	+ NH ₃	→	NH ₃ ⁺	+ H	>0.95	5.20×10 ⁻⁹	±10%	7401	
H ⁺	+ O	→	O ⁺	+ H	1.00	3.75×10 ⁻¹⁰	±50%	7201	
H ⁺	+ H ₂ O	→	H ₂ O ⁺	+ H	1.00	8.20×10 ⁻⁹	±10%	7401	
H ⁺	+ O ₂	→	O ₂ ⁺	+ H	1.00	1.17×10 ⁻⁹	±10%	7401	
H ⁺	+ H ₂ S	→	Products		1.00	7.60×10 ⁻⁹	±15%	7714	
H ⁺	+ HCl	→	HCl ⁺	+ H	1.00	1.30×10 ⁻⁹	±20%	<u>8502</u>	a
H ⁺	+ HCN	→	HCN ⁺	+ H	1.00	1.10×10 ⁻⁸	±20%	<u>8512</u> 7701	ab
H ⁺	+ CO ₂	→	HCO ⁺	+ O	1.00	3.80×10 ⁻⁹	±20%	8018 7101	b
H ⁺	+ NO	→	NO ⁺	+ H	1.00	1.90×10 ⁻⁹	±30%	7201	
D ⁺	+ H ₂	→	H ⁺	+ HD	1.00	1.40×10 ⁻⁹	±20%	8212 <u>8109</u> <u>7421</u>	ab
D ⁺	+ HD	→	H ⁺	+ D ₂	1.00	9.50×10 ⁻¹⁰	±20%	<u>8109</u>	a
D ⁺	+ D ₂	→ <u>M</u>	Adduct				8632		
D ⁺	+ CH ₄	→	CH ₃ ⁺ CH ₂ D ⁺ CH ₄ ⁺	+ HD + H ₂ + D	0.57 0.21 0.21	3.50×10 ⁻⁹	±10%	8421	
D ⁺	+ O	→	O ⁺	+ D	1.00	2.80×10 ⁻¹⁰	±50%	8008	
D ⁺	+ CO ₂	→	CO ₂ ⁺	+ D	1.00	3.50×10 ⁻⁹	±10%	8018	
H ₂ ⁺	+ H	→	H ⁺	+ H ₂	1.00	6.40×10 ⁻¹⁰	±20%	7901	
H ₂ ⁺	+ H ₂	→	H ₃ ⁺	+ H	1.00	2.00×10 ⁻⁹	±10%	9120 <u>8631</u> 8621 7520 <u>7404</u> 7212 7211	a
H ₂ ⁺	+ D ₂	→	H ₂ D ⁺ HD ₂ ⁺	+ D + H		3.20×10 ⁻⁹	±20%	7212	
H ₂ ⁺	+ He	→	HeH ⁺	+ H	1.00	1.35×10 ⁻¹⁰	±10%	9121 7603 7404	
H ₂ ⁺	+ CH ₄	→	CH ₃ ⁺ CH ₄ ⁺ CH ₅ ⁺	+ H ₂ + H ₂ + H	0.60 0.37 <0.03	3.80×10 ⁻⁹	±10%	7503	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
H ₂ ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺	+ H ₂ + H	0.91 0.09	5.30 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ C ₂ H ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ H ₂ + H ₂ + H ₂ + H + H ₂	0.18 0.37 0.45	4.90 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ C ₂ H ₆	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺ C ₂ H ₆ ⁺	+ H ₂ + H ₂ + H ₂ + H ₂ + H ₂ + H + H ₂ + H ₂ + H ₂ + H + H ₂	0.04 0.14 0.48 0.28 0.06	4.90 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ NH ₃	→ NH ₃ ⁺	+ H ₂	1.00	5.70 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ N ₂	→ N ₂ H ⁺	+ H	1.00	2.00 × 10 ⁻⁹	± 10%	7503 7423 6907
H ₂ ⁺	+ H ₂ O	→ H ₂ O ⁺ H ₃ O ⁺	+ H ₂ + H	0.53 0.47	7.30 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ O ₂	→ O ₂ ⁺ HO ₂ ⁺	+ H ₂ + H	0.29 0.71	2.70 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ Ne	→ NeH ⁺	+ H	1.00	2.30 × 10 ⁻¹⁰	± 10%	7603
H ₂ ⁺	+ Na	→ Na ⁺	+ H ₂	1.00	1.60 × 10 ⁻⁹	± 30%	8919
H ₂ ⁺	+ H ₂ S	→ S ⁺ HS ⁺ H ₂ S ⁺	+ H ₂ + H ₂ + H ₂ + H + H ₂	0.18 0.20 0.62	4.30 × 10 ⁻⁹	± 10%	7503
H ₂ ⁺	+ Ar	→ ArH ⁺	+ H	1.00	2.10 × 10 ⁻⁹	± 10%	9034 7620 6907
H ₂ ⁺	+ Kr	→ Kr ⁺ KrH ⁺	+ H ₂ + H	0.23 0.77	3.00 × 10 ⁻⁹	± 10%	7620
H ₂ ⁺	+ Xe	→ XeH ⁺	+ H	1.00	2.40 × 10 ⁻⁹	± 10%	7620
H ₂ ⁺	+ CO	→ HCO ⁺	+ H	0.77	2.90 × 10 ⁻⁹	± 10%	7503 7423 7207
H ₂ ⁺	+ CO ₂	→ HCO ₂ ⁺	+ H	1.00	2.35 × 10 ⁻⁹	± 10%	7608 7423 7211 7207
H ₂ ⁺	+ CS ₂	→ HCS ₂ ⁺	+ H	1.00	3.00 × 10 ⁻¹⁰	± 50%	7414
H ₂ ⁺	+ N ₂ O	→ N ₂ H ⁺ HN ₂ O ⁺	+ OH + H	0.37 0.63	2.10 × 10 ⁻⁹	± 60%	7423 7210
D ₂ ⁺	+ D	→ D ⁺	+ D ₂	1.00	5.00 × 10 ⁻¹⁰	± 10%	7901
D ₂ ⁺	+ H ₂	→ H ₂ D ⁺ HD ₂ ⁺	+ D + H		3.00 × 10 ⁻⁹	± 20%	7212
D ₂ ⁺	+ D ₂	→ D ₃ ⁺	+ D	1.00	1.60 × 10 ⁻⁹	± 5%	7212
D ₂ ⁺	+ He	→ HeD ⁺	+ D	1.00	1.15 × 10 ⁻¹⁰	± 10%	7603
D ₂ ⁺	+ N ₂	→ N ₂ D ⁺	+ D	1.00	1.61 × 10 ⁻⁹	± 10%	6907
D ₂ ⁺	+ Ne	→ NeD ⁺	+ D	1.00	1.70 × 10 ⁻¹⁰	± 10%	7603

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.			Footnotes	
D ₂ ⁺	+ SiH ₄	→	HD ₂ ⁺ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺	+ SiH ₃ + D ₂ + H ₂ + H ₂ + D ₂ + H ₂ + H + D ₂ + H ₂ + D ₂ + H	0.02 0.04 0.04 0.22 0.68	7720				
D ₂ ⁺	+ Ar	→	Ar ⁺ ArD ⁺	+ D ₂ + D	0.13 0.87	1.50 × 10 ⁻⁹ ± 20%	7620	7013	6907	b
D ₂ ⁺	+ Kr	→	Products		1.00	2.30 × 10 ⁻⁹ ± 10%	7620			
D ₂ ⁺	+ Xe	→	XeD ⁺	+ D	1.00	1.50 × 10 ⁻⁹ ± 15%	7620			
H ₃ ⁺	+ H ₂	→	M Adduct				8632			
H ₃ ⁺	+ HD	→	H ₂ D ⁺	+ H ₂	1.00	1.10 × 10 ⁻⁹ ± 20%	8105			a
H ₃ ⁺	+ CH ₄	→	CH ₅ ⁺	+ H ₂	1.00	2.40 × 10 ⁻⁹ ± 20%	8926 7005	8006	7405	ab
H ₃ ⁺	+ C ₂ H ₂	→	C ₂ H ₃ ⁺	+ H ₂	1.00	3.20 × 10 ⁻⁹ ± 25%	7713	7405	7005	b
H ₃ ⁺	+ C ₂ H ₄	→	C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ H ₂ + H ₂ + H ₂	0.70 0.30	2.90 × 10 ⁻⁹ ± 20%	8208	7616	7405	b
H ₃ ⁺	+ C ₂ H ₆	→	C ₂ H ₅ ⁺	+ H ₂ + H ₂	1.00	2.90 × 10 ⁻⁹ ± 25%	8117 7005	7405	7316	b
H ₃ ⁺	+ N	→	NH ⁺ NH ₂ ⁺	+ H ₂ + H	~0.40 ~0.60	6.50 × 10 ⁻¹⁰ ± 10%	7714			
H ₃ ⁺	+ NH ₃	→	NH ₄ ⁺	+ H ₂	1.00	4.40 × 10 ⁻⁹ ± 10%	8926 7405	7516 7005	7415	ab
H ₃ ⁺	+ N ₂	→	N ₂ H ⁺	+ H ₂	1.00	1.86 × 10 ⁻⁹ ± 10%	8926 8006 7505 7005	8323 7602 7423 6907	8208 7514 7310	ab
H ₃ ⁺	+ O	→	OH ⁺ H ₂ O ⁺	+ H ₂ + H		8.00 × 10 ⁻¹⁰ ± 50%	7604			
H ₃ ⁺	+ H ₂ O	→	H ₃ O ⁺	+ H ₂	1.00	5.30 × 10 ⁻⁹ ± 25%	7510	7405	7005	b
H ₃ ⁺	+ O ₂	→	HO ₂ ⁺ M Adduct	+ H ₂	1.00	6.70 × 10 ⁻¹⁰ ± 10%	8414 7505 8632	8006 7312	7514	ab
H ₃ ⁺	+ Na	→	Na ⁺	+ H ₂ + H	1.00	2.10 × 10 ⁻⁹ ± 30%	8919			
H ₃ ⁺	+ H ₂ S	→	H ₃ S ⁺	+ H ₂	1.00	3.70 × 10 ⁻⁹ ± 10%	8926	7507	7405	a
H ₃ ⁺	+ HCl	→	H ₂ Cl ⁺	+ H ₂	1.00	3.60 × 10 ⁻⁹ ± 10%	8623	8511	8502	a
H ₃ ⁺	+ Ar	→	ArH ⁺ M Adduct	+ H ₂	1.00	3.65 × 10 ⁻¹⁰ ± 10%	7104 8632	6907		b
H ₃ ⁺	+ Kr	→	KrH ⁺	+ H ₂	1.00	1.10 × 10 ⁻⁹ ± 10%	8006			
H ₃ ⁺	+ HCN	→	HCNH ⁺	+ H ₂	1.00	7.50 × 10 ⁻⁹ ± 10%	8512 7704	7719 7605	7714	a

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
H ₃ ⁺	+ CH ₃ NH ₂	→ CH ₃ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ NH ₃ + H ₂ + H ₂ + H ₂ + H ₂ + H + H ₂	0.01 0.76 0.07 0.16			7316	
H ₃ ⁺	+ CH ₃ CN	→ CH ₃ CNH ⁺	+ H ₂	1.00	8.90 × 10 ⁻⁹	± 25%	7719	7605
H ₃ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ H ₂	1.00	9.80 × 10 ⁻⁹	± 30%	8412	7911
H ₃ ⁺	+ C ₂ N ₂	→ HC ₂ N ₂ ⁺	+ H ₂	1.00	2.80 × 10 ⁻⁹	± 25%	8412	7719
H ₃ ⁺	+ CO	→ HCO ⁺ HOC ⁺	+ H ₂ + H ₂	0.94 0.06	1.85 × 10 ⁻⁹	± 25%	<u>8926</u> <u>8105</u> 7423	8310 8006 7505 7005
H ₃ ⁺	+ H ₂ CO	→ CH ₂ OH ⁺	+ H ₂	> 0.99	6.30 × 10 ⁻⁹	± 25%	7906	
H ₃ ⁺	+ CH ₃ OH	→ CH ₃ ⁺ CH ₂ OH ⁺ CH ₃ OH ₂ ⁺	+ H ₂ O + H ₂ + H ₂ + H ₂ + H ₂	0.46 0.28 0.26	2.90 × 10 ⁻⁹	± 20%	7619	7316
H ₃ ⁺	+ CO ₂	→ HCO ₂ ⁺	+ H ₂	1.00	2.50 × 10 ⁻⁹	± 35%	8208	7423 7005
H ₃ ⁺	+ CHOOH	→ H ₃ O ⁺ HCO ⁺	+ CO + H ₂ + H ₂ O + H ₂	0.30 0.70	5.00 × 10 ⁻⁹	± 30%	7821	7818
H ₃ ⁺	+ CH ₃ COOH	→ CH ₃ CO ⁺	+ H ₂ O + H ₂	1.00	6.80 × 10 ⁻⁹	± 30%	7818	
H ₃ ⁺	+ CH ₃ SH	→ CH ₂ SH ⁺ CH ₃ SH ⁺	+ H ₂ + H ₂ + H ₂ + H	0.98 0.02			7316	
H ₃ ⁺	+ CS ₂	→ HCS ₂ ⁺	+ H ₂	1.00	2.00 × 10 ⁻⁹	± 25%	8208	
H ₃ ⁺	+ NO	→ HNO ⁺	+ H ₂	1.00	1.25 × 10 ⁻⁹	± 25%	8208	7005
H ₃ ⁺	+ NO ₂	→ NO ⁺ NO ₂ ⁺	+ OH + H ₂ + H ₂ + H	0.99 0.01	7.00 × 10 ⁻¹⁰	± 30%	7005	
H ₃ ⁺	+ N ₂ O	→ HN ₂ O ⁺	+ H ₂	1.00	2.50 × 10 ⁻⁹	± 40%	8208	7423 7005
H ₃ ⁺	+ SO ₂	→ HSO ₂ ⁺	+ H ₂	1.00	1.30 × 10 ⁻⁹	± 25%	<u>8926</u>	8208
H ₃ ⁺	+ COS	→ HCO ⁺ HCOS ⁺	+ H ₂ S + H ₂	< 0.10 > 0.90	1.90 × 10 ⁻⁹	± 25%	8208	
H ₂ D ⁺	+ H ₂	→ H ₃ ⁺	+ HD	1.00	5.60 × 10 ⁻¹⁰	± 20%	<u>8105</u>	a
H ₂ D ⁺	+ HD	→ HD ₂ ⁺	+ H ₂	1.00	2.60 × 10 ⁻¹⁰	± 10%	7611	
H ₂ D ⁺	+ CO	→ HCO ⁺	+ HD	1.00	1.60 × 10 ⁻⁹	± 20%	<u>8105</u>	a
HD ₂ ⁺	+ HD	→ H ₂ D ⁺	+ D ₂	1.00	3.50 × 10 ⁻¹⁰	± 10%	7611	
D ₃ ⁺	+ H ₂	→ Products		1.00	4.00 × 10 ⁻¹⁰	± 20%	7615	
D ₃ ⁺	+ D ₂	M Adduct					8632	
D ₃ ⁺	+ CH ₄	→ CH ₄ D ⁺	+ D ₂	> 0.98	2.40 × 10 ⁻⁹	± 25%	7501	
D ₃ ⁺	+ NH ₃	→ Products		1.00	3.60 × 10 ⁻⁹	± 20%	7406	7403
D ₃ ⁺	+ N ₂	→ N ₂ D ⁺	+ D ₂	1.00	7.49 × 10 ⁻¹⁰	± 10%	6907	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
D ₃ ⁺	+ O ₂	→ DO ₂ ⁺	+ D ₂	1.00	5.20 × 10 ⁻¹⁰	± 25%	8414	8006	a
D ₃ ⁺	+ SiH ₄	→ SiH ₃ ⁺	+ D ₂ + HD	1.00			7720		
D ₃ ⁺	+ Ar	→ ArD ⁺	+ D ₂	1.00	2.90 × 10 ⁻¹⁰	± 90%	7612	6907	
D ₃ ⁺	+ Mg	→ Mg ⁺	+ D ₂ + D	1.00	1.50 × 10 ⁻⁹	± 20%	7710		T = 623
He ⁺	+ H ₂	→ H ⁺	+ H	0.83	1.00 × 10 ⁻¹³	± 20%	8921	8725	
		H ₂ ⁺	+ He	0.17	8004	7603	8626	7407	
		M	Products		7404	7003		8632	
He ⁺	+ HD	→ No Reaction			< 2.00 × 10 ⁻¹⁴		8725		
He ⁺	+ D ₂	→ D ⁺	+ D		1.10 × 10 ⁻¹⁴	± 20%	8725	8004	7407
		D ₂ ⁺	+ He						a,b
		HeD ⁺	+ D						
*He ⁺	+ He	→ He ⁺	+ He	1.00	5.00 × 10 ⁻¹⁰	± 10%	9028	7411	a
	M	Adduct					8632		
He ⁺	+ CH ₄	→ H ⁺	+ CH ₃ + He	0.27	1.63 × 10 ⁻⁹	± 11%	8317	7908	7801
		CH ⁺	+ H ₂ + H + He	0.15	7702	7602	7402		b
		CH ₂ ⁺	+ H ₂ + He	0.52			7003		
		CH ₃ ⁺	+ H + He	0.05					
		CH ₄ ⁺	+ He	0.02					
He ⁺	+ C ₂ H ₂	→ CH ⁺	+ CH + He	0.22	3.50 × 10 ⁻⁹	± 10%	7502		
		C ₂ ⁺	+ H ₂ + He	0.46					
		C ₂ H ⁺	+ H + He	0.25					
		C ₂ H ₂ ⁺	+ He	0.07					
He ⁺	+ C ₂ H ₄	→ CH ₂ ⁺	+ CH ₂ + He	0.12	3.40 × 10 ⁻⁹	± 10%	7502		
		C ₂ H ⁺	+ H ₂ + H + He	0.13					
		C ₂ H ₂ ⁺	+ H ₂ + He	0.64					
		C ₂ H ₃ ⁺	+ H + He	0.05					
		C ₂ H ₄ ⁺	+ He	0.07					
He ⁺	+ C ₂ H ₆	→ C ₂ H ₂ ⁺	+ H ₂ + H ₂ + He	0.28	2.90 × 10 ⁻⁹	± 10%	8317	7502	
		C ₂ H ₃ ⁺	+ H ₂ + H + He	0.58					
		C ₂ H ₄ ⁺	+ H ₂ + He	0.14					
He ⁺	+ NH ₃	→ NH ⁺	+ H ₂ + He	0.08	2.00 × 10 ⁻⁹	± 10%	8524	7515	7502
		NH ₂ ⁺	+ H + He	0.80	7003				a,b
		NH ₃ ⁺	+ He	0.12					
He ⁺	+ N ₂	→ N ⁺	+ N + He	0.60	1.30 × 10 ⁻⁹	± 15%	8927	8523	8514
		N ₂ ⁺	+ He	0.40	7908	7702	7602		a
					7515	7417	7003		
					7001	6905	6803		
					6801	6601			
He ⁺	+ H ₂ O	→ H ⁺	+ OH + He	0.37	5.00 × 10 ⁻¹⁰	± 15%	8823	8524	7801
		OH ⁺	+ H + He	0.52	7502	7202	7006		a,b
		H ₂ O ⁺	+ He	0.11					
He ⁺	+ D ₂ O	→ D ⁺	+ OD + He				8823		
		OD ⁺	+ D + He						
He ⁺	+ O ₂	→ O ⁺	+ O + He	0.97	1.00 × 10 ⁻⁹	± 10%	8523	8514	7908
		O ₂ ⁺	+ He	0.03	7907	7702	7602		a,b
					7003	7001	6905		
					6601				

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
He ⁺	+ Ne	→	Ne ⁺	+ He	+ hν	0.83	1.20 × 10 ⁻¹⁵	± 30%	8306 7815 7317 b
			HeNe ⁺	+ hν		0.17			
He ⁺	+ SiH ₄	→	Si ⁺	+ He	+ H ₂ + H ₂	0.56	2.35 × 10 ⁻⁹	± 40%	9002
			SiH ⁺	+ He	+ H ₂ + H	0.38			
			SiH ₂ ⁺	+ He	+ H ₂	0.04			
			SiH ₃ ⁺	+ He	+ H	0.03			
He ⁺	+ H ₂ S	→	S ⁺	+ H ₂	+ He	0.82	4.40 × 10 ⁻⁹	± 15%	8703 7502 ab
			HS ⁺	+ H	+ He	0.11			
			H ₂ S ⁺	+ He		0.07			
He ⁺	+ HCl	→	Cl ⁺	+ H	+ He	1.00	3.30 × 10 ⁻⁹	± 15%	8703 7307 ab
He ⁺	+ Ar	→	No Reaction			< 1.00 × 10 ⁻¹³			7317 7003 6601
He ⁺	+ HBr	→	Br ⁺	+ H	+ He	1.00	3.20 × 10 ⁻⁹	± 15%	7307
He ⁺	+ Kr	→	No Reaction			< 1.00 × 10 ⁻¹¹			7003
He ⁺	+ Xe	→	Xe ⁺	+ He		1.00	7.00 × 10 ⁻¹²	± 20%	8213 7003 a
He ⁺	+ Hg	→	Hg ⁺	+ He		1.00	2.10 × 10 ⁻⁹	± 20%	8016 7317
He ⁺	+ HCN	→	C ⁺	+ NH	+ He	0.25	3.30 × 10 ⁻⁹	± 10%	7704 7701 b
			N ⁺	+ CH	+ He	0.07			
			CH ⁺	+ N	+ He	0.21			
			CN ⁺	+ H	+ He	0.47			
			HCN ⁺	+ He		< 0.01			
He ⁺	+ HC ₃ N	→	C ₂ H ⁺	+ CN	+ He	0.28	7.70 × 10 ⁻⁹	± 20%	8518 8509 7911 b
			C ₃ H ⁺	+ N	+ He	0.05			
			C ₂ N ⁺	+ CH	+ He	0.36			
			C ₃ N ⁺	+ H	+ He	0.31			
He ⁺	+ CO	→	C ⁺	+ O	+ He	1.00	1.60 × 10 ⁻⁹	± 10%	8523 8514 7702 a
			O ⁺	+ C	+ He	< 0.01			7515 7003 6601
			CO ⁺	+ He		< 0.01			
He ⁺	+ CO ₂	→	C ⁺	+ O ₂	+ He	0.02	1.00 × 10 ⁻⁹	± 25%	8927 8317 7702 a
			O ⁺	+ CO	+ He	0.14			7602 7515 7003
			CO ⁺	+ O	+ He	0.78			6601
			CO ₂ ⁺	+ He		0.05			
He ⁺	+ CHOONH ₄	→	HCO ⁺	+ OH	+ He		4.10 × 10 ⁻⁹	± 30%	7821
			HCO ₂ ⁺	+ H	+ He				
			CHOONH ₄ ⁺	+ He					
He ⁺	+ NO	→	N ⁺	+ O	+ He	0.93	1.45 × 10 ⁻⁹	± 15%	7702 7003 6601
			O ⁺	+ N	+ He	0.07			
He ⁺	+ N ₂ O	→	N ⁺	+ NO	+ He	0.13	2.30 × 10 ⁻⁹	± 10%	8930 8822 7702 b
			O ⁺	+ N ₂	+ He	0.12			
			N ₂ ⁺	+ O	+ He	0.54			
			NO ⁺	+ N	+ He	0.21			
			N ₂ O ⁺	+ He		< 0.01			
He ⁺	+ SO ₂	→	S ⁺	+ O ₂	+ He	0.21	4.30 × 10 ⁻⁹	± 20%	8703 7302 ab
			SO ⁺	+ O	+ He	0.69			
			SO ₂ ⁺	+ He		0.10			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
HeH ⁺	+ H	→	H ₂ ⁺	+ He	1.00	9.10 × 10 ⁻¹⁰	± 30%	7901
HeH ⁺	+ H ₂	→	H ₃ ⁺	+ He	1.00	1.77 × 10 ⁻⁹	± 20%	8006 7008
HeH ⁺	+ C ₂ H ₄	→	C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ He + H ₂ + He + H	0.75 0.25	2.80 × 10 ⁻⁹	± 20%	7610
HeH ⁺	+ C ₂ H ₆	→	C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ He + H ₂ + H ₂ + He + H ₂		2.10 × 10 ⁻⁹	± 20%	8117
HeH ⁺	+ N ₂	→	N ₂ H ⁺	+ He	1.00	1.70 × 10 ⁻⁹	± 20%	7602
HeH ⁺	+ O ₂	→	HO ₂ ⁺	+ He	1.00	1.10 × 10 ⁻⁹	± 20%	8006
HeH ⁺	+ Ne	→	NeH ⁺	+ He	1.00	1.25 × 10 ⁻⁹	± 50%	9130
HeH ⁺	+ Kr	→	KrH ⁺	+ He	1.00	1.20 × 10 ⁻⁹	± 20%	8006
He ₂ ⁺	+ H ₂	→	Products		1.00	5.30 × 10 ⁻¹⁰	± 30%	7008
	M	→	Products					8632
He ₂ ⁺	+ CH ₄	M	→ Products					8632
He ₂ ⁺	+ C ₃ H ₈	M	→ Products					8632
He ₂ ⁺	+ NH ₃	M	→ Products					8632
He ₂ ⁺	+ N ₂	→	N ₂ ⁺	+ He + He	1.00	1.20 × 10 ⁻⁹	± 30%	7417 8632
	M	→	Products					6804
He ₂ ⁺	+ H ₂ O	M	→ Products					8632
He ₂ ⁺	+ O ₂	M	→ Products					8632
He ₂ ⁺	+ Ne	M	→ Ne ⁺ Products	+ He + He	1.00	1.40 × 10 ⁻¹⁰	± 30%	6804 8632
He ₂ ⁺	+ HCl	M	→ Products					8632
He ₂ ⁺	+ Ar	M	→ Products					8632
He ₂ ⁺	+ Kr	M	→ Products					8632
He ₂ ⁺	+ Hg	→	Hg ⁺	+ He + He	1.00	4.50 × 10 ⁻¹⁰	± 20%	8016
He ₂ ⁺	+ CO	M	→ Products					8632
He ₂ ⁺	+ CO ₂	M	→ Products					8632
He ₂ ⁺	+ NO	M	→ Products					8632
He ₂ ⁺	+ NO ₂	M	→ Products					8632
He ₂ ⁺	+ N ₂ O	M	→ Products					8632
B ⁺	+ H ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴			9008
B ⁺	+ HD	→	No Reaction		< 2.00 × 10 ⁻¹⁴			9008

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
C ⁺	+ H ₂	→ CH ⁺	+ H	1.00	1.20 × 10 ⁻¹⁶	± 75%	8707 8307 7705 8632	8607 8014	8602 7905
		M → Products							ab
C ⁺	+ HD	→ CH ⁺ CD ⁺	+ D + H	0.17 0.83	1.20 × 10 ⁻¹⁶	± 75%	8607		
C ⁺	+ D ₂	→ CD ⁺	+ D	1.00	2.30 × 10 ⁻¹⁷	± 75%	8607	8602	
		M → Products					8632		b
C ⁺	+ CH ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺	+ H ₂ + H	0.28 0.72	1.30 × 10 ⁻⁹	± 10%	9029 7905 7705 7617 7601	8207 7705 7617 7012 7010	8012 7617 7010
C ⁺	+ C ₂ H ₂	→ C ₃ H ⁺	+ H	1.00	2.63 × 10 ⁻⁹	± 10%	8624	8207	8012
C ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ C ₃ H ⁺ C ₃ H ₂ ⁺ C ₃ H ₃ ⁺	+ CH + C + H ₂ + H + H ₂ + H	0.08 0.15 0.05 0.29 0.42	1.50 × 10 ⁻⁹	± 30%	8309	8207	7617
C ⁺	+ C ₂ H ₆	→ C ₂ H ₇ ⁺ C ₃ H ₃ ⁺ C ₂ H ₄ ⁺ C ₃ H ₂ ⁺ C ₃ H ₄ ⁺	+ CH ₄ + CH ₃ + CH ₂ + CH + H ₂ + H ₂ + H ₂ + H	0.05 0.30 0.07 0.14 0.01 0.43	1.65 × 10 ⁻⁹	± 30%	8309	8207	7617
C ⁺	+ NH ₃	→ NH ₃ ⁺ HCN ⁺ HCNH ⁺	+ C + H ₂ + H	0.32 0.05 0.63	2.30 × 10 ⁻⁹	± 10%	8524 7707 7412	8012 7704 7601	
C ⁺	+ N ₂	→ No Reaction			< 2.00 × 10 ⁻¹⁴		9104	7705	
C ⁺	+ H ₂ O	→ H ₂ O ⁺ HO ⁺	+ C + H	0.10 0.90	2.40 × 10 ⁻⁹	± 15%	8710 7705	8524 7601	7905 7202
C ⁺	+ O ₂	→ O ⁺ CO ⁺	+ CO + O	0.60 0.40	8.70 × 10 ⁻¹⁰	± 15%	9029 8409 7602	8814 7905 7601	8811 7705 6602
C ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺ HCSi ⁺ CH ₂ Si ⁺	+ CH ₄ + CH ₃ + CH ₂ + CH + H ₂ + H + H ₂	0.06 0.08 0.14 0.61 0.03 0.08	4.40 × 10 ⁻⁹	± 20%	7319		
C ⁺	+ H ₂ S	→ H ₂ S ⁺ HCS ⁺	+ C + H	0.27 0.73	1.80 × 10 ⁻⁹	± 10%	8703 7507	7803	7601
C ⁺	+ HCl	→ CCl ⁺	+ H	1.00	1.00 × 10 ⁻⁹	+ 20%	9015 7601	8703 8502	a
C ⁺	+ HCN	→ C ₂ N ⁺	+ H	1.00	2.95 × 10 ⁻⁹	± 15%	9015 8012	8624 7704	8512 7601
C ⁺	+ CH ₃ NH ₂	→ CH ₃ ⁺ HCNH ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ HCN + H + CH ₃ + CH + C	0.01 0.03 0.27 0.69	3.20 × 10 ⁻⁹	± 45%	7803	7601	
C ⁺	+ CH ₃ CN	→ Products		1.00	5.60 × 10 ⁻⁹	± 20%	9015		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
C ⁺	+ C ₂ N ₂	→ CCN ⁺ CNC ⁺	+ CN + CN	0.11 0.89	1.90 × 10 ⁻⁹	± 30%	8802	8515
C ⁺	+ HC ₃ N	→ C ₃ ⁺ C ₃ H ⁺ C ₂ N ⁺ C ₄ N ⁺	+ HCN + CN + C ₂ H + H	0.05 0.70 0.02 0.23	5.50 × 10 ⁻⁹	± 20%	8518	8509 7911 b
*C ⁺	+ CO	→ C ⁺	+ CO	1.00	2.65 × 10 ⁻¹⁰	± 30%	8005	7601 a
C ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³		7905	7705
C ⁺	+ H ₂ CO	→ CH ₂ ⁺ HCO ⁺ H ₂ CO ⁺	+ CO + CH + C	0.54 0.20 0.26	4.20 × 10 ⁻⁹	± 10%	7803	7601
C ⁺	+ CH ₃ OH	→ CH ₃ ⁺ CH ₂ OH ⁺	+ HCO + CH	0.80 0.20	3.40 × 10 ⁻⁹	± 30%	7803	7601 b
C ⁺	+ CO ₂	→ CO ⁺ CO ₂ ⁺	+ CO + C	0.90 0.10	1.10 × 10 ⁻⁹	± 10%	8112 7601	7905 6602 7705 b
C ⁺	+ CHO OH	→ HCO ⁺	+ HCO	1.00	3.30 × 10 ⁻⁹	± 30%	7821	
C ⁺	+ NO	→ N ⁺ NO ⁺	+ CO + C	≤ 0.08 1.00	7.50 × 10 ⁻¹⁰	± 25%	9029 8008	8811 7905 8409 7601 a
C ⁺	+ N ₂ O	→ NO ⁺	+ CN	1.00	9.10 × 10 ⁻¹⁰	± 30%	9029 7009	8811 8810 ab
C ⁺	+ SO ₂	→ SO ⁺	+ CO	1.00	2.30 × 10 ⁻⁹	± 30%	8703	7507 ab
C ⁺	+ COS	→ CS ⁺ COS ⁺	+ CO + C	0.80 0.20	2.00 × 10 ⁻⁹	± 20%	7803	
CH ⁺	+ H	→ C ⁺	+ H ₂	1.00	7.50 × 10 ⁻¹⁰	± 30%	8403	
CH ⁺	+ H ₂	→ CH ₂ ⁺	+ H	1.00	1.20 × 10 ⁻⁹	± 15%	8403 7506	8103 7705 a
CH ⁺	+ CH ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ H ₂ + H ₂ + H	0.11 0.84 0.05	1.30 × 10 ⁻⁹	± 20%	7705	7402 7012 b
CH ⁺	+ C ₂ H ₂	→ C ₃ H ₂ ⁺	+ H	1.00	2.40 × 10 ⁻⁹	± 10%	8624	
CH ⁺	+ N	→ CN ⁺ H ⁺	+ H + CN	1.00 0.00	1.90 × 10 ⁻¹⁰	± 50%	8613	8008
CH ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺ HCNH ⁺	+ CH + C + H ₂	0.17 0.15 0.68	2.70 × 10 ⁻⁹	± 20%	7707	
CH ⁺	+ N ₂	→ Adduct					8632	
CH ⁺	+ O	→ H ⁺ CO ⁺	+ CO + H		3.50 × 10 ⁻¹⁰	± 50%	8008	
CH ⁺	+ H ₂ O	→ H ₃ O ⁺ HCO ⁺ H ₂ CO ⁺	+ C + H ₂ + H	> 0.50	2.90 × 10 ⁻⁹	± 20%	7705	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
CH ⁺	+ O ₂	→ O ⁺ CO ⁺ HCO ⁺	+ HCO + OH + O	>0.90	9.70×10 ⁻¹⁰	±20%	7705
CH ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺ CH ₂ Si ⁺ CH ₃ Si ⁺	+ CH ₄ + H + CH ₄ + CH ₃ + CH ₂ + H ₂ + H + H ₂	0.05 0.10 0.09 0.43 0.19 0.14	4.60×10 ⁻⁹	±20%	7319
CH ⁺	+ H ₂ S	→ H ₃ S ⁺ HCS ⁺	+ C + H ₂	0.30 0.70	2.10×10 ⁻⁹	±20%	7803 7305
CH ⁺	+ HCN	→ HCNH ⁺ C ₂ N ⁺ CHCN ⁺	+ C + H ₂ + H	0.75 0.15 0.10	2.80×10 ⁻⁹	±15%	8624 7819 7406
CH ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ CH ₂ + CH + C	0.50 0.10 0.40	2.30×10 ⁻⁹	±20%	7803
CH ⁺	+ CO	→ HCO ⁺	+ C	1.00	~7.00×10 ⁻¹²	±50%	7705
CH ⁺	+ H ₂ CO	→ CH ₂ ⁺ HCO ⁺ CH ₂ OH ⁺ CH ₂ CO ⁺	+ CO + CH ₂ + C + H	0.30 0.30 0.30 0.10	3.20×10 ⁻⁹	±20%	7803
CH ⁺	+ CH ₃ OH	→ CH ₃ ⁺ CH ₂ OH ⁺ CH ₃ OH ₂ ⁺	+ H ₂ CO + CH ₂ + C	0.50 0.10 0.40	2.90×10 ⁻⁹	±30%	7803
CH ⁺	+ CO ₂	→ HCO ⁺	+ CO	1.00	1.60×10 ⁻⁹	±20%	7705
CH ⁺	+ NO	→ NO ⁺	+ CH	1.00	7.60×10 ⁻¹⁰	±50%	8008
CH ⁺	+ COS	→ HCS ⁺ HCOS ⁺	+ CO + C	0.55 0.45	1.90×10 ⁻⁹	±20%	7803
CH ₂ ⁺	+ H ₂	→ CH ₃ ⁺	+ H	1.00	1.16×10 ⁻⁹	±54%	7705 7506
CH ₂ ⁺	+ CH ₄	→ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺	+ H ₂ + H	0.70 0.30	1.30×10 ⁻⁹	±15%	7705 7402 7012
CH ₂ ⁺	+ C ₂ H ₂	→ C ₃ H ₃ ⁺	+ H	1.00	2.50×10 ⁻⁹	±10%	8624
CH ₂ ⁺	+ N	→ CN ⁺ HCN ⁺	+ H ₂ + H		2.20×10 ⁻¹⁰	±50%	8008
CH ₂ ⁺	+ NH ₃	→ NH ₄ ⁺ CH ₂ NH ₂ ⁺	+ CH + H	0.33 0.67	2.66×10 ⁻⁹	±10%	8001 7707 7305
CH ₂ ⁺	+ N, M	Adduct					8632
CH ₂ ⁺	+ H ₂ O	→ CH ₂ OH ⁺	+ H	1.00	2.05×10 ⁻⁹	±60%	8001 7802 7705
CH ₂ ⁺	+ O ₂	→ HCO ⁺ H ₂ CO ⁺	+ OH + O	>0.50 <0.50	9.10×10 ⁻¹⁰	±20%	7705

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
CH ₂ ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺ CH ₂ Si ⁺ CH ₃ Si ⁺	+ CH ₄ + H ₂ + CH ₄ + H + CH ₄ + CH ₃ + H ₂ + H ₂ + H ₂ + H	0.03 0.09 0.03 0.62 0.03 0.20	3.50 × 10 ⁻⁹ ± 20%	7319			
CH ₂ ⁺	+ H ₂ S	→ HCS ⁺ CH ₂ SH ⁺	+ H ₂ + H + H	0.37 0.63	2.50 × 10 ⁻⁹ ± 10%	8401	7803	7305	
CH ₂ ⁺	+ HCl	→ CH ₃ ⁺ CHCl ⁺ CH ₂ Cl ⁺	+ Cl + H ₂ + H	0.15 0.42 0.42	1.50 × 10 ⁻⁹ ± 30%	9125			
CH ₂ ⁺	+ HCN	→ CH ₂ CN ⁺	+ H	1.00	1.80 × 10 ⁻⁹ ± 10%	8624			
CH ₂ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ CH ₃ + CH ₂ + CH	0.55 0.35 0.10	2.10 × 10 ⁻⁹ ± 20%	7803			
CH ₂ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ CH	1.00	4.10 × 10 ⁻⁹ ± 30%	7911			
CH ₂ ⁺	+ CO	→ No Reaction <u>M</u> Adduct			< 5.00 × 10 ⁻¹²		7705		
CH ₂ ⁺	+ H ₂ CO	→ HCO ⁺ CH ₂ CO ⁺ CH ₃ CO ⁺	+ CH ₃ + H ₂ + H	0.85 0.05 0.10	3.30 × 10 ⁻⁹ ± 20%	7803			
CH ₂ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ COH ₂ ⁺	+ CH ₃ + CH	0.50 0.50	2.60 × 10 ⁻⁹ ± 30%	7803			
CH ₂ ⁺	+ CO ₂	→ H ₂ CO ⁺	+ CO	1.00	1.60 × 10 ⁻⁹ ± 20%	7705			
CH ₂ ⁺	+ NO	→ NO ⁺	+ CH ₂	1.00	4.20 × 10 ⁻¹⁰ ± 50%	8008			
CH ₂ ⁺	+ COS	→ HCS ⁺ CH ₂ S ⁺	+ HCO + CO	0.60 0.40	1.80 × 10 ⁻⁹ ± 20%	7803			
CH ₃ ⁺	+ H	→ No Reaction			< 1.00 × 10 ⁻¹¹		7901		
CH ₃ ⁺	+ H ₂	→ CH ₅ ⁺ <u>M</u> Adduct	+ hν	1.00	< 5.00 × 10 ⁻¹³ ± 30%	<u>8410</u> 8632	7506		
CI ⁺	+ IID	→ Products		1.00	8.10 × 10 ⁻¹⁰ ± 20%	<u>8202</u>			
CH ₃ ⁺	+ D ₂	→ Products		1.00	6.80 × 10 ⁻¹⁰ ± 20%	<u>8202</u>			
CH ₃ ⁺	+ CH ₄	→ C ₂ H ₅ ⁺	+ H ₂	1.00	1.10 × 10 ⁻⁹ ± 15%	7803 7402 7012	7705 7304 7013	7424	
CH ₃ ⁺	+ C ₂ H ₂	→ C ₃ H ₃ ⁺	+ H ₂	1.00	1.15 × 10 ⁻⁹ ± 10%	8624 7712	8012	7803	
CH ₃ ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₃ H ₃ ⁺ C ₃ H ₅ ⁺	+ CH ₄ + H ₂ + H ₂ + H ₂	0.46 0.04 0.51	1.06 × 10 ⁻⁹ ± 10%	7712	7703		
CH ₃ ⁺	+ C ₂ H ₆	→ C ₂ H ₅ ⁺ C ₃ H ₅ ⁺ C ₃ H ₇ ⁺	+ CH ₄ + H ₂ + H ₂ + H ₂	0.85 0.09 0.06	1.74 × 10 ⁻⁹ ± 10%	7712			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
CH ₃ ⁺	+ N	→ HCN ⁺ HCNH ⁺	+ H ₂ + H		6.70 × 10 ⁻¹¹	± 20%	8613	7604
CH ₃ ⁺	+ NH ₃	→ NH ₄ ⁺ CH ₂ NH ₂ ⁺ M Adduct	+ CH ₂ + H ₂	0.15 0.85	1.75 × 10 ⁻⁹	± 10%	8706 7707 8632	8001 7305 7707
CH ₃ ⁺	+ N ₂	M Adduct					8632	
CH ₃ ⁺	+ O	→ H ₃ ⁺ H ₂ CO ⁺ HCO ⁺	+ CO + H + H ₂	1.00	4.40 × 10 ⁻¹⁰	± 20%	8809	7604
CH ₃ ⁺	+ H ₂ O	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹		7305 8632	
CH ₃ ⁺	+ O ₂	→ HCO ⁺ M Adduct	+ H ₂ O	1.00	4.30 × 10 ⁻¹¹	± 10%	7701 8632	
CH ₃ ⁺	+ SiH ₄	→ SiH ₃ ⁺ CH ₃ Si ⁺ CH ₃ SiH ₂ ⁺	+ CH ₄ + H ₂ + H ₂ + H ₂ + H	0.94 0.03 0.03	2.40 × 10 ⁻⁹	± 20%	7319	
CH ₃ ⁺	+ PH ₃	→ CH ₂ P ⁺ CH ₃ PH ⁺	+ H ₂ + H ₂ + H ₂	0.63 0.37	1.11 × 10 ⁻⁹	± 20%	7011	
CH ₃ ⁺	+ H ₂ S	→ CH ₂ SH ⁺	+ H ₂	1.00	9.90 × 10 ⁻¹⁰	± 45%	8401	7803
CH ₃ ⁺	+ HCl	→ CH ₂ Cl ⁺	+ H ₂	1.00	1.20 × 10 ⁻¹⁰	± 60%	8623	8511
CH ₃ ⁺	+ HCN	→ CH ₃ CNH ⁺	+ hν	1.00	2.00 × 10 ⁻¹⁰	± 10%	8623 8624 7701 8632	8516 8120 8510
		M Adduct					8510	
CH ₃ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ M Adduct	+ CH ₄ + CH ₃	0.45 0.55	3.20 × 10 ⁻⁹	± 20%	7803 8632	7609
CH ₃ ⁺	+ CH ₃ CN	→ C ₂ H ₅ ⁺ HCNH ⁺ C ₂ H ₅ CNH ⁺ M Adduct	+ HCN + C ₂ H ₄ + hν	0.37 0.58 0.05	1.80 × 10 ⁻⁹	± 20%	8929 8510	
CH ₃ ⁺	+ CH ₃ NC	→ CH ₃ CNH ⁺	+ CH ₂	1.00	1.10 × 10 ⁻⁹	± 30%	8510	
CH ₃ ⁺	+ HC ₃ N	→ C ₃ H ₅ ⁺ H ₄ C ₄ N ⁺ M Adduct	+ HCN	0.49 0.51	4.30 × 10 ⁻⁹	± 20%	8518 8518	8509 7911
CH ₃ ⁺	+ CO	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹		7701 8632	
CH ₃ ⁺	+ H ₂ CO	→ HCO ⁺ M Adduct	+ CH ₄	1.00	1.30 × 10 ⁻⁹	± 20%	7803 8632	7701
CH ₃ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ OH ⁺ CH ₃ OH ₂ ⁺ M Adduct	+ CH ₄ + CH ₃ + CH ₂	0.91 0.01 0.08	2.30 × 10 ⁻⁹	± 30%	7804 8632	7803 7701
CH ₃ ⁺	+ CO ₂	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹		7701 8632	
CH ₃ ⁺	+ CHO OH	→ CH ₅ ⁺	+ CO ₂	1.00	2.10 × 10 ⁻⁹	± 30%	7821	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
CH ₃ ⁺	+ c-(CH ₂) ₂ O →	c-C ₂ H ₅ O ⁺	+ CH ₄	1.00	1.40 × 10 ⁻⁹	± 10%	7609	
CH ₃ ⁺	+ CH ₃ CHO →	C ₂ H ₅ ⁺ CH ₂ OH ⁺ CH ₃ CO ⁺ Adduct	+ H ₂ CO + C ₂ H ₄ + CH ₄		4.00 × 10 ⁻⁹	± 50%	9014 7609	b
CH ₃ ⁺	+ C ₂ H ₅ OH →	C ₂ H ₅ ⁺ C ₂ H ₆ ⁺ C ₂ H ₄ ⁺ C ₂ H ₅ O ⁺	+ CH ₃ OH + CH ₃ O + HCO + CH ₄	0.53 0.03 0.23 0.20	3.40 × 10 ⁻⁹	± 10%	7804 7609	b
CH ₃ ⁺	+ (CH ₃) ₂ O →	CH ₃ OCH ₂ ⁺	+ CH ₄	1.00	3.00 × 10 ⁻⁹	± 10%	7609	
CH ₃ ⁺	+ CS ₂ →	No Reaction			< 1.00 × 10 ⁻¹⁰		7414	
CH ₃ ⁺	+ NO →	NO ⁺	+ CH ₃	1.00	9.70 × 10 ⁻¹⁰	± 10%	8008 7701	
CH ₃ ⁺	+ N ₂ O →	No Reaction			< 4.00 × 10 ⁻¹¹		7424	
CH ₃ ⁺	+ COS →	CH ₂ SH ⁺	+ CO	1.00	1.30 × 10 ⁻⁹	± 20%	7803	
CH ₂ D ⁺	+ H ₂ →	M Adduct					8632	
CH ₂ D ⁺	+ O →	HCO ⁺ DCO ⁺	+ HD + H ₂	0.60 0.40	4.40 × 10 ⁻¹⁰	± 20%	8809	
CHD ₂ ⁺	+ H ₂ →	M Adduct					8632	
CHD ₂ ⁺	+ O →	HCO ⁺ DCO ⁺	+ D ₂ + HD	0.30 0.70	4.40 × 10 ⁻¹⁰	± 20%	8809	
CD ₃ ⁺	+ H ₂ →	Products		1.00	5.10 × 10 ⁻¹⁰	± 10%	8202 7506	a
CD ₃ ⁺		M Adduct					8632	
CD ₃ ⁺	+ HD →	Products		1.00	4.00 × 10 ⁻¹⁰	± 25%	8202	a
CD ₃ ⁺	+ O →	DCO ⁺	+ D ₂	1.00	4.40 × 10 ⁻¹⁰	± 20%	8809	
CD ₃ ⁺	+ O ₂ →	M Adduct					8632	
CD ₃ ⁺	+ HCN →	M Adduct					8632	
CD ₃ ⁺	+ CO →	M Adduct					8632	
CH ₄ ⁺	+ H →	No Reaction			< 1.00 × 10 ⁻¹¹		7901	
CH ₄ ⁺	+ H ₂ →	CH ₅ ⁺	+ H	1.00	3.50 × 10 ⁻¹¹	± 15%	8521 7705 7506	
CH ₄ ⁺	+ CH ₄ →	CH ₅ ⁺	+ CH ₃	1.00	1.14 × 10 ⁻⁹	± 15%	7705 7425 7424 7402 7304 7211 7203 7013 6906	
CH ₄ ⁺	+ CD ₄ →	CH ₄ D ⁺ CH ₃ D ₂ ⁺ CH ₂ D ₃ ⁺ CHD ₄ ⁺	+ CD ₃ + CHD ₂ + CH ₂ D + CH ₃	0.10 0.22 0.43 0.25	1.30 × 10 ⁻⁹	± 20%	8913	a
CH ₄ ⁺	+ C ₂ H ₂ →	C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₃ H ₃ ⁺	+ CH ₄ + CH ₃ + H ₂ + H	0.53 0.41 0.06	2.72 × 10 ⁻⁹	± 10%	7712 7203	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
CH ₄ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺ C ₃ H ₆ ⁺	+ CH ₄ + CH ₃ + H ₂ + H	0.85 0.13 0.03	2.00 × 10 ⁻⁹ 	± 30%	7712	7203
CH ₄ ⁺	+ C ₂ H ₆	→ C ₂ H ₄ ⁺	+ CH ₄ + H ₂	1.00	1.91 × 10 ⁻⁹	± 10%	7712	
CH ₄ ⁺	+ NH ₃	→ CH ₃ ⁺ NH ₄ ⁺ NH ₃ ⁺	+ NH ₂ + CH ₃ + CH ₄	0.02 0.45 0.53	3.00 × 10 ⁻⁹	± 10%	8001	7707 7305 b
CH ₄ ⁺	+ N ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		7705	
CH ₄ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ CH ₃	1.00	2.50 × 10 ⁻⁹	± 10%	8001 7305	7802 7705 b
CH ₄ ⁺	+ O ₂	→ O ₂ ⁺	+ CH ₄	1.00	3.90 × 10 ⁻¹⁰	± 20%	8018	7705
CH ₄ ⁺	+ SiH ₄	→ SiH ₂ ⁺ SiH ₃ ⁺ CH ₃ SiH ⁺ CH ₃ SiH ₂ ⁺	+ CH ₄ + H ₂ + CH ₄ + H + H ₂ + H ₂ + H ₂ + H	0.23 0.72 0.02 0.03	2.00 × 10 ⁻⁹	± 20%	7319	
CH ₄ ⁺	+ H ₂ S	→ H ₂ S ⁺ H ₃ S ⁺	+ CH ₄ + CH ₃	0.55 0.45	2.30 × 10 ⁻⁹	± 10%	8401	7803 7305 b
CH ₄ ⁺	+ HCN	→ HCNH ⁺ CH ₃ CNH ⁺	+ CH ₃ + H	0.98 0.02	3.30 × 10 ⁻⁹	± 10%	8624	8101 b
CH ₄ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ CH ₄ + H + CH ₄	0.40 0.60	2.20 × 10 ⁻⁹	± 20%	7803	
CH ₄ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ CH ₃	1.00	2.50 × 10 ⁻⁹	± 30%	7911	
CH ₄ ⁺	+ CO	→ HCO ⁺ CH ₃ CO ⁺	+ CH ₃ + H	0.96 0.04	1.08 × 10 ⁻⁹	± 40%	8001	7705
CH ₄ ⁺	+ H ₂ CO	→ H ₂ CO ⁺ CH ₂ OH ⁺	+ CH ₄ + CH ₃	0.45 0.55	3.60 × 10 ⁻⁹	± 20%	7803	
CH ₄ ⁺	+ CH ₃ OH	→ CH ₃ OH ⁺ CH ₃ OH ₂ ⁺	+ CH ₄ + CH ₃	0.60 0.40	3.00 × 10 ⁻⁹	± 30%	7803	
CH ₄ ⁺	+ CO ₂	→ HCO ₂ ⁺ CH ₃ CO ⁺	+ CH ₃ + OH	0.99 0.01	1.00 × 10 ⁻⁹	± 20%	8001	7705 7424 b
CH ₄ ⁺	+ CS ₂	→ HCS ₂ ⁺	+ CH ₃	1.00	3.40 × 10 ⁻¹⁰	± 50%	7414	
CH ₄ ⁺	+ N ₂ O	→ HNO ⁺ HN ₂ O ⁺	+ H ₃ CN + CH ₃	0.03 0.97	1.27 × 10 ⁻⁹	± 20%	7424	7210 b
CH ₄ ⁺	+ COS	→ COS ⁺ HCOS ⁺	+ CH ₄ + CH ₃	0.30 0.70	1.40 × 10 ⁻⁹	± 20%	7803	
CD ₄ ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹²		7506	
CD ₄ ⁺	+ CH ₄	→ CH ₄ D ⁺ CH ₃ D ₂ ⁺ CH ₂ D ₃ ⁺ CHD ₄ ⁺	+ CD ₃ + CHD ₂ + CH ₂ D + CH ₃	0.28 0.36 0.24 0.12	1.20 × 10 ⁻⁹	± 20%	8913	a

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.			Footnotes	
CH ₅ ⁺	+ H	→ CH ₄ ⁺	+ H ₂	1.00	1.50 × 10 ⁻¹⁰	± 50%	8521	8308	7901	b
*CH ₅ ⁺	+ CH ₄	→ Products \xrightarrow{M} Adduct		1.00	3.00 × 10 ⁻¹¹	± 30%			7611	
							8632			
CH ₅ ⁺	+ CD ₄	→ Products		1.00	2.90 × 10 ⁻¹⁰	± 25%		8206		a
CH ₅ ⁺	+ C ₂ H ₂	→ C ₂ H ₃ ⁺	+ CH ₄	1.00	1.48 × 10 ⁻⁹	± 20%	7713	7426		
CH ₅ ⁺	+ C ₂ H ₄	→ C ₂ H ₅ ⁺	+ CH ₄	1.00	1.50 × 10 ⁻⁹	± 20%	7426			
CH ₅ ⁺	+ C ₂ H ₆	→ C ₂ H ₅ ⁺ C ₂ H ₇ ⁺	+ CH ₄ + H ₂ + CH ₄	0.15 0.85	1.35 × 10 ⁻⁹ 0.85	± 15%	8305	8117		
CH ₅ ⁺	+ N	→ No Reaction			< 1.00 × 10 ⁻¹¹		8613	8008		
CH ₅ ⁺	+ NH ₃	→ NH ₄ ⁺	+ CH ₄	1.00	2.40 × 10 ⁻⁹	± 15%	7516	7415	7315	
CH ₅ ⁺	+ O	→ H ₃ O ⁺ CH ₂ OH ⁺	+ CH ₂ + H ₂	~0.98 ~0.02	2.40 × 10 ⁻¹⁰	± 30%	8008	8006		
CH ₅ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ CH ₄	1.00	3.70 × 10 ⁻⁹	± 25%	7510			
CH ₅ ⁺	+ Mg	→ Mg ⁺ MgH ⁺	+ CH ₄ + H + CH ₄	0.65 0.35	1.40 × 10 ⁻⁹	± 20%	7710			T=623
CH ₅ ⁺	+ SiH ₄	→ SiH ₃ ⁺	+ CH ₄ + H ₂	1.00	2.00 × 10 ⁻⁹	± 20%	7319			
CH ₅ ⁺	+ CH ₃ NH ₂	→ Products		1.00	2.25 × 10 ⁻⁹	± 15%	7315			
CH ₅ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ CH ₄	1.00	4.50 × 10 ⁻⁹	± 30%	7911			
CH ₅ ⁺	+ CO	→ HCO ⁺	+ CH ₄	1.00	9.90 × 10 ⁻¹⁰	± 20%	8006			
CH ₅ ⁺	+ H ₂ CO	→ CH ₂ OH ⁺	+ CH ₄	1.00	4.50 × 10 ⁻⁹	± 25%	7906			
CH ₅ ⁺	+ CO ₂	→ HCO ₂ ⁺	+ CH ₄	1.00	3.25 × 10 ⁻¹¹	± 30%	7424	7313	7310	b
CH ₅ ⁺	+ CHOOH	→ CH(OH) ₂ ⁺	+ CH ₄	1.00	2.95 × 10 ⁻⁹	± 30%	7820	7818		
CH ₅ ⁺	+ NO	→ No Reaction			< 3.00 × 10 ⁻¹²		8008	7104		
CH ₅ ⁺	+ N ₂ O	→ HN ₂ O ⁺	+ CH ₄	1.00	9.00 × 10 ⁻¹⁰	± 10%	9031 7415	8006	7424	
CD ₅ ⁺	+ H ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		7506			
CD ₅ ⁺	+ CH ₄	→ Products		1.00	2.00 × 10 ⁻¹⁰	± 25%	8206			a
C ₂ ⁺	+ H ₂	→ C ₂ H ⁺	+ H	1.00	1.24 × 10 ⁻⁹	± 15%	9021	7705	7506	
C ₂ ⁺	+ CH ₄	→ C ₂ H ⁺ C ₂ H ₂ ⁺ C ₃ H ⁺ C ₃ H ₂ ⁺ C ₃ H ₃ ⁺	+ CH ₃ + CH ₂ + H ₂ + H + H ₂ + H	0.17 0.13 0.14 0.41 0.15	1.40 × 10 ⁻⁹	± 20%	7705			
C ₂ ⁺	+ C ₂ H ₂	→ C ₄ H ⁺	+ H	1.00	1.85 × 10 ⁻⁹	± 40%	8709	8624	7012	
C ₂ ⁺	+ C ₂ H ₄	→ Products		1.00	~1.90 × 10 ⁻⁹		7012			T=373
C ₂ ⁺	+ N	→ No Reaction			< 4.00 × 10 ⁻¹¹		8008			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
C ₂ ⁺	+ O	→ C ⁺ CO ⁺	+ CO + C		3.10 × 10 ⁻¹⁰	± 50%	8008	
C ₂ ⁺	+ HCN	→ C ₂ H ⁺ C ₃ H ⁺ C ₃ N ⁺	+ CN + N + H	0.10 0.30 0.60	2.60 × 10 ⁻⁹	± 10%	8624 8012 8011	b
C ₂ ⁺	+ C ₂ N ₂	→ C ₂ N ⁺ C ₃ N ⁺ C ₄ ⁺	+ C ₂ N + CN + N ₂	0.50 0.30 0.20	1.50 × 10 ⁻⁹	± 30%	8515	
C ₂ ⁺	+ HC ₃ N	→ C ₃ H ⁺ CHCCN ⁺ C ₄ ⁺ C ₄ H ⁺ C ₅ N ⁺	+ C ₂ N + C ₂ + HCN + CN + H	0.07 0.06 0.17 0.39 0.31	4.00 × 10 ⁻⁹	± 25%	8518 8509	b
C ₂ ⁺	+ NO	→ NO ⁺	+ C ₂	1.00	3.40 × 10 ⁻¹⁰	± 50%	8008	
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C ₂ H ⁺	+ H ₂	→ C ₂ H ₂ ⁺	+ H	1.00	1.24 × 10 ⁻⁹	± 50%	7705 7506	
C ₂ H ⁺	+ CH ₄	→ C ₂ H ₂ ⁺ C ₃ H ₃ ⁺ C ₃ H ₄ ⁺ C ₃ H ₅ ⁺	+ CH ₃ + H ₂ + H	0.34 0.34 0.12 0.20	1.10 × 10 ⁻⁹	± 20%	7705	
C ₂ H ⁺	+ C ₂ H ₂	→ C ₄ H ₂ ⁺	+ H	1.00	1.85 × 10 ⁻⁹	± 30%	8709 8624 7422 7105 7012	b
C ₂ H ⁺	+ C ₂ H ₄	→ Products		1.00	1.71 × 10 ⁻⁹	± 10%	7012	T = 373
C ₂ H ⁺	+ N	→ CH ⁺	+ CN	1.00	9.50 × 10 ⁻¹¹	± 20%	8613 8008	
C ₂ H ⁺	+ O	→ C ⁺ CH ⁺ CO ⁺ HCO ⁺	+ HCO + CO + CH + C		3.30 × 10 ⁻¹⁰	± 50%	8008	
C ₂ H ⁺	+ HCN	→ C ₂ H ₂ ⁺ HCNH ⁺ CHCCN ⁺	+ CN + C ₂ + H	0.20 0.35 0.45	2.70 × 10 ⁻⁹	± 10%	8624 8012 8011	b
C ₂ H ⁺	+ HC ₃ N	→ C ₄ H ⁺ C ₂ H ₂ ⁺ CHCCNH ⁺ HC ₃ N ⁺	+ HCN + CN + C ₂ + H	0.20 0.12 0.37 0.31	3.80 × 10 ⁻⁹	± 25%	8518 8509	b
C ₂ H ⁺	+ NO	→ NO ⁺	+ C ₂ H	1.00	1.20 × 10 ⁻¹⁰	± 50%	8008	
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C ₂ D ⁺	+ D ₂	→ C ₂ D ₂ ⁺ C ₂ D ₃ ⁺	+ D	0.80 0.20	1.10 × 10 ⁻⁹	± 20%	9021	
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C ₂ H ₂ ⁺	+ D	→ C ₂ HD ⁺	+ H	1.00	2.00 × 10 ⁻¹⁰	± 20%	8916	
C ₂ H ₂ ⁺	+ H ₂	→ C ₂ H ₃ ⁺	+ H	1.00	1.00 × 10 ⁻¹¹	± 30%	9029 7409 8632	8916 7705 ab
	M → Adduct							
C ₂ H ₂ ⁺	+ HD	→ C ₂ HD ⁺	+ H ₂	1.00	9.00 × 10 ⁻¹¹	± 20%	8713	a
C ₂ H ₂ ⁺	+ D ₂	→ C ₂ H ₂ D ⁺ C ₂ HD ⁺	+ D + HD	~0.30 ~0.70	1.40 × 10 ⁻¹⁰	± 20%	8916	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
C ₂ H ₂ ⁺	+ CH ₄	→ C ₃ H ₄ ⁺ C ₃ H ₅ ⁺	+ H ₂ + H	0.21 0.79	8.90 × 10 ⁻¹⁰ ± 10%	9029 7705	8012 7203	7712	ab
C ₂ H ₂ ⁺	+ CD ₄	→ C ₃ H ₂ D ₂ ⁺ C ₃ HD ₃ ⁺ C ₃ H ₂ D ₃ ⁺ C ₃ HD ₄ ⁺ Adduct	+ D ₂ + HD + D + H	0.07 0.12 0.40 0.41 0.02			8931		
C ₂ H ₂ ⁺	+ C ₂ H ₂	→ C ₄ H ₄ ⁺ C ₄ H ₃ ⁺	+ H ₂ + H	0.32 0.68	1.40 × 10 ⁻⁹ ± 15%	7712 7203 6906 8709	7422 7105 7012	7409 8632	
C ₂ H ₂ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ C ₃ H ₃ ⁺ C ₄ H ₅ ⁺	+ C ₂ H ₂ + CH ₃ + H	0.30 0.48 0.23	1.38 × 10 ⁻⁹ ± 15%	9029 7203	8321 7012	7712	ab
C ₂ H ₂ ⁺	+ C ₂ H ₆	→ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺ C ₃ H ₃ ⁺ C ₃ H ₄ ⁺ C ₃ H ₅ ⁺ C ₄ H ₅ ⁺ C ₄ H ₇ ⁺	+ C ₂ H ₄ + C ₂ H ₃ + CH ₃ + H ₂ + CH ₄ + CH ₃ + H ₂ + H + H	0.18 0.09 0.06 0.01 0.54 0.05 0.09	1.38 × 10 ⁻⁹ ± 10%	7712	7208		
C ₂ H ₂ ⁺	+ N	→ CH ⁺ C ₂ N ⁺ CHCN ⁺	+ HCN + H ₂ + H	~0.10 ~0.30 ~0.60	2.50 × 10 ⁻¹⁰ ± 20%	8613	8008		
C ₂ H ₂ ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ C ₂ H ₂ + C ₂ H	0.69 0.31	3.10 × 10 ⁻⁹ ± 10%	9026	7714		
C ₂ H ₂ ⁺	+ O	→ HCO ⁺ HC ₂ O ⁺	+ CH + H	~0.50 ~0.50	1.70 × 10 ⁻¹⁰ ± 25%	8008			
C ₂ H ₂ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ C ₂ H	1.00	2.20 × 10 ⁻¹⁰ ± 10%	7714			
C ₂ H ₂ ⁺	+ O ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹	7714			
C ₂ H ₂ ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺ CH ₃ Si ⁺ CHCSi ⁺ CH ₃ CSi ⁺ CH ₃ CHSi ⁺ C ₂ H ₅ Si ⁺	+ C ₂ H ₄ + H ₂ + C ₂ H ₅ + C ₂ H ₄ + C ₂ H ₃ + CH ₃ + H ₂ + H ₂ + H + H ₂ + H + H ₂ + H	0.06 0.04 0.19 0.61 0.02 0.01 0.02 0.01 0.03	1.45 × 10 ⁻⁹ ± 20%	7428	7427		
C ₂ H ₂ ⁺	+ H ₂ S	→ H ₂ S ⁺ H ₃ S ⁺ C ₂ H ₃ ⁺	+ C ₂ H ₂ + C ₂ H + SH	0.96 0.02 0.02	2.30 × 10 ⁻⁹ ± 10%	7714			
C ₂ H ₂ ⁺	+ HCN	→ HCNH ⁺ CHCCNH ⁺	+ C ₂ H + H	0.66 0.34	3.90 × 10 ⁻¹⁰ ± 25%	8002			
		M Adduct					9026		
C ₂ H ₂ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ C ₂ H ₃ + C ₂ H ₂ + C ₂ H	0.24 0.28 0.48	2.70 × 10 ⁻⁹ ± 25%	9026			
C ₂ H ₂ ⁺	+ CH ₃ CN	→ CH ₃ CNH ⁺ C ₃ H ₄ ⁺ C ₃ H ₅ ⁺ Adduct	+ C ₂ H + HCN + CN	0.22 0.28 0.28 0.23	3.80 × 10 ⁻⁹ ± 25%	9026			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
C ₂ H ₂ ⁺	+ HC ₃ N	→ C ₄ H ₂ ⁺ H ₃ C ₃ N ⁺	+ HCN	0.45 0.55	3.45 × 10 ⁻⁹	± 20%	8518	8509	7911
C ₂ H ₂ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ OH ₂ ⁺	+ C ₂ H ₃ + C ₂ H	0.85 0.15	2.29 × 10 ⁻⁹	± 25%	9026		
C ₂ H ₂ ⁺	+ CO ₂	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹¹		7714 8632		
C ₂ H ₂ ⁺	+ CH ₃ CHO	→ CH ₂ CO ⁺ CH ₃ CO ⁺ CH ₃ CHO ⁺ CH ₃ COH ₂ ⁺	+ C ₂ H ₄ + C ₂ H ₃ + C ₂ H ₂ + C ₂ H	0.22 0.24 0.36 0.18	3.20 × 10 ⁻⁹	± 25%	9026		
C ₂ H ₂ ⁺	+ (CH ₃) ₂ CO	→ CH ₃ CO ⁺ (CH ₃) ₂ CO ⁺ (CH ₃) ₂ COH ⁺	+ C ₃ H ₅ + C ₂ H ₂ + C ₂ H	0.09 0.55 0.36	3.00 × 10 ⁻⁹	± 25%	9026		
C ₂ H ₂ ⁺	+ NO	→ NO ⁺	+ C ₂ H ₂	1.00	1.20 × 10 ⁻¹⁰	± 25%	9029	8008	a,b
C ₂ H ₂ ⁺	+ COS	→ CH ₂ CS ⁺ COS ⁺	+ CO + C ₂ H ₂	0.46 0.54	4.20 × 10 ⁻¹⁰	± 30%	9027		
C ₂ HD ⁺	+ H ₂	→ C ₂ H ₂ ⁺	+ HD	1.00	2.00 × 10 ⁻¹¹	± 20%	8713		a
C ₂ D ₂ ⁺	+ D ₂	→ C ₂ D ₃ ⁺	+ D	1.00	4.00 × 10 ⁻¹¹	± 25%	9029		T = 15
C ₂ H ₃ ⁺	+ H	→ C ₂ H ₂ ⁺	+ H ₂	1.00	1.00 × 10 ⁻¹⁰	± 20%	8916	7901	b
C ₂ H ₃ ⁺	+ H ₂	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹²		8309 8632	7409 8632	a
C ₂ H ₃ ⁺	+ CH ₄	→ C ₃ H ₅ ⁺	+ H ₂	1.00	1.90 × 10 ⁻¹⁰	± 20%	8012	7712	7705
*C ₂ H ₃ ⁺	+ C ₂ H ₂	→ C ₂ H ₃ ⁺ C ₄ H ₅ ⁺	+ *C ₂ H ₂ + H ₂	~0.70 ~0.30	7.20 × 10 ⁻¹⁰	± 10%	8624		
C ₂ H ₃ ⁺	+ C ₂ H ₂	→ C ₄ H ₃ ⁺	+ H ₂	1.00	2.40 × 10 ⁻¹⁰	± 30%	8012 7409 8632	7712 7208 7005	b
C ₂ H ₃ ⁺	+ C ₂ H ₄	→ C ₂ H ₅ ⁺	+ C ₂ H ₂	1.00	8.90 × 10 ⁻¹⁰	± 10%	7712	7012	
C ₂ H ₃ ⁺	+ C ₂ H ₆	→ C ₂ H ₅ ⁺ C ₃ H ₅ ⁺ C ₄ H ₇ ⁺	+ C ₂ H ₄ + CH ₄ + H ₂	0.47 0.40 0.13	6.20 × 10 ⁻¹⁰	± 10%	7712	7208	b
C ₂ H ₃ ⁺	+ N	→ CHCN ⁺	+ H ₂	1.00	2.20 × 10 ⁻¹⁰	± 20%	8613		
C ₂ H ₃ ⁺	+ NH ₃	→ NH ₄ ⁺	+ C ₂ H ₂	1.00	2.48 × 10 ⁻⁹	± 10%	7714		
C ₂ H ₃ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ C ₂ H ₂	1.00	1.11 × 10 ⁻⁹	± 10%	7714		
C ₂ H ₃ ⁺	+ SiH ₄	→ SiH ₃ ⁺ SiH ₅ ⁺	+ C ₂ H ₄ + C ₂ H ₂	0.89 0.11	2.80 × 10 ⁻¹⁰	± 20%	7428		
C ₂ H ₃ ⁺	+ H ₂ S	→ H ₃ S ⁺	+ C ₂ H ₂	1.00	8.40 × 10 ⁻¹⁰	± 10%	7714		
C ₂ H ₃ ⁺	+ HCN	→ HCNH ⁺	+ C ₂ H ₂	1.00	2.30 × 10 ⁻⁹	± 40%	8624	8011	
C ₂ H ₃ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ C ₂ H ₂	1.00	3.80 × 10 ⁻⁹	± 20%	8518	8412	7911

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
C ₂ H ₃ ⁺	+ C ₂ N ₂	→ <u>M</u>	HC ₂ N ₂ ⁺ Adduct	+ C ₂ H ₂	1.00	5.50 × 10 ⁻¹⁰ ± 40%	8702 8412	b	
C ₂ H ₄ ⁺	+ H	→	C ₂ H ₃ ⁺	+ H ₂	1.00	3.00 × 10 ⁻¹⁰ ± 20%	8916 7901	b	
C ₂ H ₄ ⁺	+ H ₂	→	No Reaction		< 4.00 × 10 ⁻¹⁴	8616 7705 8632	8309 7711	a	
		→ <u>M</u>	Adduct						
C ₂ H ₄ ⁺	+ CH ₄	→	No Reaction		< 1.00 × 10 ⁻¹³	7712	7705	7203	
C ₂ H ₄ ⁺	+ C ₂ H ₂	→ <u>M</u>	C ₃ H ₃ ⁺ C ₄ H ₅ ⁺ Adduct	+ CH ₃ + H	0.77 0.23	8.40 × 10 ⁻¹⁰ ± 10%	8321 8632	7712 7705 7208	
C ₂ H ₄ ⁺	+ C ₂ H ₄	→ <u>C₃H₅⁺ C₄H₇⁺</u>	+ CH ₃ + H	0.91 0.09	7.90 × 10 ⁻¹⁰ ± 10%	7712 7012	7203 7014	b	
C ₂ H ₄ ⁺	+ C ₂ H ₆	→ <u>C₃H₆⁺ C₃H₇⁺</u>	+ CH ₄ + CH ₃	0.07 0.93	5.15 × 10 ⁻¹² ± 10%	7712	7208		
C ₂ H ₄ ⁺	+ NH ₃	→ <u>NH₃⁺ NH₄⁺</u>	+ C ₂ H ₄ + C ₂ H ₃	0.06 0.94	2.06 × 10 ⁻⁹ ± 10%	7714			
C ₂ H ₄ ⁺	+ H ₂ O	→	No Reaction		< 1.00 × 10 ⁻¹²	7714			
C ₂ H ₄ ⁺	+ SiH ₄	→ <u>C₂H₅⁺ SiH₂⁺ SiH₃⁺ CH₃CHSi⁺ C₂H₅Si⁺ C₂H₄Si⁺ C₂H₇Si⁺</u>	+ SiH ₃ + C ₂ H ₆ + C ₂ H ₅ + H ₂ + H ₂ + H ₂ + H + H ₂ + H	0.36 0.14 0.44 0.01 0.01 0.02 0.02	1.40 × 10 ⁻⁹ ± 20%	7428			
C ₂ H ₄ ⁺	+ H ₂ S	→ <u>H₂S⁺ CH₂S⁺ CH₂SH⁺</u>	+ C ₂ H ₄ + CH ₄ + CH ₃	0.62 0.07 0.31	1.06 × 10 ⁻⁹ ± 10%	7714			
C ₂ H ₄ ⁺	+ HCN	→ <u>M</u>	No Reaction Adduct		< 2.00 × 10 ⁻¹¹	8624 8011		b	
C ₂ H ₄ ⁺	+ HC ₃ N	→	CHCCNH ⁺	+ C ₂ H ₃	1.00	1.10 × 10 ⁻⁹ ± 30%	7911		
C ₂ H ₅ ⁺	+ H	→	C ₂ H ₄ ⁺	+ H ₂	1.00	~ 1.00 × 10 ⁻¹¹ ± 30%	8916 7901	b	
C ₂ H ₅ ⁺	+ H ₂	→ <u>M</u>	No Reaction Adduct		< 4.00 × 10 ⁻¹⁴	8309 8632	7711 7701	a	
C ₂ H ₅ ⁺	+ CH ₄	→ <u>M</u>	C ₃ H ₇ ⁺ Adduct	+ H ₂	1.00	9.00 × 10 ⁻¹⁴ ± 15%	8305 8632	7712 7509	a
*C ₂ H ₅ ⁺	+ C ₂ H ₂	→ <u>M</u>	C ₂ H ₅ ⁺ C ₃ H ₅ ⁺ C ₄ H ₅ ⁺ Adduct	+ C ₂ H ₂ + CH ₄ + H ₂	0.79 0.08 0.13	9.00 × 10 ⁻¹⁰ ± 20%	7712 8632	7703 7005	b
C ₂ H ₅ ⁺	+ C ₂ H ₄	→ <u>M</u>	C ₃ H ₅ ⁺ Adduct	+ CH ₄	1.00	3.55 × 10 ⁻¹⁰ ± 15%	7712 7005	7012 7005	b
C ₂ H ₅ ⁺	+ C ₂ H ₆	→ <u>M</u>	C ₃ H ₇ ⁺ C ₄ H ₉ ⁺	+ CH ₄ + H ₂	0.14 0.86	3.90 × 10 ⁻¹¹ ± 10%	8305 7712	7705 7005	b

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
C ₂ H ₅ ⁺	+ NH ₃	→ NH ₄ ⁺	+ C ₂ H ₄	1.00	2.09 × 10 ⁻⁹	± 10%	7701	7415	7315
C ₂ H ₅ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ C ₂ H ₄	1.00	1.86 × 10 ⁻⁹	± 65%	8807 7701	8208	8115
C ₂ H ₅ ⁺	+ H ₂ S	→ H ₃ S ⁺	+ C ₂ H ₄	1.00	6.70 × 10 ⁻¹⁰	± 10%	7701		
C ₂ H ₅ ⁺	+ HCN	→ HCNH ⁺	+ C ₂ H ₄	1.00	2.70 × 10 ⁻⁹	± 20%	8011		
C ₂ H ₅ ⁺	+ CH ₃ NH ₂	→ Products		1.00	1.87 × 10 ⁻⁹	± 15%	7315		
C ₂ H ₅ ⁺	+ CH ₃ CN	→ CH ₃ CNH ⁺	+ C ₂ H ₄	1.00	3.80 × 10 ⁻⁹	± 20%	8929		
C ₂ H ₅ ⁺	+ C ₂ N ₂	→ HC ₂ N ₂ ⁺ Adduct	+ C ₂ H ₄	1.00	8.00 × 10 ⁻¹¹	± 50%	8932 8932	8702	
C ₂ H ₅ ⁺	+ HC ₃ N	→ CHCCNH ⁺	+ C ₂ H ₄	1.00	3.55 × 10 ⁻⁹	± 20%	8518	7911	
C ₂ H ₅ ⁺	+ H ₂ CO	→ CH ₂ OH ⁺	+ C ₂ H ₄	1.00	3.10 × 10 ⁻⁹	± 25%	7906		
C ₂ H ₅ ⁺	+ CHOONH ₄	→ CH(OH) ₂ ⁺	+ C ₂ H ₄	1.00	1.50 × 10 ⁻⁹	± 30%	7821		
C ₂ H ₅ ⁺	+ CS ₂	→ HCS ₂ ⁺	+ C ₂ H ₄	1.00	7.20 × 10 ⁻¹⁰	± 20%	8807		a
C ₂ H ₆ ⁺	+ H	→ C ₂ H ₅ ⁺	+ H ₂	1.00	1.00 × 10 ⁻¹⁰	± 20%	8916	7901	b
C ₂ H ₆ ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹		7701		
C ₂ H ₆ ⁺	+ CH ₄	→ No Reaction			< 1.00 × 10 ⁻¹²		7712		
C ₂ H ₆ ⁺	+ C ₂ H ₂	→ C ₂ H ₅ ⁺ C ₃ H ₅ ⁺ C ₄ H ₇ ⁺	+ C ₂ H ₃ + CH ₃ + H	0.19 0.70 0.11	1.30 × 10 ⁻⁹	± 10%	7712	7208	
C ₂ H ₆ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺	+ C ₂ H ₆	1.00	1.15 × 10 ⁻⁹	± 10%	7712		
C ₂ H ₆ ⁺	+ C ₂ H ₆	→ C ₃ H ₈ ⁺ C ₃ H ₇ ⁺	+ CH ₄ + CH ₃	0.42 0.58	1.90 × 10 ⁻¹¹	± 10%	7712	7208	
C ₂ H ₆ ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ C ₂ H ₆ + C ₂ H ₅	0.28 0.72	2.23 × 10 ⁻⁹	± 10%	7701		
C ₂ H ₆ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ C ₂ H ₅	1.00	2.95 × 10 ⁻⁹	± 10%	7701		
C ₂ H ₆ ⁺	+ H ₂ S	→ H ₂ S ⁺ H ₃ S ⁺	+ C ₂ H ₆ + C ₂ H ₅	0.69 0.31	2.87 × 10 ⁻⁹	± 10%	7701		
C ₃ ⁺	+ H ₂	→ C ₃ H ⁺	+ H	1.00	2.40 × 10 ⁻¹⁰	± 25%	9021	8916	8309
C ₃ ⁺	+ D ₂	→ C ₃ D ⁺ Adduct	+ D	1.00	1.50 × 10 ⁻¹⁰	± 20%	9021 9021	8916	8726
C ₃ ⁺	+ CH ₄	→ C ₃ H ⁺ C ₄ H ₂ ⁺ C ₄ H ₃ ⁺	+ CH ₃ + H ₂ + H	0.25 0.38 0.37	9.50 × 10 ⁻¹⁰	± 30%	8805		
C ₃ ⁺	+ C ₂ H ₂	→ C ₅ H ⁺	+ H	1.00	1.70 × 10 ⁻⁹	± 30%	8805	8624	
C ₃ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ C ₃ H ₂ ⁺ C ₅ H ₂ ⁺ C ₅ H ₃ ⁺	+ C ₃ + C ₂ H ₂ + H ₂ + H	0.44 0.15 0.26 0.15	9.00 × 10 ⁻¹⁰	± 30%	8805		
C ₃ ⁺	+ O ₂	→ C ₃ O ⁺	+ O	1.00	1.75 × 10 ⁻¹⁰	± 20%	8726		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
C ₃ ⁺	+ HCN	→ C ₃ H ⁺ C ₄ N ⁺	+ CN + H	0.20 0.80	1.30 × 10 ⁻⁹ ± 30%	8924	8624	
C ₃ ⁺	+ " HC ₃ N	→ C ₅ H ⁺	+ CN	1.00	3.20 × 10 ⁻⁹ ± 20%	8518		
C ₃ H ⁺	+ H ₂	→ c-C ₃ H ₂ ⁺ l-C ₃ H ₂ ⁺ c-C ₃ H ₃ ⁺ l-C ₃ H ₃ ⁺ M Adduct	+ H + H	-0.04 -0.16 -0.52 -0.28	2.60 × 10 ⁻¹¹ ± 30%	8712	<u>8309</u>	a
						8712	8632	<u>8309</u>
C ₃ H ⁺	+ CH ₄	→ C ₂ H ₃ ⁺ C ₃ H ₃ ⁺ C ₄ H ₃ ⁺	+ C ₂ H ₂ + CH ₂ + H ₂	0.70 0.20 0.10	5.50 × 10 ⁻¹⁰ ± 30%	8304		
C ₃ H ⁺	+ C ₂ H ₂	→ C ₅ H ₂ ⁺	+ H	1.00	8.40 × 10 ⁻¹⁰ ± 50%	8805	8624	8012
C ₃ H ⁺	+ C ₂ H ₄	→ C ₃ H ₃ ⁺ C ₅ H ₃ ⁺	+ C ₂ H ₂ + H ₂	0.95 0.05	9.50 × 10 ⁻¹⁰ ± 30%	8304		
C ₃ H ⁺	+ CH ₂ CCH ₂	→ C ₄ H ₃ ⁺	+ C ₂ H ₂	1.00	1.40 × 10 ⁻⁹ ± 20%	8429		
C ₃ H ⁺	+ CH ₃ CCH	→ C ₄ H ₃ ⁺	+ C ₂ H ₂	1.00	1.40 × 10 ⁻⁹ ± 20%	8429		
C ₃ H ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₂ ⁺ HCN ⁺ CH ₂ CHCN ⁺	+ C ₃ H + C ₃ + C ₂ H ₂ + H	0.20 0.45 0.25 0.10	1.65 × 10 ⁻⁹ ± 30%	8311	8304	
C ₃ H ⁺	+ N ₂	→ No Reaction			< 1.00 × 10 ⁻¹³	8304		
C ₃ H ⁺	+ H ₂ O	→ C ₂ H ₃ ⁺ HCO ⁺ CHCCO ⁺	+ CO + C ₂ H ₂ + H ₂	0.40 0.55 0.05	4.50 × 10 ⁻¹⁰ ± 30%	8304		
C ₃ H ⁺	+ O ₂	→ HCO ⁺ HC ₂ O ⁺ CHCCO ⁺	+ C ₂ O + CO + O	0.60 0.10 0.30	2.50 × 10 ⁻¹¹ ± 30%	8304		
C ₃ H ⁺	+ H ₂ S	→ C ₂ H ₃ ⁺ HCS ⁺ CHCCS ⁺	+ CS + C ₂ H ₂ + H ₂	0.30 0.63 0.07	1.20 × 10 ⁻⁹ ± 30%	8304		
C ₃ H ⁺	+ HCN	→ HCN ⁺ H ₂ C ₄ N ⁺ M Adduct	+ C ₃ + hν	0.09 0.91	4.00 × 10 ⁻¹¹ ± 30%	8924	8624	b
						8311		
C ₃ H ⁺	+ CH ₃ CN	→ C ₂ H ₃ ⁺ CH ₃ CNH ⁺ CHCCNH ⁺ H ₄ C ₅ N ⁺	+ HC ₃ N + C ₃ + C ₂ H ₂	0.20 0.15 0.33 0.30	3.00 × 10 ⁻⁹ ± 30%	8311	8304	b
C ₃ H ⁺	+ C ₂ N ₂	→ HC ₅ N ₂ ⁺		1.00	> 4.40 × 10 ⁻¹⁰ ± 30%	8304		
C ₃ H ⁺	+ HC ₃ N	→ H ₂ C ₆ N ⁺		1.00	1.25 × 10 ⁻⁹ ± 20%	8518	8509	
C ₃ H ⁺	+ CO	M Adduct				8632		
C ₃ H ⁺	+ CH ₃ OH	→ CH ₃ ⁺ CH ₂ OH ⁺ CHCCO ⁺	+ H ₂ C ₃ O + C ₃ H ₂ + CH ₄	0.10 0.10 0.80	2.20 × 10 ⁻⁹ ± 30%	8311	8304	b
C ₃ H ⁺	+ CO ₂	→ CHCCO ⁺	+ CO	1.00	2.00 × 10 ⁻¹² ± 30%	8304		

Table of Reactions — Continued

Reactions					Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
C ₃ H ⁺	+ NO	→	NO ⁺ CHCN ⁺	+ C ₃ H + CO	0.25 0.75	5.50 × 10 ⁻¹⁰ ± 30%	8304	
C ₃ H ⁺	+ N ₂ O	→	HCN ⁺ NO ⁺ CHCCO ⁺	+ C ₂ NO + HC ₃ N + N ₂	0.05 0.55 0.40		8304	
C ₃ H ⁺	+ COS	→	CS ⁺ CHCCO ⁺ CHCCS ⁺	+ HC ₃ O + CS + CO	0.70 0.20 0.10	6.10 × 10 ⁻¹⁰ ± 30%	8304	
<i>l</i> -C ₃ H ⁺	+ D	→	<i>l</i> -C ₃ D ⁺	+ H	1.00	5.00 × 10 ⁻¹⁰ ± 20%	8916	
<i>l</i> -C ₃ H ⁺	+ H ₂	→	<i>c</i> -C ₃ H ₂ [‡]	+ H	1.00	6.00 × 10 ⁻¹² ± 30%	8916	
<i>l</i> -C ₃ H ⁺	+ D ₂	→	<i>c</i> -C ₃ HD ⁺ <i>c</i> -C ₃ D ₂ [‡]	+ D + H	0.50 0.50	6.00 × 10 ⁻¹² ± 30%	8916	
C ₃ D ⁺	+ D ₂	→	C ₃ D ₂ [‡]	+ D	1.00	2.70 × 10 ⁻¹¹ ± 20%	8726	
C ₃ H ₂ [‡]	+ H ₂	→	No Reaction M → No Reaction		< 5.00 × 10 ⁻¹⁴		8415 8632	^a
C ₃ H ₂ [‡]	+ CH ₂ CCH ₂	→	C ₄ H ₂ ⁺ C ₄ H ₃ ⁺ C ₄ H ₄ ⁺ C ₅ H ₃ ⁺ C ₆ H ₅ ⁺	+ C ₂ H ₄ + C ₂ H ₃ + C ₂ H ₂ + CH ₃ + H	0.04 0.14 0.50 0.09 0.21	1.40 × 10 ⁻⁹ ± 20%	8429	
C ₃ H ₂ [‡]	+ CH ₃ CCH	→	C ₄ H ₂ ⁺ C ₄ H ₃ ⁺ C ₄ H ₄ ⁺ C ₅ H ₃ ⁺ C ₆ H ₅ ⁺	+ C ₂ H ₄ + C ₂ H ₃ + C ₂ H ₂ + CH ₃ + H	0.09 0.12 0.41 0.18 0.20	1.30 × 10 ⁻⁹ ± 20%	8429	
C ₃ H ₂ [‡]	+ HCN	→	Products		1.00	1.60 × 10 ⁻¹⁰ ± 10%	8624	
<i>c</i> -C ₃ H ₂ [‡]	+ H	→	No Reaction		< 7.00 × 10 ⁻¹²		8916	
<i>c</i> -C ₃ H ₂ [‡]	+ D	→	<i>c</i> -C ₃ HD ⁺	+ H	1.00	1.00 × 10 ⁻¹⁰ ± 20%	8916	
<i>c</i> -C ₃ H ₂ [‡]	+ D ₂	→	No Reaction		< 1.00 × 10 ⁻¹²		8916	
<i>c</i> -C ₃ H ₂ [‡]	+ C ₂ H ₂	→	C ₅ H ₃ ⁺	+ H	1.00	9.00 × 10 ⁻¹⁰ ± 20%	8712	
<i>l</i> -C ₃ H ₂ [‡]	+ H	→	<i>l</i> -C ₃ H ⁺	+ H ₂	1.00	6.00 × 10 ⁻¹¹ ± 20%	8916	
<i>l</i> -C ₃ H ₂ [‡]	+ D	→	<i>c</i> -C ₃ HD ⁺ <i>l</i> -C ₃ HD ⁺	+ H + H	0.50 0.50	1.00 × 10 ⁻⁹ ± 20%	8916	
<i>l</i> -C ₃ H ₂ [‡]	+ D ₂	→	No Reaction		< 1.00 × 10 ⁻¹²		8916	
<i>l</i> -C ₃ H ₂ [‡]	+ C ₂ H ₂	→	C ₅ H ₃ ⁺	+ H	1.00	1.10 × 10 ⁻⁹ ± 20%	8712 8624	^b
C ₃ H ₃ ⁺	+ H ₂	→	No Reaction M → No Reaction		< 1.00 × 10 ⁻¹³		8309 8632	T = 80
C ₃ H ₃ ⁺	+ C ₂ H ₂	→	No Reaction		< 1.00 × 10 ⁻¹¹		8624	

Table of Reactions — Continued

Reactions			Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
C ₃ H ₃ ⁺	+ CH ₂ CCH ₂	→ No Reaction		< 1.00 × 10 ⁻¹¹	8429			
C ₃ H ₃ ⁺	+ CH ₃ CCH	→ No Reaction		< 1.00 × 10 ⁻¹¹	8429			
C ₃ H ₃ ⁺	+ N	→ CHCCNH ⁺	+ H	1.00	1.30 × 10 ⁻¹⁰ ± 20%	8613		
C ₃ H ₃ ⁺	+ HCN	→ No Reaction		< 2.00 × 10 ⁻¹¹	8624			
c-C ₃ H ₃ ⁺	+ C ₂ H ₂	→ No Reaction		< 8.00 × 10 ⁻¹³	8712	8624	8209	
c-C ₃ H ₃ ⁺	+ C ₂ H ₄	→ No Reaction		< 1.00 × 10 ⁻¹¹	8209			
c-C ₃ H ₃ ⁺	+ c-C ₆ H ₆	→ No Reaction		< 1.00 × 10 ⁻¹¹	8209			
c-C ₃ H ₃ ⁺	+ HCN	→ No Reaction		< 2.00 × 10 ⁻¹¹	8624			
c-C ₃ H ₃ ⁺	+ CH ₃ OH	→ No Reaction		< 1.00 × 10 ⁻¹¹	8630			
c-C ₃ H ₃ ⁺	+ C ₂ H ₅ OH	→ No Reaction		< 1.00 × 10 ⁻¹¹	8630			
<i>l</i> -C ₃ H ₃ ⁺ + C ₂ H ₂ M Adduct					9041	8712	8708	
<i>l</i> -C ₃ H ₃ ⁺ + C ₂ D ₂	→ <i>l</i> -C ₃ H ₃ ⁺	+ C ₂ D ₂	0.08	9.10 × 10 ⁻¹⁰ ± 15%	9041	8708	T = 373	
	→ <i>l</i> -C ₃ H ₂ D ⁺	+ C ₂ HD	0.46					
	→ <i>l</i> -C ₃ HD ₂ ⁺	+ C ₂ H ₂	0.23					
	→ c-C ₃ H ₃ ⁺	+ C ₂ D ₂	0.02					
	→ c-C ₃ H ₂ D ⁺	+ C ₂ HD	0.14					
	→ c-C ₃ HD ₂	+ C ₂ H ₂	0.07					
<i>l</i> -C ₃ H ₃ ⁺	+ C ₂ H ₄	→ C ₅ H ₅ ⁺ C ₅ H ₇ ⁺	+ H ₂	1.10 × 10 ⁻⁹ ± 50%	8209			
<i>l</i> -C ₃ H ₃ ⁺	+ C ₄ H ₂	→ c-C ₃ H ₃ ⁺ C ₅ H ₃ ⁺	+ C ₄ H ₂ + C ₂ H ₂	0.24 0.76	1.40 × 10 ⁻⁹ ± 50%	9041	8708	T = 363
<i>l</i> -C ₃ H ₃ ⁺	+ c-C ₆ H ₆	→ C ₇ H ₇ ⁺ C ₉ H ₇ ⁺	+ C ₂ H ₂ + H ₂		1.40 × 10 ⁻⁹ ± 20%	8209		
<i>l</i> -C ₃ H ₃ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ OH ₂ ⁺	+ C ₃ H ₄ + C ₃ H ₂		3.00 × 10 ⁻¹⁰ ± 20%	8630		
<i>l</i> -C ₃ H ₃ ⁺	+ C ₂ H ₅ OH	→ C ₂ H ₅ ⁺ C ₂ H ₅ O ⁺ C ₂ H ₅ OH ₂ ⁺ C ₃ H ₅ O ⁺	+ C ₃ H ₄ + C ₃ H ₄ + C ₃ H ₂ + C ₂ H ₄		6.00 × 10 ⁻¹⁰ ± 20%	8630		
C ₃ H ₄ ⁺	+ H ₂	→ No Reaction		< 1.00 × 10 ⁻¹³	8309		T = 80	
M	No Reaction				8632			
C ₃ H ₄ ⁺	+ C ₂ H ₂	→ C ₅ H ₅ ⁺	+ H	1.00	4.90 × 10 ⁻¹⁰ ± 10%	8624		
C ₃ H ₄ ⁺	+ II CN	→ No Reaction		< 1.00 × 10 ⁻¹¹	8624			
CH ₂ CCH ₂ ⁺	+ CH ₂ CCH ₂	→ C ₄ H ₄ ⁺ C ₄ H ₅ ⁺ C ₅ H ₅ ⁺ C ₆ H ₅ ⁺ c-C ₆ H ₇ ⁺ ac-C ₆ H ₇ ⁺	+ C ₂ H ₄ + C ₂ H ₂ + CH ₃ + H ₂ + H + H + H	0.05 0.01 0.01 0.07 0.61 0.26	1.10 × 10 ⁻⁹ ± 20%	8527	8429	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
CH ₃ CCH ⁺ + CH ₃ CCH →	C ₃ H ₅ ⁺	+ C ₃ H ₃		0.18	1.10 × 10 ⁻⁹	± 20%	8527 8429
	C ₄ H ₆ ⁺	+ C ₂ H ₄		0.02			
	C ₄ H ₆ ⁺	+ C ₂ H ₂		0.02			
	C ₅ H ₅ ⁺	+ CH ₃		0.02			
	C ₆ H ₅ ⁺	+ H ₂ + H		0.08			
	c-C ₆ H ₇ ⁺	+ H		0.30			
	ac-C ₆ H ₇ ⁺	+ H		0.38			
C ₃ H ₅ ⁺ + H ₂ →	M	No Reaction					8632
C ₃ H ₅ ⁺ + C ₂ H ₄ →	M	Adduct					8632
C ₃ II ₅ ⁺ + C ₂ II ₆ →	M	Adduct					8632
C ₃ H ₅ ⁺ + N →	C ₂ H ₄ ⁺	+ HCN		0.88	1.25 × 10 ⁻¹⁰	± 20%	8613
	CH ₂ CHCN ⁺	+ H ₂		0.12			
C ₃ H ₇ ⁺ + H ₂ →	M	No Reaction					8632
C ₃ H ₇ ⁺ + N →		No Reaction			< 1.00 × 10 ⁻¹¹	± 20%	8613
C ₄ ⁺ + H ₂ →	C ₄ H ⁺	+ H		1.00	1.30 × 10 ⁻¹⁰	± 20%	9021 8914 8309 a
C ₄ ⁺ + D ₂ →	C ₄ D ⁺	+ D		1.00	3.20 × 10 ⁻¹⁰	± 20%	8726
C ₄ ⁺ + CH ₄ →	C ₃ H ₅ ⁺	+ C ₂ H ₂		0.20	7.80 × 10 ⁻¹⁰	± 30%	8805
	C ₄ H ⁺	+ CH ₃		0.18			
	C ₃ H ₂ ⁺	+ H ₂		0.48			
	C ₃ H ₃ ⁺	+ H		0.14			
C ₄ ⁺ + C ₂ H ₂ →	C ₃ H ₂ ⁺	+ C ₃		0.12	1.60 × 10 ⁻⁹	± 20%	8805 8709 8624
	C ₆ H ⁺	+ H		0.88			
C ₄ ⁺ + C ₂ H ₄ →	C ₃ H ₄ ⁺	+ C ₄		0.27	1.40 × 10 ⁻⁹	± 30%	8805
	C ₃ H ₃ ⁺	+ C ₃ H		0.08			
	C ₄ H ₂ ⁺	+ C ₂ H ₂		0.17			
	C ₃ H ⁺	+ CH ₃		0.09			
	C ₆ H ₂ ⁺	+ H ₂		0.39			
C ₄ ⁺ + C ₄ H ₂ →	C ₈ H ⁺	+ H		1.00	1.70 × 10 ⁻⁹	± 20%	8429
C ₄ ⁺ + C ₄ H ₄ →		Products		1.00	1.50 × 10 ⁻⁹	± 20%	8429
C ₄ ⁺ + O ₂ →	C ₃ ⁺	+ CO ₂		0.50	2.50 × 10 ⁻¹⁰	± 20%	8726
	C ₄ O ⁺	+ O		0.50			
C ₄ ⁺ + HCN →	C ₄ H ⁺	+ CN		0.28	1.95 × 10 ⁻⁹	± 60%	8924 8624
	C ₅ N ⁺	+ H		0.57			
	HC ₅ N ⁺	+ hν		0.16			
C ₄ ⁺ + CO →		Adduct		1.00	4.50 × 10 ⁻¹⁰	± 20%	8914 a
C ₄ H ⁺ + H ₂ →	C ₄ H ₂ ⁺	+ H		1.00	1.65 × 10 ⁻¹⁰	± 20%	9021 8914 8309 a
	M	No Reaction					8632
C ₄ H ⁺ + C ₂ H ₂ →	C ₆ H ₂ ⁺	+ H		1.00	1.22 × 10 ⁻⁹	± 35%	8805 8709 8624
C ₄ H ⁺ + C ₄ H ₂ →	C ₈ H ₂ ⁺	+ H		1.00	1.60 × 10 ⁻⁹	± 20%	8429

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
C ₄ H ⁺	+ C ₄ H ₄	→ C ₄ H ₅ ⁺ C ₆ H ₃ ⁺ C ₈ H ₄ ⁺	+ C ₄ H + C ₂ H ₂ + H	0.55 0.37 0.08	2.20 × 10 ⁻⁹ ± 20%	8429		
C ₄ H ⁺	+ HCN	→ C ₄ H ₂ ⁺ HC ₅ N ⁺ H ₂ C ₅ N ⁺	+ CN + H + hν	0.07 0.91 0.03	1.35 × 10 ⁻⁹ ± 30%	8924	8624	b
C ₄ H ⁺	+ CO	→ Adduct		1.00	4.70 × 10 ⁻¹⁰ ± 20%	8914		a
C ₄ D ⁺	+ D ₂	→ C ₄ D ₂ ⁺	+ D	1.00	1.10 × 10 ⁻¹⁰ ± 20%	8726		
C ₄ H ₂ ⁺	+ C ₂ H ₂	→ C ₆ H ₃ ⁺ C ₈ H ₄ ⁺ M Adduct	+ H + hν	0.05 0.95	2.80 × 10 ⁻¹⁰ ± 65%	8624 7105 8709	8121 7422 8632	b
C ₄ H ₂ ⁺	+ C ₂ D ₂	→ C ₄ HD ⁺ Adduct	+ C ₂ HD + hν	0.52 0.48	5.90 × 10 ⁻¹⁰ ± 20%	9033		
C ₄ H ₂ ⁺	+ CH ₃ CCH	→ C ₅ H ₄ ⁺ C ₇ H ₅ ⁺	+ C ₂ H ₂ + H	0.10 0.90		8429		
C ₄ H ₂ ⁺	+ C ₄ H ₂	→ C ₆ H ₂ ⁺ C ₈ H ₂ ⁺ C ₈ H ₃ ⁺	+ C ₂ H ₂ + H ₂ + H	0.83 0.17 0.01	1.40 × 10 ⁻⁹ ± 20%	8429		
C ₄ H ₂ ⁺	+ C ₄ H ₄	→ C ₄ H ₅ ⁺ C ₆ H ₄ ⁺ C ₈ H ₄ ⁺ C ₈ H ₆ ⁺	+ C ₄ H ₂ + C ₂ H ₂ + H ₂ + hν	0.13 0.80 0.06 < 0.01	1.40 × 10 ⁻⁹ ± 20%	8429		
C ₄ H ₂ ⁺	+ HCN	→ No Reaction			< 2.00 × 10 ⁻¹¹	8624		
C ₄ H ₂ ⁺	+ HC ₃ N	→ H ₃ C ₇ N ⁺		1.00	1.70 × 10 ⁻⁹ ± 20%	8518		
C ₄ H ₂ ⁺	+ CO	→ Adduct		1.00	3.20 × 10 ⁻¹¹ ± 20%	8914		a
C ₄ H ₃ ⁺	+ C ₂ H ₂	→ C ₆ H ₅ ⁺ M Adduct	+ hν	1.00	2.20 × 10 ⁻¹⁰ ± 10%	9033 7422 8709	8624 7105 8632	b
C ₄ H ₃ ⁺	+ C ₂ D ₂	→ C ₄ H ₂ D ⁺ Adduct	+ C ₂ HD + hν	0.30 0.70	3.00 × 10 ⁻¹⁰ ± 20%	9033		
C ₄ H ₃ ⁺	+ CH ₃ CCH	→ C ₅ H ₅ ⁺ C ₆ H ₅ ⁺	+ C ₂ H ₂ + CH ₂	> 0.96 < 0.04		8429		
C ₄ H ₃ ⁺	+ C ₄ H ₂	→ C ₆ H ₃ ⁺	+ C ₂ H ₂	1.00	7.40 × 10 ⁻¹⁰ ± 20%	8429		
C ₄ H ₃ ⁺	+ C ₄ H ₄	→ C ₄ H ₅ ⁺ C ₆ H ₃ ⁺ C ₈ H ₆ ⁺	+ C ₄ H ₂ + C ₂ H ₂ + H	0.25 0.65 0.10	1.10 × 10 ⁻⁹ ± 20%	8429		
C ₄ H ₃ ⁺	+ c-C ₆ H ₆	→ C ₆ H ₇ ⁺	+ C ₄ H ₂	1.00		8702		
C ₄ H ₃ ⁺	+ HCN	→ No Reaction			< 5.00 × 10 ⁻¹¹	8624		
C ₄ H ₃ ⁺	+ CO	→ Adduct		1.00	1.30 × 10 ⁻¹² ± 20%	8914		a
C ₄ H ₃ ⁺	+ CH ₃ OH	→ CH ₃ OH ₂ ⁺	+ C ₄ H ₂	1.00	~ 3.00 × 10 ⁻¹⁰ ± 50%	8702		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
C ₄ H ₄ ⁺	+ C ₂ H ₂	→ C ₆ H ₄ ⁺ C ₆ H ₅ ⁺ C ₆ H ₆ ⁺ M Adduct	+ H ₂ + H + hν	0.10 0.75 0.15	1.20 × 10 ⁻¹⁰ ± 20%	8709	8624
						8632	b
C ₄ H ₄ ⁺	+ CH ₃ CCH	→ C ₅ H ₆ ⁺ C ₇ H ₇ ⁺	+ C ₂ H ₂ + H	0.05 0.95		8429	
C ₄ H ₄ ⁺	+ C ₄ H ₂	→ C ₆ H ₄ ⁺ C ₆ H ₆ ⁺ M Adduct	+ C ₂ H ₂ + hν	0.87 0.13	8.00 × 10 ⁻¹⁰ ± 20%	8429	
						8709	
C ₄ H ₄ ⁺	+ C ₄ H ₄	→ C ₆ H ₄ ⁺ C ₆ H ₇ ⁺	+ C ₂ H ₂ + H	0.38 0.62	1.00 × 10 ⁻⁹ ± 20%	8429	
C ₄ H ₄ ⁺	+ HCN	→ No Reaction			< 3.00 × 10 ⁻¹¹	8624	
I-C ₄ H ₄ ⁺	+ C ₂ H ₂	→ C ₅ H ₃ ⁺ c-C ₄ H ₄ ⁺ C ₆ H ₄ ⁺ C ₆ H ₅ ⁺ C ₆ H ₆ ⁺	+ C ₃ H ₃ + C ₂ H ₂ + H ₂ + H + hν	0.04 0.37 0.08 0.44 0.06	2.86 × 10 ⁻¹⁰ ± 30%	8624	8407 8316
I-C ₄ H ₄ ⁺	+ HCN	→ No Reaction			< 3.00 × 10 ⁻¹¹	8624	
c-C ₄ H ₄ ⁺	+ C ₂ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹	8407	
C ₄ H ₅ ⁺	+ CH ₃ CCH	→ C ₆ H ₅ ⁺ C ₇ H ₇ ⁺	+ CH ₄ + H ₂	0.40 0.60		8429	
C ₄ H ₅ ⁺	+ C ₄ H ₂	→ C ₆ H ₅ ⁺	+ C ₂ H ₂	1.00		8429	
C ₄ H ₅ ⁺	+ C ₄ H ₄	→ C ₆ H ₇ ⁺	+ C ₂ H ₂	1.00		8429	
C ₄ H ₆ ⁺	+ CH ₃ CCH	→ C ₆ H ₇ ⁺ C ₇ H ₆ ⁺	+ CH ₃ + H	0.85 0.15		8429	
C ₄ H ₇ ⁺	+ N	→ No Reaction			< 1.00 × 10 ⁻¹¹ ± 20%	8613	
C ₄ H ₇ ⁺	+ N	→ No Reaction			< 1.00 × 10 ⁻¹¹ ± 20%	8613	
C ₅ ⁺	+ H ₂	→ C ₅ H ⁺	+ H	1.00	6.20 × 10 ⁻¹⁰ ± 20%	8914	a
C ₅ ⁺	+ D ₂	→ C ₅ D ⁺	+ D	1.00	4.70 × 10 ⁻¹⁰ ± 20%	9021	8726
C ₅ ⁺	+ CH ₄	→ C ₄ H ₂ ⁺ C ₅ H ⁺ C ₆ H ₂ ⁺ C ₆ H ₃ ⁺	+ C ₂ H ₂ + CH ₃ + H ₂ + H	0.30 0.41 0.11 0.18	8.80 × 10 ⁻¹⁰ ± 30%	8805	
C ₅ ⁺	+ C ₂ H ₂	→ C ₇ H ⁺	+ H	1.00	1.80 × 10 ⁻⁹ ± 30%	8805	
C ₅ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ C ₃ H ₂ ⁺ C ₃ H ₃ ⁺ C ₅ H ₂ ⁺ C ₇ H ₂ ⁺ C ₇ H ₃ ⁺	+ C ₅ + C ₄ H ₂ + C ₄ H + C ₂ H ₂ + H ₂ + H	0.18 0.04 0.05 0.30 0.16 0.27	1.70 × 10 ⁻⁹ ± 30%	8805	

Table of Reactions — Continued

Reactions			Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
C ₅ ⁺	+ H ₂ O	M Adduct			8632		
C ₅ ⁺	+ O ₂	→ C ₃ ⁺ + CO C ₄ ⁺ + CO ₂ C ₅ O ⁺ + O	0.13 0.11 0.76	1.90 × 10 ⁻¹⁰ ± 20%	8726		
C ₅ ⁺	+ HCN	→ C ₅ H ⁺ + CN C ₆ N ⁺ + H	0.30 0.70	1.10 × 10 ⁻⁹ ± 30%	8924		
C ₅ ⁺	+ CO	→ Adduct	1.00	6.40 × 10 ⁻¹⁰ ± 20%	<u>8914</u>	^a	
C ₅ H ⁺	+ D ₂	→ No Reaction		< 2.00 × 10 ⁻¹²	9021		
C ₅ H ⁺	+ C ₂ H ₂	→ C ₇ H ₂ ⁺ C ₇ H ₃ ⁺	+ H + hν	0.30 0.70	5.00 × 10 ⁻¹⁰ ± 30%	8805	
C ₅ H ⁺	+ HCN	→ H ₂ C ₆ N ⁺	+ hν	1.00	9.10 × 10 ⁻¹¹ ± 30%	8924	
C ₅ H ⁺	+ CO	→ Adduct	1.00	2.30 × 10 ⁻¹⁰ ± 20%	<u>8914</u>	^a	
C ₅ D ⁺	+ D ₂	→ No Reaction		< 2.00 × 10 ⁻¹³	8726		
C ₅ H ₂ ⁺	+ C ₂ H ₂	→ No Reaction		< 1.00 × 10 ⁻¹²	8805		
C ₅ H ₂ ⁺	+ CO	→ No Reaction		< 5.00 × 10 ⁻¹³	<u>8914</u>	^a	
C ₅ H ₃ ⁺	+ CH ₃ CCH	→ C ₆ H ₅ ⁺ C ₈ H ₇ ⁺	+ C ₂ H ₂ + H	0.81 0.19		8429	
C ₅ H ₃ ⁺	+ C ₄ H ₂	→ C ₇ H ₃ ⁺ C ₉ H ₅ ⁺	+ C ₂ H ₂ + hν	0.43 0.57	5.60 × 10 ⁻¹⁰ ± 20%	8708	T = 373
C ₅ H ₃ ⁺	+ c-C ₆ H ₆	→ c-C ₆ H ₅ ⁺ c-C ₆ H ₆ ⁺ C ₇ H ₇ ⁺ C ₉ H ₇ ⁺ Adduct	+ C ₅ H ₄ + C ₅ H ₃ + C ₄ H ₂ + C ₂ H ₂			8708	T = 373
C ₅ H ₄ ⁺	+ CH ₃ CCH	→ C ₆ H ₆ ⁺ C ₈ H ₇ ⁺	+ C ₂ H ₂ + H	0.57 0.43		8429	
C ₅ H ₅ ⁺	+ C ₂ H ₂	→ C ₇ H ₇ ⁺	+ hν	1.00	3.10 × 10 ⁻¹¹ ± 40%	8708	T = 373
C ₅ H ₅ ⁺	+ CH ₃ CCH	→ C ₆ H ₇ ⁺ C ₈ H ₇ ⁺	+ C ₂ H ₂ + H ₂	0.56 0.44		8429	
C ₅ H ₅ ⁺	+ C ₄ H ₂	→ C ₇ H ₅ ⁺ C ₇ H ₇ ⁺ C ₉ H ₇ ⁺	+ C ₂ H ₂ + C ₂ + hν		2.20 × 10 ⁻¹⁰ ± 40%	8708	T = 373
C ₆ ⁺	+ H ₂	→ C ₆ H ^{+ C₆H₂⁺}	+ H	~0.20 ~0.80	2.70 × 10 ⁻¹⁰ ± 20%	<u>8914</u>	^a
C ₆ ⁺	+ CH ₄	→ C ₅ H ₂ ⁺ C ₇ H ₂ ⁺ C ₇ H ₃ ⁺	+ C ₂ H ₂ + H ₂ + H	0.40 0.21 0.39	5.80 × 10 ⁻¹⁰ ± 30%	8805	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
C ₆ ⁺	+ C ₂ H ₂	→ C ₅ H ₂ ⁺ C ₈ H ⁺	+ C ₃ + H	0.38 0.62	1.40 × 10 ⁻⁹ ± 30%	8805	
C ₆ ⁺	+ C ₂ H ₄	→ C ₄ H ₂ ⁺ C ₅ H ⁺ C ₆ H ₂ ⁺ C ₇ H ⁺ C ₈ H ₂ ⁺ C ₈ H ₃ ⁺	+ C ₄ H ₂ + C ₃ H ₃ + C ₂ H ₂ + CH ₃ + H ₂ + H	0.09 0.04 0.40 0.16 0.24 0.07	1.30 × 10 ⁻⁹ ± 30%	8805	
C ₆ ⁺	+ HCN	→ C ₆ H ⁺ C ₇ N ⁺ HC ₇ N ⁺	+ CN + H + hν	0.06 0.19 0.75	8.50 × 10 ⁻¹⁰ ± 30%	8924	
C ₆ ⁺	+ CO	→ Adduct		1.00	7.40 × 10 ⁻¹⁰ ± 20%	8914	
C ₆ H ⁺	+ H ₂	→ C ₆ H ₂ ⁺	+ H	1.00	1.30 × 10 ⁻¹² ± 20%	8914	a
C ₆ H ⁺	+ C ₂ H ₂	→ C ₈ H ₂ ⁺	+ H	1.00	5.80 × 10 ⁻¹⁰ ± 30%	8805	8709
C ₆ H ⁺	+ CO	→ Adduct		1.00	2.80 × 10 ⁻¹⁰ ± 20%	8914	a
C ₆ H ⁺	+ HCN	→ C ₆ H ₂ ⁺ HC ₇ N ⁺ H ₂ C ₇ N ⁺	+ CN + H + hν	0.04 0.53 0.43	5.10 × 10 ⁻¹⁰ ± 30%	8924	
C ₆ H ₂ ⁺	+ C ₂ H ₂	→ C ₈ H ₃ ⁺ C ₈ H ₄ ⁺ Adduct	+ H + hν	0.69 0.31	1.40 × 10 ⁻¹⁰ ± 30%	8805	b
C ₆ H ₂ ⁺	+ C ₄ H ₂	→ C ₈ H ₂ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₂ ⁺	+ C ₄ H ₄	→ C ₈ H ₄ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₃ ⁺	+ C ₂ H ₂	→ C ₈ H ₅ ⁺ C ₈ H ₄ ⁺	+ H	> 0.98 < 0.02	2.50 × 10 ⁻¹⁰ ± 20%	8709	
C ₆ H ₃ ⁺	+ C ₄ H ₂	→ C ₈ H ₃ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₃ ⁺	+ C ₄ H ₄	→ C ₈ H ₅ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₄ ⁺	+ C ₂ H ₂	→ C ₈ H ₆ ⁺ C ₈ H ₅ ⁺	+ H	> 0.98 < 0.02	7.00 × 10 ⁻¹¹ ± 20%	8709	
C ₆ H ₄ ⁺	+ C ₄ H ₂	→ C ₈ H ₄ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₄ ⁺	+ C ₄ H ₄	→ C ₈ H ₆ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₅ ⁺	+ C ₂ H ₂	→ C ₈ H ₇ ⁺ C ₈ H ₆ ⁺	+ H	> 0.98 < 0.02	4.00 × 10 ⁻¹⁰ ± 20%	8709	
C ₆ H ₅ ⁺	+ C ₄ H ₂	→ C ₈ H ₅ ⁺	+ C ₂ H ₂	1.00		8429	
C ₆ H ₅ ⁺	+ C ₄ H ₄	→ C ₈ H ₇ ⁺	+ C ₂ H ₂	1.00		8429	
ac-C ₆ H ₃ ⁺	+ H ₂	→ C ₆ H ₇ ⁺	+ hν	1.00	5.00 × 10 ⁻¹¹ ± 20%	8920	8914
ac-C ₆ H ₃ ⁺	+ CO	→ Adduct		1.00	2.00 × 10 ⁻¹⁰ ± 20%	8914	a

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
c-C ₆ H ₅ ⁺	+ H ₂	→ No Reaction			< 5.00 × 10 ⁻¹³	8920	<u>8914</u>
c-C ₆ H ₅ ⁺	+ CH ₄	→ C ₇ H ₇ ⁺	+ H ₂	1.00	7.50 × 10 ⁻¹¹ ± 30%	8920	
c-C ₆ H ₅ ⁺	+ C ₂ H ₂	→ C ₈ H ₆ ⁺	+ H	0.60	1.30 × 10 ⁻¹⁰ ± 30%	8920	
		C ₈ H ₇ ⁺	+ hν	0.40			
c-C ₆ H ₅ ⁺	+ C ₂ H ₄	→ C ₆ H ₇ ⁺	+ C ₂ H ₂	0.50	1.70 × 10 ⁻¹⁰ ± 30%	8920	
		C ₈ H ₇ ⁺	+ H ₂	0.50			
c-C ₆ H ₅ ⁺	+ C ₂ H ₆	→ C ₆ H ₇ ⁺	+ C ₂ H ₄	0.97	1.30 × 10 ⁻¹⁰ ± 30%	8920	
		C ₇ H ₇ ⁺	+ CH ₄	0.03			
c-C ₆ H ₅ ⁺	+ CH ₂ CCH ₂	→ C ₇ H ₇ ⁺	+ C ₂ H ₂	0.30	5.20 × 10 ⁻¹⁰ ± 30%	8920	
		C ₉ H ₇ ⁺	+ H ₂	0.70			
c-C ₆ H ₅ ⁺	+ CH ₃ CCH	→ C ₇ H ₇ ⁺	+ C ₂ H ₂	0.18	2.30 × 10 ⁻¹⁰ ± 30%	8920	8429
		C ₈ H ₇ ⁺	+ H ₂	0.78			
		C ₉ H ₈ ⁺	+ H	0.05			
c-C ₆ H ₅ ⁺	+ CH ₃ CHCH ₂	→ C ₇ H ₇ ⁺	+ C ₂ H ₄	1.00	3.40 × 10 ⁻¹⁰ ± 30%	8920	
c-C ₆ H ₅ ⁺	+ C ₄ H ₆	→ C ₇ H ₇ ⁺	+ C ₃ H ₄	0.35	3.30 × 10 ⁻¹⁰ ± 30%	8920	
		C ₈ H ₇ ⁺	+ CH ₄	0.10			
		C ₉ H ₈ ⁺	+ CH ₃	0.20			
		C ₁₀ H ₈ ⁺	+ H ₂ + H	0.20			
		C ₁₀ H ₉ ⁺	+ H ₂	0.10			
c-C ₆ H ₅ ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³	<u>8914</u>	
c-C ₆ H ₅ ⁺	+ CH ₃ OH	→ C ₆ H ₆ O ⁺	+ CH ₃	1.00	4.00 × 10 ⁻¹¹ ± 30%	8920	
c-C ₆ H ₅ ⁺	+ CH ₃ CHO	→ C ₇ H ₇ ⁺	+ CH ₃ OH	0.09	2.30 × 10 ⁻¹⁰ ± 30%	8920	
		C ₈ H ₇ ⁺	+ H ₂ CO	0.47			
		C ₉ H ₈ ⁺	+ H ₂ O	0.16			
		C ₆ H ₅ O ⁺	+ C ₂ H ₄	0.28			
c-C ₆ H ₅ ⁺	+ (CH ₃) ₂ CO	→ C ₇ H ₇ O ⁺	+ C ₂ H ₄	1.00	2.90 × 10 ⁻¹⁰ ± 30%	8920	
c-C ₆ H ₆ ⁺	+ D ₂	→ No Reaction			< 2.00 × 10 ⁻¹³	9131	
c-C ₆ H ₆ ⁺	+ C ₂ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹³	9131	8709
c-C ₆ H ₆ ⁺	+ C ₄ H ₂	→ Adduct		1.00	5.00 × 10 ⁻¹⁰ ± 30%	9131	
c-C ₆ H ₆ ⁺	+ c-C ₆ H ₆	→ Adduct		1.00	> 5.00 × 10 ⁻¹¹	9131	
	M	Adduct				8632	
c-C ₆ H ₆ ⁺	+ C ₈ H ₈	→ C ₈ H ₈ ⁺	+ c-C ₆ H ₆	1.00	7.80 × 10 ⁻¹⁰ ± 30%	9131	
C ₆ H ₇ ⁺	+ C ₂ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹³	8709	
C ₆ H ₇ ⁺	+ CH ₃ CCH	→ C ₇ H ₇ ⁺	+ C ₂ H ₄	1.00		8429	
C ₆ H ₇ ⁺	+ C ₄ H ₂	→ No Reaction			< 2.00 × 10 ⁻¹¹	8702	
c-C ₆ H ₇ ⁺	+ CH ₃ OH	→ CH ₃ OH ₂ ⁺	+ c-C ₆ H ₆	1.00	2.00 × 10 ⁻¹⁰ ± 25%	8527	
c-C ₆ H ₇ ⁺	+ CH ₃ CHO	→ C ₂ H ₅ O ⁺	+ c-C ₆ H ₆	1.00	1.30 × 10 ⁻⁹ ± 25%	8527	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
C ₇ H ₃ ⁺	+ C ₄ H ₂	→ C ₁₁ H ₅ ⁺	+ hν	1.00		8708	T=373		
C ₇ H ₇ ⁺	+ C ₂ H ₂	→ C ₉ H ₉ ⁺	+ hν	1.00		8708	T=373		
C ₇ H ₇ ⁺	+ C ₄ H ₂	→ C ₁₁ H ₅ ⁺	+ hν	1.00		8708	T=373		
c-C ₇ H ₇ ⁺	+ CH ₃ CCH	C ₉ H ₈ ⁺ C ₁₀ H ₉ ⁺ C ₁₀ H ₁₁ ⁺	+ CH ₃ + H ₂ + hν	0.10 0.42 0.48		8429			
CH ₃ C ₆ H ₅ ⁺	+ CH ₃ CCH	C ₈ H ₉ ⁺ C ₉ H ₇ ⁺ C ₉ H ₈ ⁺ C ₁₀ H ₉ ⁺ C ₁₀ H ₁₁ ⁺	+ C ₂ H ₂ + CH ₄ + CH ₃ + H ₂ + hν	0.18 0.18 0.13 0.20 0.31		8429			
C ₉ H ₇ ⁺	+ CH ₃ CCH	C ₁₂ H ₉ ⁺ C ₁₂ H ₁₁ ⁺	+ H ₂ + hν			8429			
C ₁₀ H ₈ ⁺	+ D ₂	→ No Reaction		<4.00×10 ⁻¹³		9131			
C ₁₀ H ₈ ⁺	+ C ₂ H ₂	→ No Reaction		<1.00×10 ⁻¹²		9131			
C ₁₀ H ₈ ⁺	+ C ₄ H ₂	→ Adduct		1.00	1.00×10 ⁻¹²	9131			
C ₁₀ H ₈ ⁺	+ C ₈ H ₈	→ No Reaction		<1.00×10 ⁻¹²		9131			
C ₁₀ H ₈ ⁺	+ (CH ₃) ₃ N	(CH ₃) ₃ N ⁺ (CH ₃) ₃ NH ⁺	+ C ₁₀ H ₈ + C ₁₀ H ₇	0.75 0.25	1.10×10 ⁻⁹ ±30%	9131			
C ₁₀ H ₈ ⁺	+ NO	→ No Reaction		<2.00×10 ⁻¹³		9131			
N ⁺	+ H ₂	→ NH ⁺	+ H	1.00	5.00×10 ⁻¹⁰ ±20%	8927 8523 8010 7506	8821 8513 7905 6702	8720 8307 7602	ab
N ⁺	+ p-H ₂	→ NH ⁺	+ H	1.00	3.00×10 ⁻¹⁰ ±30%	8821			^a T=163
N ⁺	+ HD	→ NH ⁺ ND ⁺	+ D + H	0.25 0.75	3.10×10 ⁻¹⁰ ±20%	8821	8720	8513	^a
N ⁺	+ D ₂	→ ND ⁺	+ D	1.00	1.50×10 ⁻¹⁰ ±20%	8821	8720	8513	^a
N ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₄ ⁺ HCN ⁺ IICN ⁺	+ NH + N + H ₂ + II ₂ + H	0.50 0.05 0.36 0.10	1.15×10 ⁻⁹ ±15%	8523 8010	8514 7905	8421 7708	ab
N ⁺	+ C ₂ H ₄	C ₂ H ₃ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ HCN ⁺ HCN ⁺ CH ₂ CN ⁺	+ NH ₂ + NH + N + CH ₃ + CH ₂ + H ₂	0.10 0.30 0.25 0.15 0.10 0.10	1.60×10 ⁻⁹ ±20%	8007			
N ⁺	+ NH ₃	NH ₂ ⁺ NH ₂ ⁺ N ₂ H ⁺	+ NH + N + H ₂	0.20 0.71 0.09	2.35×10 ⁻⁹ ±20%	8524	8010	7905	^a

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
N ⁺	+ N ₂	→ <u>M</u> Adduct	N ⁺ + N ₂	1.00	2.55 × 10 ⁻¹⁰ ± 40%	7708 8632	7421	
N ⁺	+ H ₂ O	→ H ₂ O ⁺	+ N	1.00	2.70 × 10 ⁻⁹ ± 20%	8524 7202	8010 7006	a,b
N ⁺	+ O ₂	→ O ⁺ NO ⁺ O ₂ ⁺	+ NO + O + N	0.08 0.40 0.53	5.80 × 10 ⁻¹⁰ ± 10% 8619 8514 7905 7417 7001	8615 8017 7708 7311 6801	8523 8010 7602 7007 6603	a,b
N ⁺	+ HCl	→ HCl ⁺ NCl ⁺	+ N + H		9.00 × 10 ⁻¹⁰ ± 20%	9015		
N ⁺	+ H ₂ S	→ NH ⁺ S ⁺ HS ⁺ H ₂ S ⁺	+ SH + NH ₂ + NH + N	0.03 0.12 0.29 0.56	1.90 × 10 ⁻⁹ ± 20%	8010		
N ⁺	+ Hg	→ No Reaction			< 1.00 × 10 ⁻¹²	8015		
N ⁺	+ HCN	→ HCN ⁺	+ N	1.00	3.70 × 10 ⁻⁹ ± 20%	9015		
N ⁺	+ CH ₃ NH ₂	→ CH ₃ ⁺ HCN ⁺ CHNH ₂ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ C ₂ N ₂ + NH ₃ + NH ₂ + NH + N	0.06 0.10 0.07 0.70 0.07	2.00 × 10 ⁻⁹ ± 20%	8010		
N ⁺	+ C ₂ N ₂	→ C ₂ N ⁺ C ₂ N ₂ ⁺	+ N ₂ + N	0.70 0.30	1.40 × 10 ⁻⁹ ± 30%	8515		
N ⁺	+ HC ₃ N	→ C ₃ H ⁺ CHCCN ⁺	+ N ₂ + N	0.50 0.50	4.20 × 10 ⁻⁹ ± 20%	8518		
N ⁺	+ CO	→ C ⁺ CO ⁺ NO ⁺	+ NO + N + C	0.01 0.88 0.11	5.60 × 10 ⁻¹⁰ ± 25% 8701 8426 8010 7905 6701	8523 8409 8408 7708	8514	a,b
N ⁺	+ H ₂ CO	→ HCO ⁺ H ₂ CO ⁺ NO ⁺	+ NH + N + CH ₂	0.25 ~0.65 ~0.10	2.90 × 10 ⁻⁹ ± 20%	8010		
N ⁺	+ CH ₃ OH	→ CH ₃ ⁺ H ₂ CO ⁺ CH ₂ OH ⁺ CH ₃ OH ⁺ NO ⁺	+ HNO + NH ₂ + NH + N + CH ₄	0.04 ~0.30 0.16 0.40 ~0.10	3.10 × 10 ⁻⁹ ± 20%	8010		
N ⁺	+ CO ₂	→ CO ⁺ CO ₂ ⁺	+ NO + N	0.18 0.82	1.12 × 10 ⁻⁹ ± 10%	8010 6701	7905 7708	b
N ⁺	+ CHOONa	→ HCO ⁺	+ HNO	1.00	6.20 × 10 ⁻⁹ ± 30%	7821		
N ⁺	+ NO	→ NO ⁺ N ₂ ⁺	+ N + O	0.85 0.15	5.55 × 10 ⁻¹⁰ ± 10%	8106 7708	8010 6603	b
N ⁺	+ N ₂ O	→ NO ⁺	+ N ₂	1.00	~5.50 × 10 ⁻¹⁰	6401		
N ⁺	+ COS	→ S ⁺ CS ⁺ COS ⁺	+ NCO + NO + N	0.22 0.05 0.73	1.40 × 10 ⁻⁹ ± 20%	8010		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
NH ⁺	+ H ₂	→ H ₃ ⁺ NH ₂ ⁺	+ N + H	0.15 0.85	1.23 × 10 ⁻⁹	± 30%	8010	7506 6702
NH ⁺	+ CH ₄	→ CH ₃ ⁺ NH ₂ ⁺ HCNH ⁺	+ N + CH ₃ + H ₂ + H	0.10 0.20 0.70	9.60 × 10 ⁻¹⁰	± 20%	8010	
NH ⁺	+ C ₂ H ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ HCNH ⁺ CHNH ₂ ⁺ CH ₂ CNH ⁺	+ NH ₃ + NH ₂ + NH + CH ₃ + CH ₂ + H ₂	0.10 0.25 0.25 0.20 0.10 0.10	1.50 × 10 ⁻⁹	± 20%	8007	
NH ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₂ ⁺	+ NH + N	0.75 0.25	2.40 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ N ₂	→ N ₂ H ⁺	+ N	1.00	6.50 × 10 ⁻¹⁰	± 20%	8010	6702
NH ⁺	+ H ₂ O	→ NH ₂ ⁺ NH ₃ ⁺ H ₂ O ⁺ H ₃ O ⁺ HNO ⁺	+ OH + O + NH + N + H ₂	0.25 0.05 0.30 0.30 0.10	3.50 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ O ₂	→ O ₂ ⁺ HO ₂ ⁺ NO ⁺	+ NH + N + OH	0.55 0.20 0.25	8.20 × 10 ⁻¹⁰	± 20%	8010	
NH ⁺	+ H ₂ S	→ HS ⁺ H ₂ S ⁺ NHS ⁺ NHSH ⁺	+ NH ₂ + NH + H ₂ + H	0.15 0.55 0.15 0.15	1.70 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ CH ₃ NH ₂	→ HCNH ⁺ CHNH ₂ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ NH ₃ + H + NH ₃ + NH ₂ + NH + N	0.20 0.05 0.45 0.20 0.20	2.10 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ CO	→ HCO ⁺ NCO ⁺	+ N + H	0.45 0.55	9.80 × 10 ⁻¹⁰	± 20%	8010	
NH ⁺	+ H ₂ CO	→ HCO ⁺ H ₂ CO ⁺ CH ₂ OH ⁺	+ NH ₂ + NH + N	0.55 0.30 0.15	3.30 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ CH ₃ OH	→ HCO ⁺ H ₂ CO ⁺ CH ₂ OH ⁺ CH ₃ OH ⁺ M Adduct	+ NH ₃ + H + NH ₃ + NH ₂ + N	0.15 0.15 0.70 0.10	3.00 × 10 ⁻⁹	± 20%	8010 8632	
NH ⁺	+ CO ₂	→ HCO ₂ ⁺ NO ⁺ HNO ⁺	+ N + HCO + CO	0.35 0.30 0.35	1.10 × 10 ⁻⁹	± 20%	8010	
NH ⁺	+ NO	→ NO ⁺ N ₂ H ⁺	+ NH + O	0.80 0.20	8.90 × 10 ⁻¹⁰	± 20%	8010	
NH ⁺	+ COS	→ HS ⁺ NS ⁺ COS ⁺ HCOS ⁺	+ NCO + HCO + NH + N	0.05 0.05 0.85 0.05	1.80 × 10 ⁻⁹	± 20%	8010	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes		
NH ₂ ⁺	+ H ₂	→ NH ₃ ⁺	+ H	1.00	1.95 × 10 ⁻¹⁰	± 50%	8010	7506	6702	b
NH ₂ ⁺	+ CH ₄	→ NH ₃ ⁺	+ CH ₃	1.00	9.20 × 10 ⁻¹⁰	± 20%	8010	7305		
NH ₂ ⁺	+ C ₂ H ₄	→ C ₂ H ₅ ⁺ C ₂ H ₃ ⁺ CH ₂ NH ₂ ⁺ CH ₂ CHNH ₂ ⁺	+ NH ₂ + NH + CH ₂ + H	0.30 0.20 0.30 0.20	1.50 × 10 ⁻⁹	± 20%	8007			
NH ₂ ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ NH ₂ + NH	0.50 0.50	2.30 × 10 ⁻⁹	± 10%	8010	7304	7106	b
NH ₂ ⁺	+ N ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		8018	8010		
NH ₂ ⁺	+ H ₂ O	→ NH ₃ ⁺ NH ₄ ⁺ H ₃ O ⁺	+ OH + O + NH	0.03 0.04 0.94	2.90 × 10 ⁻⁹	± 20%	8617	8010	7709	b
NH ₂ ⁺	+ O ₂	→ HNO ⁺ H ₂ NO ⁺	+ OH + O	0.15 0.85	1.40 × 10 ⁻¹⁰	± 20%	8010			
NH ₂ ⁺	+ H ₂ S	→ HS ⁺ H ₂ S ⁺ H ₃ S ⁺ NH ₃ ⁺ NH ₄ ⁺	+ NH ₃ + NH ₂ + NH + SH + S	0.10 0.40 0.15 0.25 0.10	1.80 × 10 ⁻⁹	± 20%	8010	7410		b
NH ₂ ⁺	+ CH ₃ NH ₂	→ NH ₄ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ H ₃ CN + NH ₃ + NH ₂ + NH	0.08 0.20 0.53 0.20	1.90 × 10 ⁻⁹	± 20%	8322	8010		
NH ₂ ⁺	+ CO	→ No Reaction			< 1.00 × 10 ⁻¹¹		8018			
NH ₂ ⁺	+ H ₂ CO	→ NH ₃ ⁺ CH ₂ OH ⁺	+ HCO + NH	0.20 0.80	2.80 × 10 ⁻⁹	± 20%	8010			
NH ₂ ⁺	+ CH ₃ OH	→ NH ₃ ⁺ CH ₃ OH ₂ ⁺	+ CH ₂ O + NH	0.14 0.86	3.05 × 10 ⁻⁹	+ 20%	8122	8010		
NH ₂ ⁺	+ CO ₂	→ No Reaction			< 1.00 × 10 ⁻¹²		8018	8010		
NH ₂ ⁺	+ CHOOH	→ Products		1.00	2.70 × 10 ⁻⁹	± 30%	7821			
NH ₂ ⁺	+ CH ₃ CHO	→ HCO ⁺ CH ₃ CO ⁺ CH ₃ CHO ⁺ C ₂ H ₅ O ⁺	+ CH ₃ NH ₂ + NH ₃ + NH ₂ + NH	0.15 0.11 0.19 0.55	8.00 × 10 ⁻⁹	± 25%	8617			
NH ₂ ⁺	+ NO	→ NO ⁺	+ NH ₂	1.00	7.00 × 10 ⁻¹⁰	+ 20%	8010			
NH ₂ ⁺	+ COS	→ NHSH ⁺ H ₂ NCO ⁺ HCOS ⁺	+ CO + S + NH	0.80 0.15 0.05	1.50 × 10 ⁻⁹	± 20%	8010			
NH ₃ ⁺	+ H ₂	→ NH ₄ ⁺	+ H	1.00	4.40 × 10 ⁻¹³	± 20%	9029 8416 8010	8704 8307 7508	8523 8103 7506	a
	M	No Reaction					7412 8632			
NH ₃ ⁺	+ D ₂	→ No Reaction			< 2.00 × 10 ⁻¹²		8704	7506		a
NH ₃ ⁺	+ CH ₄	→ NH ₄ ⁺	+ CH ₃	1.00	3.90 × 10 ⁻¹⁰	± 25%	8010	8001	7305	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
NH ₃ ⁺	+ C ₂ H ₄	→ NH ₄ ⁺	+ C ₂ H ₃	1.00	1.40 × 10 ⁻⁹	± 20%	8007
NH ₃ ⁺	+ NH ₃	→ NH ₄ ⁺	+ NH ₂	1.00	2.10 × 10 ⁻⁹	± 12%	<u>9029</u> <u>7516</u> <u>7304</u> 8010 7415 7711 7308
NH ₃ ⁺	+ N ₂	→ No Reaction			< 5.00 × 10 ⁻¹⁴		8010
NH ₃ ⁺	+ H ₂ O	→ NH ₄ ⁺	+ OH	1.00	~ 2.50 × 10 ⁻¹⁰	± 30%	8313 8010 7709
NH ₃ ⁺	+ O ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		8010
	M	Adduct					8632
NH ₃ ⁺	+ H ₂ S	→ NH ₄ ⁺	+ SH	1.00	9.50 × 10 ⁻¹⁰	± 50%	8405 8010 7410
NH ₃ ⁺	+ HCN	→ No Reaction			< 1.00 × 10 ⁻¹¹		7709
NH ₃ ⁺	+ CH ₃ NH ₂	→ NH ₄ ⁺	+ CH ₂ NH ₂	0.15	1.80 × 10 ⁻⁹	± 20%	8010
		CH ₃ NH ₂ ⁺	+ NH ₃	0.50			
		CH ₃ NH ₃ ⁺	+ NH ₂	0.35			
NH ₃ ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³		8010
NH ₃ ⁺	+ H ₂ CO	→ NH ₄ ⁺	+ HCO	1.00	8.00 × 10 ⁻¹⁰	± 50%	8010 7709
NH ₃ ⁺	+ CH ₃ OH	→ NH ₄ ⁺	+ CH ₃ O	1.00	2.20 × 10 ⁻⁹	± 20%	8122 8010
NH ₃ ⁺	+ CO ₂	→ No Reaction			< 1.00 × 10 ⁻¹³		8010
	M	Adduct					8632
NH ₃ ⁺	+ CHOONH ₄	→ Products		1.00	9.00 × 10 ⁻¹⁰	± 30%	7821
NH ₃ ⁺	+ NO	→ NO ⁺	+ NH ₃	1.00	7.20 × 10 ⁻¹⁰	± 20%	8010
NH ₃ ⁺	+ COS	→ Products		1.00	~ 2.00 × 10 ⁻¹²	± 20%	8010
ND ₃ ⁺	+ H ₂	→ NHD ₃ ⁺	+ H	1.00	6.20 × 10 ⁻¹³	± 50%	<u>8704</u>
ND ₃ ⁺	+ D ₂	→ ND ₄ ⁺	+ D	1.00	1.00 × 10 ⁻¹³	± 50%	<u>8704</u>
NH ₄ ⁺	+ H ₂	→ No Reaction			< 4.00 × 10 ⁻¹⁴		7711
NH ₄ ⁺	+ D ₂	→ No Reaction			< 1.00 × 10 ⁻¹³		7506
NH ₄ ⁺	+ C ₂ H ₄	→ No Reaction			< 5.00 × 10 ⁻¹³		8007
*NH ₄ ⁺	+ NH ₃	→ NH ₄ ⁺	+ *NH ₃	1.00	6.00 × 10 ⁻¹⁰	± 10%	7611 8632
	M	Adduct					
NH ₄ ⁺	+ ND ₃	→ Products		1.00	1.90 × 10 ⁻⁹	± 25%	<u>8206</u>
NH ₄ ⁺	+ H ₂ O	M	Adduct				8632
NH ₄ ⁺	+ Mg	→ MgH ⁺	+ NH ₃	1.00	8.00 × 10 ⁻¹¹	± 20%	7710
NH ₄ ⁺	+ CH ₃ NH ₂	→ CH ₃ NH ₃ ⁺	+ NH ₃	1.00	2.00 × 10 ⁻⁹	± 30%	8322
NH ₄ ⁺	+ CH ₃ NC	→ CH ₃ CNH ⁺	+ NH ₃	1.00	1.60 × 10 ⁻¹⁰	± 30%	8510
NH ₄ ⁺	+ HC ₃ N	→ No Reaction			< 1.00 × 10 ⁻¹⁴		7911
NH ₄ ⁺	+ CO ₂	M	Adduct				8632

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
NH ₃ D ⁺	+ D ₂	→ NH ₂ D ₂ ⁺ NHD ₃ ⁺	+ HD + H ₂			<3.00×10 ⁻¹³	8704	^a T=12	
NHD ₃ ⁺	+ H ₂	→ NH ₃ D ⁺ NH ₂ D ₂ ⁺	+ D ₂ + HD			<8.00×10 ⁻¹⁴	8704	^a T=12	
ND ₄ ⁺	+ NH ₃	→ Products			1.00	1.50×10 ⁻⁹ ±25%	8206	^a	
N ₂ ⁺	+ H	→ Products			<1.00×10 ⁻¹¹		9102		
N ₂ ⁺	+ D	→ Products			<1.00×10 ⁻¹¹		9102	7901	^b
N ₂ ⁺	+ H ₂	→ N ₂ H ⁺	+ H	1.00	2.00×10 ⁻⁹ ±15%	9114 8010 7506 6907	9102 7905 7423 6702	8428 7602 7209	^{ab}
N ₂ ⁺	+ D ₂	→ N ₂ D ⁺	+ D	1.00	1.25×10 ⁻⁹ ±20%	9102	7901	6907	
N ₂ ⁺	+ CH ₄	→ CH ₂ ⁺ CH ₃ ⁺	+ N ₂ + H ₂ + N ₂ + H	0.09 0.91	1.14×10 ⁻⁹ ±15%	9114 8001	8927 7905	8010 7209	^a
N ₂ ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺	+ N ₂	1.00	4.30×10 ⁻¹⁰	7209			
N ₂ ⁺	+ N	→ N ⁺	+ N ₂	1.00	<1.00×10 ⁻¹¹	6804			
N ₂ ⁺	+ NH ₃	→ NH ₃ ⁺	+ N ₂	1.00	1.95×10 ⁻⁹ ±10%	8318 7905	8010	8001	
*N ₂ ⁺	+ N ₂	→ N ₂ ⁺ M Adduct	+ *N ₂	1.00	5.80×10 ⁻¹⁰ ±25%	8108 8632	7611		^a
N ₂ ⁺	+ O	→ O ⁺ NO ⁺	+ N ₂ + N	0.07 0.93	1.40×10 ⁻¹⁰ ±50%	7418	7004	6501	^b
N ₂ ⁺	+ H ₂ O	→ H ₂ O ⁺ N ₂ H ⁺	+ N ₂ + OH	0.79 0.21	2.40×10 ⁻⁹ ±20%	8010	8001	7905	
N ₂ ⁺	+ O ₂	→ O ₂ ⁺	+ N ₂	1.00	5.00×10 ⁻¹¹ ±15%	9129 8523 7905 7311 7001 6603	9114 8118 7602 7417 7007 6801	8611 8010 7006	^{ab}
N ₂ ⁺	+ Cl ₂	→ Products			1.00	6.00×10 ⁻¹⁰ ±20%	8119		
N ₂ ⁺	+ Na	→ Na ⁺	+ N ₂	1.00	1.30×10 ⁻⁹ ±75%	8919	6901		
N ₂ ⁺	+ H ₂ S	→ S ⁺ HS ⁺ H ₂ S ⁺ N ₂ H ⁺	+ N ₂ + H ₂ + N ₂ + H + N ₂ + SH	0.16 0.73 0.11 0.01	1.65×10 ⁻⁹ ±10%	8401	8010		
N ₂ ⁺	+ Ar	→ Ar ⁺	+ N ₂	1.00	2.00×10 ⁻¹³ ±20%	9107	8116	8114	^{ab}
N ₂ ⁺	+ Kr	→ Kr ⁺	+ N ₂	1.00	1.00×10 ⁻¹² ±30%	8119			
N ₂ ⁺	+ Xe	→ No Reaction			<1.00×10 ⁻¹³		8119		
N ₂ ⁺	+ Hg	→ Hg ⁺	+ N ₂	1.00	1.20×10 ⁻¹¹ ±20%	8015			

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
N ₂ ⁺	+ HCN	→	HCN ⁺	+ N ₂	1.00	3.90 × 10 ⁻¹⁰	± 10%	8101
N ₂ ⁺	+ CH ₃ NH ₂	→	CH ₃ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ N ₂ + NH ₂ + N ₂ + H + N ₂	0.21 0.73 0.06	1.20 × 10 ⁻⁹	± 30%	8010
N ₂ ⁺	+ CH ₃ CN	→	CHCN ⁺ CH ₂ CN ⁺ CH ₂ CNH ⁺	+ N ₂ + H ₂ + N ₂ + H + N ₂	0.20 0.65 0.15	2.10 × 10 ⁻⁹	± 30%	8804
N ₂ ⁺	+ C ₂ N ₂	→	C ₂ N ₂ ⁺	+ N ₂	> 0.95	8.60 × 10 ⁻¹⁰	± 30%	8515
N ₂ ⁺	+ HC ₃ N	→	CHCCN ⁺	+ N ₂	1.00	3.50 × 10 ⁻⁹	± 25%	8518 8509
N ₂ ⁺	+ CO	→	CO ⁺	+ N ₂	1.00	7.30 × 10 ⁻¹¹	± 20%	8010 8001 6701
N ₂ ⁺	+ H ₂ CO	→	HCO ⁺ H ₂ CO ⁺	+ N ₂ H + N ₂	0.87 0.13	2.90 × 10 ⁻⁹	± 30%	8010
N ₂ ⁺	+ CH ₃ OH	→	CH ₃ ⁺ CH ₂ OH ⁺ CH ₃ OH ⁺	+ N ₂ + OH + N ₂ + H + N ₂	0.79 0.12 0.09	1.40 × 10 ⁻⁹	± 30%	8010
N ₂ ⁺	+ CO ₂	→	CO ₂ ⁺	+ N ₂	1.00	8.00 × 10 ⁻¹⁰	± 20%	8927 8010 7209 8001 6701
N ₂ ⁺	+ CHO OH	→	HCO ⁺	+ N ₂ + OH	1.00	4.60 × 10 ⁻⁹	± 30%	7821
N ₂ ⁺	+ CS ₂	→	S ⁺ CS [‡]	+ N ₂ + CS + N ₂	0.60 0.40	1.20 × 10 ⁻⁹	± 20%	9020
N ₂ ⁺	+ NO	→	Products		1.00	4.10 × 10 ⁻¹⁰	± 20%	8119 7905 7004 6603 7209
N ₂ ⁺	+ N ₂ O	→	N ₂ O ⁺	+ N ₂	1.00	6.00 × 10 ⁻¹⁰	± 20%	8822 7209 6804
N ₂ ⁺	+ SO ₂	→	SO [‡]	+ N ₂	1.00	5.20 × 10 ⁻¹⁰	± 30%	7606 7209
N ₂ ⁺	+ COS	→	S ⁺ COS ⁺	+ N ₂ + CO + N ₂	0.80 0.20	1.36 × 10 ⁻⁹	± 20%	8010 7209
N ₂ H ⁺	+ D	→	N ₂ D ⁺	+ H	1.00	8.00 × 10 ⁻¹¹	± 20%	8503
N ₂ H ⁺	+ H ₂	→	H ₃ ⁺ M Adduct	+ N ₂	1.00	5.10 × 10 ⁻¹⁸	± 80%	7714 7310 8632
N ₂ H ⁺	+ CH ₄	→	CH ₃ ⁺	+ N ₂	1.00	8.90 × 10 ⁻¹⁰	± 30%	7005
N ₂ H ⁺	+ C ₂ H ₂	→	C ₂ H ₃ ⁺	+ N ₂	1.00	1.41 × 10 ⁻⁹	± 25%	7713
N ₂ H ⁺	+ C ₂ H ₆	→	C ₂ H ₅ ⁺ C ₂ H ₇ ⁺	+ N ₂ + H ₂ + N ₂	0.87 0.13	1.30 × 10 ⁻⁹	± 35%	8117
N ₂ H ⁺	+ NH ₃	→	NH ₄ ⁺	+ N ₂	1.00	2.30 × 10 ⁻⁹	± 20%	7415
*N ₂ H ⁺	+ N ₂	→	N ₂ H ⁺ M Adduct	+ *N ₂	1.00	4.10 × 10 ⁻⁹	± 20%	8108 8632
N ₂ H ⁺	+ O	→	OH ⁺	+ N ₂	1.00	1.40 × 10 ⁻¹⁰	± 20%	8006
N ₂ H ⁺	+ H ₂ O	→	H ₃ O ⁺	+ N ₂	1.00	2.60 × 10 ⁻⁹	± 10%	8208 7510 7005 7420 7309

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
N ₂ H ⁺	+ O ₂	→	No Reaction		<8.00×10 ⁻¹³	7406		
N ₂ H ⁺	+ Kr	→	No Reaction		<4.00×10 ⁻¹³	8418		
N ₂ H ⁺	+ Xe	→	XeH ⁺	+ N ₂	1.00	6.60×10 ⁻¹⁰	±30%	8006 7607
N ₂ H ⁺	+ HCN	→	HCNH ⁺	+ N ₂	1.00	3.20×10 ⁻⁹	±20%	7605
N ₂ H ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺	+ N ₂	1.00	4.10×10 ⁻⁹	±25%	7605
N ₂ H ⁺	+ C ₂ N ₂	→	HC ₂ N ₂ ⁺	+ N ₂	1.00	1.20×10 ⁻⁹	±30%	8412
N ₂ H ⁺	+ HC ₃ N	→	CHCCNH ⁺	+ N ₂	1.00	4.20×10 ⁻⁹	±20%	8518 8412 7911
N ₂ H ⁺	+ CO	→	HCO ⁺	+ N ₂	1.00	8.80×10 ⁻¹⁰	±25%	8006
N ₂ H ⁺	+ H ₂ CO	→	CH ₂ OH ⁺	+ N ₂	1.00	3.30×10 ⁻⁹	±25%	7906
N ₂ H ⁺	+ CH ₃ OH	→	CH ₃ ⁺ CH ₂ OH ⁺ CH ₃ OH ₂ ⁺	+ N ₂ + H ₂ O + N ₂ + H ₂ + N ₂	0.11 0.07 0.82	1.70×10 ⁻⁹	±20%	7706
N ₂ H ⁺	+ CO ₂	→	HCO ₂ ⁺	+ N ₂	1.00	1.07×10 ⁻⁹	±20%	8208 8006 7607 7005
N ₂ II ⁺	+ ClOO ₂ I	→	ClI(OH) ₂ ⁺	+ N ₂	1.00	1.70×10 ⁻⁹	±30%	7820
N ₂ H ⁺	+ CS ₂	→	HCS ₂ ⁺	+ N ₂	1.00	6.00×10 ⁻¹⁰	±40%	8208
N ₂ H ⁺	+ NO	→	HNO ⁺	+ N ₂	1.00	3.40×10 ⁻¹⁰	±40%	8208 7104
N ₂ H ⁺	+ N ₂ O	→	HN ₂ O ⁺	+ N ₂	1.00	1.25×10 ⁻⁹	±50%	8208 7005
N ₂ H ⁺	+ SO ₂	→	HSO ₂ ⁺	+ N ₂	1.00	1.70×10 ⁻⁹	±40%	8208
N ₂ D ⁺	+ H	→	N ₂ H ⁺	+ D	1.00	2.50×10 ⁻¹¹	±20%	<u>8503</u>
O ⁺	+ H	→	H ⁺	+ O	1.00	6.40×10 ⁻¹⁰	±30%	8403 7205
O ⁺	+ H ₂	→	OH ⁺	+ II	1.00	1.62×10 ⁻⁹	±20%	9122 8724 8010 7506 8403
O ⁺	+ HD	→	OH ⁺ OD ⁺	+ D + H	0.54 0.46	1.22×10 ⁻⁹	±40%	<u>9128</u> 9006 8724
O ⁺	+ D ₂	→	OD ⁺	+ D	1.00	1.04×10 ⁻⁹	±20%	8724
O ⁺	+ CH ₄	→	CH ₃ ⁺ CH ₄ ⁺	+ OH + O	0.11 0.89	1.00×10 ⁻⁹	±20%	8010
O ⁺	+ C ₂ H ₆	→	C ₂ H ₄ ⁺ C ₂ II ₅ ⁺	+ H ₂ O + OH	0.70 0.30	1.90×10 ⁻⁹	±20%	8117
O ⁺	+ NH ₃	→	NH ₃ ⁺	+ O	1.00	1.20×10 ⁻⁹	±20%	8010
O ⁺	+ N ₂	→	NO ⁺	+ N	1.00	1.20×10 ⁻¹²	±10%	9036 8718 7816 7808 7718 <u>7417</u> 7311 7306 <u>6902</u> 6803 6801 8632
		→ M	Product					
O ⁺	+ H ₂ O	→	H ₂ O ⁺	+ O	1.00	2.60×10 ⁻⁹	±15%	8925 8010 7202 7006

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
O ⁺	+ O ₂	→ O ₂ ⁺	+ O	1.00	2.10 × 10 ⁻¹¹ ± 10%	8523 7808 7417 6902	8010 7718 7311 6801	7816 7602 7306 a
*O ⁺	+ O ₂	→ O ⁺	+ *O ₂		< 1.00 × 10 ⁻¹²	7421		
O ⁺	+ H ₂ S	→ S ⁺ HS ⁺ H ₂ S ⁺	+ H ₂ O + OH + O	0.11 0.21 0.68	1.90 × 10 ⁻⁹ ± 20%	8010	7507	b
O ⁺	+ HCN	→ CO ⁺ HCO ⁺ NO ⁺	+ NH + N + CH	~0.33 ~0.33 ~0.33	3.50 × 10 ⁻⁹ ± 20%	8512		a
O ⁺	+ CH ₃ NH ₂	→ CHNH ₂ ⁺ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ H ₂ O + OH + O	0.15 0.79 0.06	2.10 × 10 ⁻⁹ ± 20%	8010		
O ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³	8010		
*O ⁺	+ CO	→ O ⁺	+ *CO	1.00	4.40 × 10 ⁻¹⁰ ± 30%	7421		
O ⁺	+ H ₂ CO	→ HCO ⁺ H ₂ CO ⁺	+ OH + O	0.40 0.60	3.50 × 10 ⁻⁹ ± 30%	8010		
O ⁺	+ CH ₃ OH	→ H ₂ CO ⁺ CH ₂ OH ⁺ CH ₃ OH ⁺	+ H ₂ O + OH + O	0.05 0.70 0.25	1.90 × 10 ⁻⁹ ± 30%	8010		
O ⁺	+ CO ₂	→ O ₂ ⁺	+ CO	1.00	1.10 × 10 ⁻⁹ ± 20%	9022 7417 6801	8010 7211 6604	7602 7007 a
O ⁺	+ CHOONH ₄	→ HO ₂ [‡] HCO ⁺	+ HCO + HO ₂		5.00 × 10 ⁻⁹ ± 30%	7821		
O ⁺	+ NO	→ NO ⁺	+ O	1.00	8.00 × 10 ⁻¹³ ± 15%	7808 7419	7718 7102	7519 6603
*O ⁺	+ NO	→ O ⁺	+ *NO		< 5.00 × 10 ⁻¹²	7421		
O ⁺	+ NO ₂	→ NO ₂ [‡]	+ O	1.00	1.60 × 10 ⁻⁹ ± 30%	7102		T=393
O ⁺	+ N ₂ O	→ N ₂ O ⁺	+ O	1.00	6.30 × 10 ⁻¹⁰ ± 30%	7102		T=393
O ⁺	+ SO ₂	→ O ₂ ⁺	+ SO	1.00	~ 8.00 × 10 ⁻¹⁰ ± 50%	8401		
O ⁺	+ COS	→ S ⁺ COS ⁺	+ CO ₂ + O	0.03 0.97	6.70 × 10 ⁻¹⁰ ± 20%	8010		
OH ⁺	+ H ₂	→ H ₂ O ⁺	+ H	1.00	9.70 × 10 ⁻¹⁰ ± 20%	8818 6702	8104	7506 b
OH ⁺	+ CH ₄	→ CH ₃ ⁺ H ₃ O ⁺	+ O + CH ₂	0.13 0.87	1.45 × 10 ⁻⁹ ± 10%	8006 7305	8001	7806 b
OH ⁺	+ C ₂ H ₆	→ H ₃ O ⁺ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺ C ₂ H ₆ ⁺ C ₂ H ₇ ⁺	+ C ₂ H ₄ + H ₂ O + H + H ₂ O + OH + O	0.10 0.65 0.20 0.03 0.02	1.60 × 10 ⁻⁹ ± 20%	8117		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
OH ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ OH + O	0.50 0.50	1.84 × 10 ⁻⁹ ± 30%	8818	7709	
OH ⁺	+ N ₂	→ N ₂ H ⁺	+ O	1.00	2.40 × 10 ⁻¹⁰ ± 30%	8818 8001	8104 7806	8006 7716
OH ⁺	+ H ₂ O	→ H ₂ O ⁺ H ₃ O ⁺	+ OH + O	0.55 0.45	2.89 × 10 ⁻⁹ ± 10%	7304		
OH ⁺	+ O ₂	→ O ₂ ⁺	+ OH	1.00	3.80 × 10 ⁻¹⁰ ± 50%	8818 6702	8104	7806
OH ⁺	+ H ₂ S	→ H ₂ S ⁺ H ₃ S ⁺	+ OH + O	0.60 0.40	2.00 × 10 ⁻⁹ ± 30%	8818 7806	8714 7410	8104 ^b
OH ⁺	+ Xe	→ Xe ⁺ XeH ⁺	+ OH + O	0.80 0.20	9.20 × 10 ⁻¹⁰ ± 20%	8104		
OH ⁺	+ CO	→ HCO ⁺	+ O	1.00	8.40 × 10 ⁻¹⁰ ± 20%	8818 8001	8104 7806	8006 7716
OH ⁺	+ H ₂ CO	→ H ₂ CO ⁺ CH ₂ OH ⁺	+ OH + O	0.40 0.60	1.86 × 10 ⁻⁹ ± 10%	7806		
OH ⁺	+ CO ₂	→ HCO ₂ ⁺	+ O	1.00	1.35 × 10 ⁻⁹ ± 15%	8818 7806	8104 7716	8001 7715
OH ⁺	+ CH ₃ SH	→ Products		1.00	1.10 × 10 ⁻⁹ ± 10%	8714		
OH ⁺	+ CS ₂	→ CS ₂ ⁺ HC ₂ S ⁺	+ OH + O		1.50 × 10 ⁻⁹ ± 30%	8818		
OH ⁺	+ C ₂ H ₅ SH	→ Products		1.00	3.50 × 10 ⁻⁹ ± 10%	8714		
OH ⁺	+ (CH ₃) ₂ S	→ Products		1.00	2.30 × 10 ⁻⁹ ± 10%	8714		
OH ⁺	+ NO	→ NO ⁺	+ OH	1.00	8.15 × 10 ⁻¹⁰ ± 15%	8818 8008	8104 7806	8018 ^b
OH ⁺	+ NO ₂	→ NO ⁺ NO ₂ ⁺	+ HO ₂ + OH		1.30 × 10 ⁻⁹ ± 30%	8818		
OH ⁺	+ N ₂ O	→ NO ⁺ N ₂ O ⁺ HN ₂ O ⁺	+ HNO + OH + O	0.11 0.16 0.72	1.33 × 10 ⁻⁹ ± 20%	8818	8104	7806
OH ⁺	+ SO ₂	→ SO ₂ ⁺ HSO ₂ ⁺	+ OH + O		2.10 × 10 ⁻⁹ ± 30%	8818		
OD ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺ SiOD ⁺ SiOH ₂ D ⁺	+ HDO + H ₂ + H + HDO + H ₂ + HDO + H + HDO + H ₂ + H ₂ + H ₂	0.03 0.09 0.21 0.27 0.26 0.13	6.60 × 10 ⁻¹⁰ ± 20%	7320		
H ₂ O ⁺	+ H ₂	→ H ₃ O ⁺	+ H	1.00	7.60 × 10 ⁻¹⁰ ± 15%	8104 6702	8009	7506
H ₂ O ⁺	+ CH ₄	→ H ₃ O ⁺	+ CH ₃	1.00	1.12 × 10 ⁻⁹ ± 10%	8818 7806	8009 7305	8001 ^b
H ₂ O ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺	+ H ₂ O + OH		1.60 × 10 ⁻⁹ ± 30%	8009		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
H ₂ O ⁺	+ C ₂ H ₆	→ H ₃ O ⁺ C ₂ H ₅ ⁺ C ₂ H ₅ ⁺ C ₂ H ₆ ⁺	+ C ₂ H ₅ + H ₂ O + H ₂ + H ₂ O + H + H ₂ O	0.83 0.12 0.01 0.04	1.60 × 10 ⁻⁹ ± 20%	8117	
H ₂ O ⁺	+ N	→ NO ⁺ HNO ⁺	+ H ₂ + H		1.90 × 10 ⁻¹⁰ ± 50%	8008	
H ₂ O ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ H ₂ O + OH	0.70 0.30	3.15 × 10 ⁻⁹ ± 10%	7709	
H ₂ O ⁺	+ N ₂	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹	7806 8632	
H ₂ O ⁺	+ O	→ No Reaction			< 4.00 × 10 ⁻¹¹	8008	
H ₂ O ⁺	+ H ₂ O	→ H ₃ O ⁺	+ OH	1.00	1.85 × 10 ⁻⁹ ± 15%	7304 7202	
H ₂ O ⁺	+ O ₂	→ O ₂ ⁺	+ H ₂ O	1.00	3.30 × 10 ⁻¹⁰ ± 45%	8818 8009 7806	8104 8018 6702
H ₂ O ⁺	+ Na	→ Na ⁺	+ H ₂ O	1.00	6.20 × 10 ⁻⁹ ± 30%	8919	
H ₂ O ⁺	+ H ₂ S	→ H ₃ O ⁺ H ₂ S ⁺ H ₃ S ⁺	+ SH + H ₂ O + OH	0.24 0.42 0.34	2.00 × 10 ⁻⁹ ± 25%	8818 7806 7410	8714 8104
H ₂ O ⁺	+ Xe	→ Xe ⁺	+ H ₂ O	1.00	8.00 × 10 ⁻¹⁰ ± 20%	8104	
H ₂ O ⁺	+ HCN	→ H ₃ O ⁺ HCN ⁺	+ CN + OH	< 0.50 > 0.50	2.10 × 10 ⁻⁹ ± 10%	8101	
H ₂ O ⁺	+ C ₂ N ₂	→ HC ₂ N ₂ ⁺	+ OH	1.00	1.00 × 10 ⁻⁹ ± 30%	8412	
H ₂ O ⁺	+ CO	→ HCO ⁺	+ OH	1.00	4.25 × 10 ⁻¹⁰ ± 20%	8818 8006 8001	8104 8009 7806
H ₂ O ⁺	+ H ₂ CO	→ H ₂ CO ⁺ CH ₂ OH ⁺	+ H ₂ O + OH	0.68 0.32	2.07 × 10 ⁻⁹ ± 10%	7806	
H ₂ O ⁺	+ CO ₂	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹	7806 8632	
H ₂ O ⁺	+ CH ₃ SH	→ Products		1.00	1.10 × 10 ⁻⁹ ± 10%	8714	
H ₂ O ⁺	+ C ₂ H ₅ SH	→ Products		1.00	3.30 × 10 ⁻⁹ ± 10%	8714	
H ₂ O ⁺	+ (CH ₃) ₂ S	→ Products		1.00	2.10 × 10 ⁻⁹ ± 10%	8714	
H ₂ O ⁺	+ NO	→ NO ⁺	+ H ₂ O	1.00	4.60 × 10 ⁻¹⁰ ± 20%	8818 8009 8008 8006	8314 8104 7806
H ₂ O ⁺	+ NO ₂	→ NO ₂ ⁺	+ H ₂ O	1.00	1.20 × 10 ⁻⁹ ± 30%	8818	8009
H ₂ O ⁺	+ N ₂ O	→ Products M Adduct		1.00	4.80 × 10 ⁻¹² ± 30%	8818 8632	7806
H ₂ O ⁺	+ SO ₂	→ SO ₂ ⁺ HSO ₂ ⁺	+ H ₂ O + OH		2.00 × 10 ⁻⁹ ± 30%	8818	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
D ₂ O ⁺	+ SiH ₄	→	HD ₂ O ⁺ SiH ₂ ⁺ SiH ₃ ⁺ SiOD ⁺ SiOH ⁺ SiOH ₂ D ⁺ SiOH ₂ D ₂ ⁺	+ SiH ₃ + D ₂ O + H ₂ + D ₂ O + H + HD + H ₂ + H + H ₂ + HD + HD + H + H ₂	0.15 0.36 0.39 0.02 0.01 0.06 0.01	5.30 × 10 ⁻¹⁰ ± 20%	7320	
H ₃ O ⁺	+ H ₂	→	No Reaction		< 5.00 × 10 ⁻¹⁵	7711		
H ₃ O ⁺	+ D ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	7506		
H ₃ O ⁺	+ C ₂ H ₄	→	C ₂ H ₅ ⁺	+ H ₂ O	1.00	5.15 × 10 ⁻¹¹ ± 30%	8807	8115
H ₃ O ⁺	+ NH ₃	→	NH ₄ ⁺	+ H ₂ O	1.00	2.23 × 10 ⁻⁹ ± 10%	8818 7711 7709 7308	8019 7904 7415
H ₃ O ⁺	+ H ₂ O	ℳ	Adduct			8632		
H ₃ O ⁺	+ D ₂ O	→	Products		1.00	2.20 × 10 ⁻⁹ ± 20%	8019	
H ₃ O ⁺	+ H ₂ S	→	H ₃ S ⁺	+ H ₂ O	1.00	1.65 × 10 ⁻⁹ ± 15%	8818 7809	8714 7904
H ₃ O ⁺	+ HCN	→	HCNH ⁺	+ H ₂ O	1.00	3.80 × 10 ⁻⁹ ± 15%	7819	7809 7605
H ₃ O ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺	+ H ₂ O	1.00	4.50 × 10 ⁻⁹ ± 15%	9112	8618 7605
H ₃ O ⁺	+ HC ₃ N	→	CHCCNH ⁺	+ H ₂ O	1.00	3.90 × 10 ⁻⁹ ± 30%	8412	7911
H ₃ O ⁺	+ H ₂ CO	→	CH ₂ OH ⁺	+ H ₂ O	1.00	3.00 × 10 ⁻⁹ ± 25%	7906	7904 7812
H ₃ O ⁺	+ CH ₃ OH	→	CH ₃ OH ₂ [‡]	+ H ₂ O	1.00	2.50 × 10 ⁻⁹ ± 25%	7904	7812
H ₃ O ⁺	+ CHO OH	→	CH(OH) ₂ [‡]	+ H ₂ O	1.00	2.50 × 10 ⁻⁹ ± 15%	7820	7904 7818
H ₃ O ⁺	+ CH ₂ CO	→	CH ₃ CO ⁺	+ H ₂ O	1.00	2.00 × 10 ⁻⁹ ± 25%	7904	
H ₃ O ⁺	+ CH ₃ CHO	→	C ₂ H ₅ O ⁺	+ H ₂ O	1.00	3.55 × 10 ⁻⁹ ± 25%	8617	7904
H ₃ O ⁺	+ C ₂ H ₅ OH	→	C ₂ H ₅ OH ₂ [‡]	+ H ₂ O	1.00	2.80 × 10 ⁻⁹ ± 25%	7904	
H ₃ O ⁺	+ (CH ₃) ₂ O	→	(CH ₃) ₂ OH ⁺	+ H ₂ O	1.00	2.70 × 10 ⁻⁹ ± 25%	7904	
H ₃ O ⁺	+ CH ₃ COOH	→	CH ₃ CO ⁺ CH ₃ C(OH) ₂ [‡]	+ H ₂ O + H ₂ O + H ₂ O	0.05 0.95	3.00 × 10 ⁻⁹ ± 30%	7818	
H ₃ O ⁺	+ (CH ₃) ₂ CO	→	Products		1.00	3.80 × 10 ⁻⁹ ± 30%	9112	
H ₃ O ⁺	+ CH ₃ COOCH ₃	→	Products		1.00	2.60 × 10 ⁻⁹ ± 30%	9112	
H ₃ O ⁺	+ CH ₃ SH	→	Products		1.00	1.00 × 10 ⁻⁹ ± 10%	8714	
H ₃ O ⁺	+ CS ₂	→	HC ₂ S ⁺	+ H ₂ O	1.00	3.05 × 10 ⁻¹⁰ ± 30%	8818	8807
H ₃ O ⁺	+ C ₂ H ₅ SH	→	Products		1.00	3.00 × 10 ⁻⁹ ± 10%	8714	
H ₃ O ⁺	+ (CH ₃) ₂ S	→	Products		1.00	2.10 × 10 ⁻⁹ ± 10%	8714	
H ₃ O ⁺	+ N ₂ O	ℳ	Adduct			8632		
H ₃ O ⁺	+ SO ₂	ℳ	Adduct			8632		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
D ₃ O ⁺	+ NH ₃	→ Products		1.00	2.20 × 10 ⁻⁹	± 20%	8019
D ₃ O ⁺	+ H ₂ O	→ Products		1.00	2.00 × 10 ⁻⁹	± 20%	8019
D ₃ O ⁺	+ SiH ₄	→ SiH ₃ ⁺ SiH ₄ D ⁺	+ D ₂ O + HD + D ₂ O	~0.80 ~0.20	> 1.40 × 10 ⁻¹⁰	± 20%	7320
O ₂ ⁺	+ H ₂	→ No Reaction M → Adduct			< 1.00 × 10 ⁻¹³	7408 8632	6702
O ₂ ⁺	+ CH ₄	→ CH(OH) ₂ ⁺ M → Adduct	+ H	1.00	6.00 × 10 ⁻¹²	± 15%	9106 8612 8406 7912 8632
O ₂ ⁺	+ CH ₃ D	→ CH(OH) ₂ ⁺ CH ₂ DO ₂ ⁺	+ D + H	0.24 0.76	4.60 × 10 ⁻¹²	± 30%	8612
O ₂ ⁺	+ CH ₂ D ₂	→ CH ₂ DO ₂ ⁺ CHD ₂ O ₂ ⁺	+ D + H	0.48 0.52	3.80 × 10 ⁻¹²	± 30%	8612
O ₂ ⁺	+ CHD ₃	→ CHD ₂ O ₂ ⁺ CD(OD) ₂ ⁺	+ D + H	0.79 0.21	2.50 × 10 ⁻¹²	± 30%	8612
O ₂ ⁺	+ CD ₄	→ CD(OD) ₂ ⁺	+ D	1.00	1.70 × 10 ⁻¹²	± 30%	8612
O ₂ ⁺	+ N	→ NO ⁺	+ O	1.00	1.50 × 10 ⁻¹⁰	± 50%	7717 8632
O ₂ ⁺	+ NH ₃	→ NH ₃ ⁺	+ O ₂	1.00	2.10 × 10 ⁻⁹	± 20%	8318 8010 7308
O ₂ ⁺	+ N ₂	→ NO ⁺ M → Adduct	+ NO	1.00	< 1.00 × 10 ⁻¹⁵		6502 8632
O ₂ ⁺	+ H ₂ O	→ No Reaction M → Adduct			< 1.00 × 10 ⁻¹²		8419 8632
*O ₂ ⁺	+ O ₂	→ O ₂ ⁺ M → Adduct	+ *O ₂	1.00	3.90 × 10 ⁻¹⁰	± 10%	8506 8632
O ₂ ⁺	+ H ₂ O ₂	→ H ₂ O ₂ ⁺	+ O ₂	1.00	1.50 × 10 ⁻⁹	± 30%	7513
O ₂ ⁺	+ O ₃	M → Adduct					8632
O ₂ ⁺	+ Na	→ Na ⁺ NaO ⁺	+ O ₂ + O	> 0.90 < 0.10	1.20 × 10 ⁻⁹	± 60%	8919 6901
O ₂ ⁺	+ H ₂ S	→ H ₂ S ⁺	+ O ₂	1.00	1.40 × 10 ⁻⁹	± 20%	8010 7507
O ₂ ⁺	+ Kr	M → Adduct					8632
O ₂ ⁺	+ Xe	→ Xe ⁺	+ O ₂	1.00	5.50 × 10 ⁻¹¹	± 25%	9022 8413
O ₂ ⁺	+ HCN	→ No Reaction			< 1.00 × 10 ⁻¹¹		8101
O ₂ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ HO ₂ + O ₂	0.35 0.65	~ 1.00 × 10 ⁻⁹	± 50%	8010
O ₂ ⁺	+ CO	→ No Reaction			< 1.00 × 10 ⁻¹¹		8018
O ₂ ⁺	+ H ₂ CO	→ H ₂ CO ⁺ HCO ⁺	+ O ₂	0.90 0.10	2.30 × 10 ⁻⁹	± 20%	8010

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
O ₂ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ OH ⁺	+ HO ₂ + O ₂	~0.50 ~0.50	~1.00 × 10 ⁻⁹	±50%	8010	
O ₂ ⁺	+ CO ₂	→ No Reaction <u>M</u> Adduct			<1.00 × 10 ⁻¹¹		8018 8632	
O ₂ ⁺	+ CHO OH	→ HCO ₂ ⁺ CHO OH ⁺	+ HO ₂ + O ₂		1.80 × 10 ⁻⁹	±30%	7821	
O ₂ ⁺	+ NO	→ NO ⁺	+ O ₂	1.00	4.60 × 10 ⁻¹⁰	±30%	7808 7007	7517 7004
O ₂ ⁺	+ NO ₂	→ NO ₂ ⁺	+ O ₂	1.00	6.60 × 10 ⁻¹⁰	±30%	7303	
O ₂ ⁺	+ N ₂ O	→ No Reaction <u>M</u> Adduct			<1.00 × 10 ⁻¹¹		8018 8632	
O ₂ ⁺	+ SO ₂	→ No Reaction <u>M</u> Adduct			<1.00 × 10 ⁻¹²		8419 8632	8401
O ₂ ⁺	+ COS	→ COS ⁺	+ O ₂	1.00	1.00 × 10 ⁻⁹	±20%	8010	
HO ₂ ⁺	+ H ₂	→ H ₃ ⁺	+ O ₂	1.00	3.30 × 10 ⁻¹⁰	±10%	8414 7505	8006 7312
HO ₂ ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₃ ⁺	+ O ₂ + H ₂ + O ₂	0.08 0.92	1.00 × 10 ⁻⁹	±30%	7613	
HO ₂ ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ O ₂ + H ₂ + O ₂	0.77 0.23	1.10 × 10 ⁻⁹	±30%	7613	
HO ₂ ⁺	+ C ₂ H ₆	→ C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ O ₂ + H ₂ + H ₂ + O ₂ + H ₂	0.02 0.98	1.40 × 10 ⁻⁹	±20%	7613	
HO ₂ ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ HO ₂ + O ₂	0.04 0.96	1.90 × 10 ⁻⁹	±20%	7613	7516
HO ₂ ⁺	+ N ₂	→ N ₂ H ⁺	+ O ₂	1.00	8.00 × 10 ⁻¹⁰	±30%	7516	
HO ₂ ⁺	+ Ar	→ ArH ⁺	+ O ₂	1.00	<5.00 × 10 ⁻¹²		7512	
HO ₂ ⁺	+ Kr	→ KrH ⁺	+ O ₂	1.00	4.30 × 10 ⁻¹⁰	±20%	8006	
HO ₂ ⁺	+ CO ₂	→ HCO ₂ ⁺	+ O ₂	1.00	1.10 × 10 ⁻⁹	±30%	7516	
HO ₂ ⁺	+ NO	→ Products		1.00	7.00 × 10 ⁻¹⁰	±30%	7517	
D ₂ O ₂ ⁺	+ D ₂	→ D ₃ ⁺	+ O ₂	1.00	2.80 × 10 ⁻¹⁰	±25%	8414	8006
H ₂ O ₂ ⁺	+ NH ₃	→ NH ₄ ⁺	+ HO ₂	1.00	1.80 × 10 ⁻⁹	±30%	7513	
H ₂ O ₂ ⁺	+ H ₂ O	→ H ₃ O ⁺	+ HO ₂	1.00	1.70 × 10 ⁻⁹	±30%	7513	
H ₂ O ₂ ⁺	+ H ₂ O ₂	→ H ₃ O ₂ ⁺	+ HO ₂	1.00	~6.00 × 10 ⁻¹⁰	±50%	7513	
H ₂ O ₂ ⁺	+ CO	→ No Reaction			<1.00 × 10 ⁻¹¹		7513	
H ₂ O ₂ ⁺	+ NO	→ NO ⁺	+ H ₂ O ₂	1.00	5.00 × 10 ⁻¹⁰	±30%	7513	

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
F ⁺	+ H ₂	→	H ⁺ H ₂ ⁺ HF ⁺	+ HF + F + H	0.03 0.60 0.37	1.04 × 10 ⁻⁹	± 20%	9013 8601
F ⁺	+ D ₂	→	D ⁺ D ₂ ⁺ DF ⁺	+ DF + F + D	0.05 0.60 0.35	7.00 × 10 ⁻¹⁰	± 20%	9013
F ⁺	+ CH ₄	→	CH ₂ ⁺ CH ₃ ⁺ CH ₄ ⁺	+ HF + H + HF + F	0.15 0.83 0.02	1.70 × 10 ⁻⁹	± 20%	9013 8601
F ⁺	+ C ₂ H ₂	→	C ₂ H ₂ ⁺ C ₂ H ₂ ⁺	+ HF + F	0.14 0.86	1.40 × 10 ⁻⁹	± 20%	9013
F ⁺	+ C ₂ H ₄	→	C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ HF + H + HF + F	0.27 0.66 0.06	1.40 × 10 ⁻⁹	± 20%	9013
F ⁺	+ c-C ₆ H ₆	→	C ₃ H ₃ ⁺ C ₄ H ₄ ⁺ C ₅ H ₃ ⁺ c-C ₆ H ₆ ⁺	+ C ₃ H ₃ F + C ₂ H ₂ F + CH ₃ F + F	0.16 0.55 0.06 0.23	2.00 × 10 ⁻⁹	± 20%	9013
F ⁺	+ NH ₃	→	NH ⁺ NH ₂ ⁺ NH ₃ ⁺ HF ⁺	+ HF + H + HF + F + NH ₂	0.05 0.79 0.12 0.04	2.05 × 10 ⁻⁹	± 20%	9013 8601
F ⁺	+ N ₂	→	N ₂ ⁺	+ F	1.00	9.70 × 10 ⁻¹⁰	± 20%	9013 8620 8601
F ⁺	+ H ₂ O	→	O ⁺ OH ⁺ H ₂ O ⁺ HF ⁺	+ HF + H + HF + F + OH	0.17 0.06 0.66 0.11	3.10 × 10 ⁻⁹	± 20%	9013
F ⁺	+ O ₂	→	O ⁺ O ₂ ⁺ FO ⁺	+ FO + F + O	0.07 0.81 0.12	8.65 × 10 ⁻¹⁰	± 20%	9013 8620 8601
F ⁺	+ H ₂ S	→	S ⁺ HS ⁺	+ HF + H + HF	0.16 0.84	7.60 × 10 ⁻¹⁰	± 20%	9013 8601
F ⁺	+ Ar	→	Ar ⁺	+ F	1.00	~1.00 × 10 ⁻¹¹	± 60%	8620
F ⁺	+ CO	→	CO ⁺ CR ⁺	+ F + O	0.96 0.04	9.80 × 10 ⁻¹⁰	± 20%	9013 8601
F ⁺	+ CO ₂	→	CO ₂ ⁺	+ F	1.00	1.15 × 10 ⁻⁹	± 20%	9013 8601
F ⁺	+ NO	→	NO ⁺ FN ⁺	+ F + O	0.90 0.10	9.40 × 10 ⁻¹⁰	± 20%	9013 8601
F ⁺	+ N ₂ O	→	O ⁺ NO ⁺	+ FN ₂ + FN	0.10 0.90	8.00 × 10 ⁻¹⁰	± 20%	8601
F ⁺	+ SO ₂	→	SO ⁺	+ FO	1.00	2.20 × 10 ⁻⁹	± 20%	8601
F ⁺	+ COS	→	S ⁺ COS ⁺	+ FCO + F	0.95 0.05	1.45 × 10 ⁻⁹	± 20%	9013 8601

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Ne ⁺	+ H ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8725 7603	8126 7010	7714
Ne ⁺	+ HD	→	No Reaction		<2.00×10 ⁻¹⁴	8725		
Ne ⁺	+ D ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8725		
Ne ⁺	+ He	→	Adduct				8632	
Ne ⁺	+ CH ₄	→	CH ⁺ CH ₂ ⁺ CH ₃ ⁺ CH ₄ ⁺	+ H ₂ + H ₂ + H + Ne	0.04 0.20 0.24 0.52	2.10×10 ⁻¹¹ ±20%	8126 7702 7010	
Ne ⁺	+ C ₂ H ₄	→	C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ H + Ne	0.82 0.18	1.20×10 ⁻⁹ ±20%	8126	
Ne ⁺	+ C ₂ H ₆	→	Products		1.00	6.00×10 ⁻¹⁰ ±20%	7010	
Ne ⁺	+ NH ₃	→	NH ⁺ NH ₂ ⁺ NH ₃ ⁺	+ H ₂ + H + Ne	0.02 0.86 0.12	2.25×10 ⁻¹⁰ ±20%	8126 7010	
Ne ⁺	+ N ₂	→	N ₂ ⁺	+ Ne	1.00	1.10×10 ⁻¹³ ±40%	8315 8126 7204 7010	7702
Ne ⁺	+ H ₂ O	→	H ₂ O ⁺	+ Ne	1.00	8.00×10 ⁻¹⁰ ±10%	8126 7006	7801 7202 b
Ne ⁺	+ O ₂	→	O ⁺	+ O + Ne	1.00	6.00×10 ⁻¹¹ ±10%	8315 7204 8126 7010	7702 7003
*Ne ⁺	+ Ne	→	Ne ⁺ Adduct	+ *Ne	1.00	3.40×10 ⁻¹⁰ ±25%	9023 8632	c
Ne ⁺	+ SiH ₄	→	Si ⁺ SiH ⁺ SiH ₂ ⁺	+ Ne + Ne + Ne	0.37 0.54 0.08	5.30×10 ⁻¹⁰ ±30%	9002	
Ne ⁺	+ H ₂ S	→	S ⁺ HS ⁺ H ₂ S ⁺	+ H ₂ + H + Ne	0.45 0.45 0.10	5.00×10 ⁻¹⁰ ±20%	8126	
Ne ⁺	+ Ar	→	Ar ⁺	+ Ne	1.00	~6.00×10 ⁻¹⁵ ±50%	7815	
Ne ⁺	+ Kr	→	No Reaction		<1.00×10 ⁻¹⁴	7817		
Ne ⁺	+ Hg	→	No Reaction		<5.00×10 ⁻¹³	8016 7317		
Ne ⁺	+ CO	→	No Reaction		<1.00×10 ⁻¹³	8315 8126 7010	7702	
Ne ⁺	+ CO ₂	→	CO ⁺	+ O + Ne	1.00	6.00×10 ⁻¹¹ ±30%	8126 7702	7010
Ne ⁺	+ NO	→	N ⁺ O ⁺	+ O + N	0.91 0.09	1.45×10 ⁻¹⁰ ±20%	8126 7702	7010
Ne ⁺	+ N ₂ O	→	N ⁺ O ⁺ N ₂ ⁺ NO ⁺ N ₂ O ⁺	+ NO + N ₂ + O + N + Ne	0.18 0.06 0.23 0.52 0.01	3.70×10 ⁻¹⁰ ±10%	8126 7702	
Ne ⁺	+ SO ₂	→	SO ⁺	+ O + Ne	1.00	2.20×10 ⁻⁹ ±20%	8126	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Ne ⁺	+ COS	→ S ⁺ CO ⁺ CS ⁺	+ CO + S + O	+ Ne + Ne + Ne	0.47 0.47 0.06	1.40 × 10 ⁻⁹	± 20%	8126
NeH ⁺	+ H ₂	→ H ₃ ⁺		+ Ne	1.00	2.00 × 10 ⁻¹¹	± 50%	7008
NeH ⁺	+ He	→ HeH ⁺		+ Ne	1.00	3.80 × 10 ⁻¹⁴	± 50%	9130
NeH ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ H ₂ + H	+ Ne + Ne	0.77 0.23	1.80 × 10 ⁻⁹	± 20%	7610
Na ⁺	+ H ₂	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8320
Na ⁺	+ CH ₄	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8320
Na ⁺	+ N ₂	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8320
Na ⁺	+ H ₂ O	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8320
Na ⁺	+ O ₂	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8632
Na ⁺	+ O ₃	→ No Reaction			< 1.00 × 10 ⁻¹¹			7103
Na ⁺	+ CO	→ No Reaction <u>M</u> Adduct			< 1.00 × 10 ⁻¹³			8632
Na ⁺	+ CO ₂	<u>M</u> Adduct						8632
Na ⁺	+ NO	→ No Reaction			< 1.00 × 10 ⁻¹³			7103
Na ⁺	+ SO ₂	<u>M</u> Adduct						8632
Mg ⁺	+ O ₂	<u>M</u> Adduct						8632
Mg ⁺	+ H ₂ O ₂	→ MgOH ⁺	+ OH		1.00	1.30 × 10 ⁻⁹	± 50%	8113
Mg ⁺	+ O ₃	→ MgO ⁺	+ O ₂		1.00	7.00 × 10 ⁻¹⁰	± 50%	8113
Mg ⁺	+ Cl ₂	→ MgCl ⁺	+ Cl		1.00	4.40 × 10 ⁻¹⁰	± 50%	8113
Mg ⁺	+ Br ₂	→ MgBr ⁺	+ Br		1.00	2.50 × 10 ⁻¹⁰	± 50%	8113
Mg ⁺	+ N ₂ O	→ No Reaction			< 5.00 × 10 ⁻¹³			8113
Al ⁺	+ HD	→ No Reaction			< 2.00 × 10 ⁻¹⁴			9009
Al ⁺	+ D ₂	→ No Reaction			< 2.00 × 10 ⁻¹⁴			9009
Al ⁺	+ O ₂	→ No Reaction			< 1.00 × 10 ⁻¹⁶			9113
Si ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹³			8705
Si ⁺	+ D ₂	→ No Reaction			< 2.00 × 10 ⁻¹³			7609
Si ⁺								8425
Si ⁺								8111
Si ⁺								8705

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Si ⁺	+ CH ₄	→ M	CH ₃ Si ⁺ Adduct	+ H	1.00	7.70 × 10 ⁻¹¹ ± 20%	7319 9110	
Si ⁺	+ C ₂ H ₂	→ M	CHCSi ⁺ Adduct	+ H	1.00	1.80 × 10 ⁻¹⁰ ± 20%	9110 9110	7427
Si ⁺	+ C ₂ H ₄	→ M	CH ₃ CSi ⁺ Adduct	+ H	1.00	7.40 × 10 ⁻¹¹ ± 20%	9110 9110	7428
Si ⁺	+ C ₂ H ₆	→	CH ₂ Si ⁺ CH ₃ Si ⁺ CH ₃ CHSi ⁺ Adduct	+ CH ₄ + CH ₃ + H ₂	0.15 0.80 0.03 0.02	8.00 × 10 ⁻¹⁰ ± 30%	9110	
Si ⁺	+ CH ₂ CCH ₂	→	CH ₂ Si ⁺ CHCSi ⁺ C ₃ H ₃ Si ⁺	+ C ₂ H ₂ + CH ₃ + H	0.10 0.20 0.70	1.20 × 10 ⁻⁹ ± 30%	9110	
Si ⁺	+ CH ₃ CCH	→	CH ₂ Si ⁺ CHCSi ⁺ C ₃ H ₃ Si ⁺	+ C ₂ H ₂ + CH ₃ + H	0.15 0.25 0.60	1.20 × 10 ⁻⁹ ± 30%	9110	
Si ⁺	+ C ₄ H ₂	→	C ₄ H ⁺	+ SiH	1.00	1.60 × 10 ⁻⁹ ± 30%	9110	
Si ⁺	+ c-C ₆ H ₆	→ M	c-C ₆ H ₆ ⁺ C ₆ H ₅ Si ⁺ Adduct Adduct	+ Si + H	0.30 0.20 0.50	4.20 × 10 ⁻¹⁰ ± 20%	9111 9111	7715
Si ⁺	+ C ₁₀ H ₈	→	C ₁₀ H ₈ ⁺	+ Si	1.00		9111	
Si ⁺	+ NH ₃	→	SiNH ₂ ⁺	+ H	1.00	6.40 × 10 ⁻¹⁰ ± 30%	8820	
Si ⁺	+ H ₂ O	→	SiOH ⁺	+ H	1.00	2.30 × 10 ⁻¹⁰ ± 30%	8705 8111	
Si ⁺	+ O ₂	→ M	No Reaction Adduct		<1.00 × 10 ⁻¹³		8918 8632	8111 6903
Si ⁺	+ SiH ₄	→	Si ₂ H ₂ ⁺ Si ₂ H ₃ ⁺	+ H ₂ + H	0.96 0.04	1.10 × 10 ⁻⁹ ± 20%	8723	7214 7213
*Si ⁺	+ SiD ₄	→	Si ⁺ Si ₂ D ₂ ⁺	+ *SiD ₄ + D ₂	0.08 0.92	8.05 × 10 ⁻¹⁰ ± 30%	8803 8723	
Si ⁺	+ H ₂ S	→	SiSH ⁺	+ H	1.00		8933	
Si ⁺	+ HCN	→	CNSi ⁺ Adduct	+ H	0.20 0.80	7.00 × 10 ⁻¹² ± 30%	8917	
Si ⁺	+ CH ₃ NH ₂	→	CH ₂ NH ₂ ⁺ SiNH ₂ ⁺ SiNHCH ₃ ⁺	+ SiH + CH ₃ + H	0.35 0.55 0.10	1.20 × 10 ⁻⁹ ± 30%	8820	
Si ⁺	+ CH ₃ CN	→	CH ₂ Si ⁺ Adduct	+ HCN	0.50 0.50	2.40 × 10 ⁻⁹ ± 30%	8917	
Si ⁺	+ (CH ₃) ₂ NH	→	m/e = 44 SiNHCH ₃ ⁺ SiN(CH ₃) ₂ ⁺	+ m=29 + CH ₃ + H	0.60 0.35 0.05	1.20 × 10 ⁻⁹ ± 30%	8820	
Si ⁺	+ C ₂ N ₂	→	CNSi ⁺ Adduct	+ CN	0.55 0.45	1.50 × 10 ⁻¹⁰ ± 30%	8917	

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
Si ⁺	+ HC ₃ N	→	CHCSi ⁺ Adduct	+ CN 0.70 0.30	1.40×10^{-9} ± 30%	8917			
Si ⁺	+ (CH ₃) ₃ N	→	m/e = 42 m/e = 44 (CH ₃) ₂ NCH ₂ ⁺ SiN(CH ₃) ₂ ⁺	+ m = 45 + m = 43 + SiH + CH ₃	0.04 0.09 0.80 0.07	9.80×10^{-10} ± 30%	8820		
Si ⁺	+ CO	→	No Reaction		$< 2.00 \times 10^{-14}$	8918	8705		
Si ⁺	+ CH ₃ OH	→	SiOH ⁺ SiOCH ₃ ⁺	+ CH ₃ + H	0.75 0.25	2.20×10^{-9} ± 30%	8705		
Si ⁺	+ C ₂ H ₅ OH	→	SiOH ⁺	+ C ₂ H ₅	1.00	2.50×10^{-9} ± 30%	8705		
Si ⁺	+ CO ₂	→	No Reaction		$< 1.70 \times 10^{-13}$	8918			
Si ⁺	+ CHOONa	→	SiOH ⁺	+ HCO	1.00	2.30×10^{-9} ± 30%	8705		
Si ⁺	+ CH ₃ COOH	→	CH ₃ CO ⁺ SiOH ⁺	+ SiOH + CH ₃ CO	0.30 0.70	3.00×10^{-9} ± 30%	8705		
Si ⁺	+ CS ₂	→	Adduct		1.00	6.60×10^{-11} ± 30%	8918		
Si ⁺	+ NO	→	No Reaction		$< 1.00 \times 10^{-11}$	8918	8111		
Si ⁺	+ NO ₂	→	NO ⁺ SiO ⁺ Adduct	+ SiO + NO	0.30 0.68 0.02	8.60×10^{-10} ± 30%	8918		
Si ⁺	+ N ₂ O	→	SiO ⁺	+ N ₂	1.00	4.00×10^{-10} ± 30%	8918		
Si ⁺	+ SO ₂	→	SO ⁺	+ SiO	1.00	8.10×10^{-10} ± 30%	8918		
Si ⁺	+ COS	→	SiS ⁺	+ CO	1.00	9.00×10^{-10} ± 30%	8918		
SiH ⁺	+ H ₂	→	No Reaction		$< 2.00 \times 10^{-14}$	8722	7609	b	
SiH ⁺	+ D ₂	→	SiD ⁺	+ HD	1.00	3.00×10^{-11} ± 20%	8722	7720	
SiH ⁺	+ CH ₄	→	CH ₃ Si ⁺ CH ₃ SiH ⁺	+ H ₂ + H	0.37 0.63	5.60×10^{-10} ± 20%	7319		
SiH ⁺	+ C ₂ H ₂	→	CHCSi ⁺ CH ₂ CSi ⁺	+ H ₂ + H	0.47 0.53	3.20×10^{-10} ± 20%	7427		
SiH ⁺	+ C ₂ H ₄	→	CH ₃ CSi ⁺	+ H ₂	1.00	2.80×10^{-10} ± 20%	7428		
SiH ⁺	+ c-C ₆ H ₆	→	c-C ₆ H ₆ ⁺ C ₆ H ₅ Si ⁺ C ₆ H ₅ Si ⁺ C ₆ H ₆ Si ⁺ Adduct	+ SiH + C ₂ H ₂ + H ₂ + H	0.55 ~0.02 0.30 ~0.02 0.09	8.90×10^{-10} ± 30%	7715		
SiH ⁺	+ D ₂ O	→	SiOD ₂ [‡]	+ H	1.00	1.20×10^{-11} ± 20%	7320		
SiH ⁺	+ SiH ₄	→	Si ₂ H ⁺ Si ₂ H ₃ [‡]	+ H ₂ + H ₂ + H ₂	0.23 0.77	3.50×10^{-10} ± 20%	7214	7213	b
SiD ⁺	+ H ₂	→	SiH ⁺	+ HD	1.00	3.00×10^{-11} ± 20%	8722		
SiD ⁺	+ SiD ₄	→	Si ₂ D ₃ [‡]	+ D ₂	1.00	5.20×10^{-10} ± 30%	8803		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
SiH_2^+ + H ₂ → No Reaction					$< 5.00 \times 10^{-12}$	7609	
* SiH_2^+	+ H ₂	→ SiH_2^+	+ *H ₂		1.00		7720
SiH_2^+	+ CH ₄	→ CH ₃ SiH ⁺ CH ₃ SiH ₂ ⁺	+ H ₂ + H	0.62 0.38	2.10×10^{-10} $\pm 20\%$	7319	
SiH_2^+	+ C ₂ H ₂	→ CHCSi ⁺ CH ₂ CSi ⁺ CH ₃ CSI ⁺	+ H ₂ + H + H ₂ + H	0.10 0.15 0.75	4.30×10^{-10} $\pm 20\%$	7427	
SiH_2^+	+ C ₂ H ₄	→ CH ₃ Si ⁺ CH ₃ CSI ⁺ CH ₃ CHSi ⁺ C ₂ H ₅ Si ⁺	+ CH ₃ + H ₂ + H + H ₂ + H	0.44 0.24 0.22 0.09	1.10×10^{-9} $\pm 20\%$	7428	
SiH_2^+	+ O ₂	→ SiOH ⁺	+ OH	1.00	2.36×10^{-11} $\pm 10\%$	7609	
SiH_2^+	+ SiH ₄	→ SiH ₃ ⁺ Si ₂ H ₂ ⁺ Si ₂ H ₄ ⁺ Si ₂ H ₅ ⁺	+ SiH ₃ + H ₂ + H ₂ + H ₂ + H	0.71 0.06 0.23 0.01	1.40×10^{-9} $\pm 20\%$	7214	7213
SiH_2^+	+ D ₂ O	→ SiOD ₂ ⁺	+ H ₂	1.00	5.30×10^{-12} $\pm 20\%$	7320	
 * SiH_3^+ + H ₂ → SiH_3^+				1.00		7720	
SiH_3^+	+ H ₂	→ No Reaction			$< 2.00 \times 10^{-12}$	7609	
SiH_3^+	+ CH ₄	→ CH ₃ SiH ₂ ⁺	+ H ₂	1.00	5.00×10^{-12} $\pm 20\%$	7319	
SiH_3^+	+ C ₂ H ₂	→ CHCSi ⁺ CH ₃ CSI ⁺	+ H ₂ + H ₂	0.28 0.72	3.60×10^{-11} $\pm 20\%$	7427	
SiH_3^+	+ C ₂ H ₄	→ C ₂ H ₅ Si ⁺ Adduct	+ H ₂	0.46 0.54	1.50×10^{-10} $\pm 20\%$	7428	
SiH_3^+	+ NH ₃	→ NH ₄ ⁺ NH ₂ SiH ₂ ⁺	+ SiH ₂ + H ₂	0.74 0.26	6.00×10^{-10} $\pm 20\%$	8629	
* SiH_3^+	+ H ₂ O	→ SiH ₂ OH ⁺	+ H ₂	1.00	2.10×10^{-10} $\pm 20\%$	8629	
SiH_3^+	+ H ₂ O	→ SiH ₂ OH ⁺	+ H ₂	1.00	5.80×10^{-12} $\pm 20\%$	7320	
SiH_3^+	+ O ₂	→ SiH ₂ OH ⁺	+ O	1.00	2.90×10^{-12} $\pm 20\%$	7609	
* SiH_3^+	+ SiH ₄	→ SiH ₃ ⁺	+ *SiH ₄	1.00	1.25×10^{-9} $\pm 20\%$	9018	7214
SiH_3^+	+ SiH ₄	→ Si ₂ H ₃ ⁺ Si ₂ H ₅ ⁺	+ H ₂ + H ₂	0.08 0.92	2.20×10^{-11} $\pm 60\%$	9018	7214 7213
SiH_3^+	+ CH ₃ CN	→ CH ₃ CNSiH ⁺	+ H ₂	1.00	1.55×10^{-9} $\pm 20\%$	8629	
* SiH_3^+	+ CH ₃ OH	→ CH ₂ OH ⁺ SiH ₂ OH ⁺ SiOCH ₃ ⁺	+ SiH ₄ + CH ₄ + H ₂	0.38 0.18 0.44	6.40×10^{-10} $\pm 20\%$	8629	
SiH_3^+	+ CH ₃ CHO	→ SiH ₂ OH ⁺	+ C ₂ H ₄	1.00	9.90×10^{-10} $\pm 20\%$	8629	
SiH_3^+	+ (CH ₃) ₂ O	→ CH ₃ OCH ₂ ⁺	+ SiH ₄	1.00	5.40×10^{-10} $\pm 20\%$	8629	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
*SiD ₃ ⁺	+ SiD ₄	→	SiD ₅ ⁺	+ *SiD ₄	1.00	8.50 × 10 ⁻¹⁰	± 20%	9018
SiD ₅ ⁺	+ SiD ₄	→	Si ₂ D ₅ ⁺ Si ₃ D ₇ ⁺	+ D ₂	0.99 <0.01	6.00 × 10 ⁻¹¹	± 20%	9018
Si ₂ ⁺	+ SiD ₄	→	Si ₃ D ₅ ⁺	+ D ₂	1.00	2.50 × 10 ⁻¹⁰	± 30%	8923
Si ₂ ⁺	+ NO ₂	→	Si ⁺	+ SiO + NO	1.00	3.40 × 10 ⁻¹⁰	± 25%	8729
*Si ₂ D ₂ ⁺	+ SiD ₄	→	Si ₂ D ₂ ⁺ Si ₃ D ₄ ⁺	+ *SiD ₄ + D ₂	0.12 0.88	3.60 × 10 ⁻¹¹	± 30%	8803
*Si ₂ H ₅ ⁺	+ SiH ₄	→	Si ₂ H ₅ ⁺	+ *SiH ₄	1.00	2.40 × 10 ⁻¹⁰	± 20%	9018
Si ₂ H ₅ ⁺	+ SiH ₄	→	Si ₃ H ₇ ⁺ Si ₃ H ₉ ⁺	+ H ₂	0.94 0.06	2.20 × 10 ⁻¹¹	± 20%	9018
Si ₂ D ₅ ⁺	+ SiD ₄	→	Si ₃ D ₇ ⁺ Si ₃ D ₉ ⁺	+ D ₂	0.57 0.43	2.80 × 10 ⁻¹¹	± 20%	9018
Si ₃ H ₇ ⁺	+ SiH ₄	→	Si ₄ H ₉ ⁺ Si ₄ H ₁₁ ⁺	+ H ₂	<0.35 >0.65	1.20 × 10 ⁻¹³	± 20%	9018
Si ₃ D ₇ ⁺	+ SiD ₄	→	Si ₄ D ₉ ⁺ Si ₄ D ₁₁ ⁺	+ D ₂	<0.04 >0.96	2.30 × 10 ⁻¹³	± 20%	9018
P ⁺	+ H ₂	→	PH ₂ ⁺		1.00	1.30 × 10 ⁻¹³	± 20%	8912 8302
P ⁺	+ D ₂	→	No Reaction			<2.00 × 10 ⁻¹⁴		9011
P ⁺	+ CH ₄	→	CH ₂ P ⁺	+ H ₂	1.00	9.50 × 10 ⁻¹⁰	± 20%	8912 8302 7011
P ⁺	+ C ₂ H ₂	→	CHCP ⁺ CH ₂ CP ⁺	+ H	0.95 0.05	1.30 × 10 ⁻⁹	± 20%	8912
P ⁺	+ C ₂ H ₄	→	CH ₂ CP ⁺	+ H ₂	1.00	1.20 × 10 ⁻⁹	± 20%	8912
P ⁺	+ CH ₃ CCH	→	C ₂ H ₃ ⁺ CH ₂ P ⁺ C ₃ H ₂ P ⁺	+ CHP + C ₂ H ₂ + H ₂	0.42 0.52 0.06	1.70 × 10 ⁻⁹	± 20%	8912
P ⁺	+ NH ₃	→	NH ₃ ⁺ NHP ⁺ NHPH ⁺	+ P + H ₂ + H	0.52 0.01 0.48	2.00 × 10 ⁻⁹	± 10%	8912 8302
P ⁺	+ N ₂	→	No Reaction			<1.00 × 10 ⁻¹¹		8302
P ⁺	+ H ₂ O	→	PO ⁺ POH ⁺	+ H ₂ + H	0.09 0.91	5.50 × 10 ⁻¹⁰	± 10%	8912 8302
P ⁺	+ O ₂	→	PO ⁺	+ O	1.00	5.30 × 10 ⁻¹⁰	± 10%	8912 8302
P ⁺	+ PH ₃	→	PH ₃ ⁺ P ₂ H ⁺ P ₂ H ₂ ⁺	+ P + H ₂ + H	0.16 0.74 0.11	1.25 × 10 ⁻⁹	± 15%	8912 8302 7011
P ⁺	+ H ₂ S	→	H ₂ S ⁺ PS ⁺ HPS ⁺	+ P + H ₂ + H	0.31 0.12 0.57	1.40 × 10 ⁻⁹	± 20%	8912

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
P ⁺	+ HCN	→ No Reaction M Adduct			< 1.00 × 10 ⁻¹¹	8302	b
						8912	
P ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ NHPH ⁺	+ PH + CH ₃	0.68 0.32	1.30 × 10 ⁻⁹ ± 20%	8912	
P ⁺	+ CO	→ Adduct		1.00	3.50 × 10 ⁻¹³ ± 20%	8912	8302
P ⁺	+ CH ₃ OH	→ POH ⁺	+ CH ₃	1.00	1.40 × 10 ⁻⁹ ± 20%	8912	
P ⁺	+ CO ₂	→ PO ⁺	+ CO	1.00	4.85 × 10 ⁻¹⁰ ± 20%	8912	8302
P ⁺	+ COS	→ PO ⁺ PS ⁺	+ CS + CO	0.38 0.62	1.10 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ H ₂	→ Adduct		1.00	4.30 × 10 ⁻¹³ ± 20%	8912	8302
PH ⁺	+ D ₂	→ PD ⁺	+ HD	1.00	3.10 × 10 ⁻¹⁰ ± 25%	8302	
PH ⁺	+ CH ₄	→ CH ₃ P ⁺ CH ₃ PH ⁺	+ H ₂ + H	0.87 0.13	9.40 × 10 ⁻¹⁰ ± 15%	8912	8302 7011
PH ⁺	+ C ₂ H ₂	→ CH ₂ CP ⁺	+ H	1.00	1.30 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ C ₂ H ₄	→ CH ₂ P ⁺ CH ₃ CP ⁺	+ CH ₃ + H ₂	0.30 0.70	1.20 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ CH ₃ CCH	→ C ₂ H ₇ ⁺ C ₃ H ₅ ⁺ CH ₂ CP ⁺	+ CHP + PH ₂ + CH ₃	0.19 0.17 0.64	1.70 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ NH ₃	→ NH ₄ ⁺ NHPH ⁺ NH ₂ PH ⁺	+ P + H ₂ + H	0.06 0.38 0.56	1.80 × 10 ⁻⁹ ± 30%	8912	8302 7011 b
PH ⁺	+ N ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹	8302	
PH ⁺	+ H ₂ O	→ H ₃ O ⁺ POH ⁺ H ₂ PO ⁺	+ P + H ₂ + H	0.07 0.66 0.27	9.90 × 10 ⁻¹⁰ ± 30%	8912	8302 7011 b
PH ⁺	+ O ₂	→ PO ⁺	+ OH	1.00	5.30 × 10 ⁻¹⁰ ± 10%	8912	8302
PH ⁺	+ PH ₃	→ PH ₃ ⁺ PH ₄ ⁺ P ₂ ⁺ P ₂ H ⁺ P ₂ H ₂ ⁺ P ₂ H ₃ ⁺	+ PH + P + H ₂ + H ₂ + H ₂ + H + H ₂ + H	0.17 0.05 0.24 0.04 0.41 0.11	1.30 × 10 ⁻⁹ ± 15%	8912	8302 7011 b
PH ⁺	+ H ₂ S	→ H ₃ S ⁺ HPS ⁺ H ₂ PS ⁺	+ P + H ₂ + H	0.09 0.64 0.27	1.50 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ HCN	→ HCNH ⁺ PNCH ⁺	+ P + H	0.65 0.35	4.70 × 10 ⁻¹⁰ ± 10%	8912	8302
PH ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ NHPH ⁺ NH ₂ PH ⁺ M Adduct	+ PH ₂ + CH ₄ + CH ₃	0.38 0.16 0.46	1.80 × 10 ⁻⁹ ± 20%	8912	
PH ⁺	+ CO	→ Adduct		1.00	1.00 × 10 ⁻¹² ± 20%	8912	8302

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
PH ⁺	+ CH ₃ OH	→ H ₂ PO ⁺	+ CH ₃	1.00	1.90 × 10 ⁻⁹	± 20%	8912
PH ⁺	+ CO ₂	→ Adduct		1.00	8.60 × 10 ⁻¹²	± 20%	8912 8302
PH ⁺	+ COS	→ HPS ⁺	+ CO	1.00	1.30 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ H ₂	→ Adduct		1.00	1.10 × 10 ⁻¹²	± 20%	8912 8302
PH ₂ ⁺	+ D ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹		8302
PH ₂ ⁺	+ NH ₃	→ NH ₄ ⁺ NH ₂ PH ⁺	+ PH + H ₂	0.28 0.72	1.70 × 10 ⁻⁹	± 10%	8302
PH ₂ ⁺	+ CH ₄	→ CH ₃ PH ⁺	+ H ₂	1.00	8.40 × 10 ⁻¹⁰	± 45%	8912 8302 7011
PH ₂ ⁺	+ C ₂ H ₂	→ CH ₂ CP ⁺	+ H ₂	1.00	1.40 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ C ₂ H ₄	→ CH ₂ P ⁺ CH ₃ CHP ⁺	+ CH ₄ + H ₂	0.12 0.88	1.20 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ CH ₃ CCH	→ C ₂ H ₅ ⁺ CH ₂ P ⁺ CH ₃ PH ⁺ C ₃ H ₄ P ⁺	+ CHP + C ₂ H ₄ + C ₂ H ₂ + H ₂	0.43 0.44 0.07 0.06	1.60 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ NH ₃	→ NH ₄ ⁺ NH ₂ PH ⁺	+ PH + H ₂	0.19 0.81	2.00 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ H ₂ O	→ H ₃ O ⁺ H ₂ PO ⁺	+ PH + H ₂	0.33 0.67	4.90 × 10 ⁻¹⁰	± 20%	8912
PH ₂ ⁺	+ O ₂	→ PO ⁺	+ H ₂ O	1.00	7.80 × 10 ⁻¹¹	± 20%	8912
PH ₂ ⁺	+ PH ₃	→ PH ₄ ⁺ P ₂ H ⁺ P ₂ H ₃ ⁺	+ PH + H ₂ + H ₂	0.02 0.54 0.52	9.50 × 10 ⁻¹⁰	± 15%	8912 8302 7011
PH ₂ ⁺	+ H ₂ S	→ H ₂ PS ⁺	+ H ₂	1.00	1.50 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ HCN	→ HCNH ⁺ Adduct	+ PH	0.72 0.28	1.40 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ PH ₃ + PH	0.62 0.38	1.70 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ CO	→ Adduct		1.00	2.90 × 10 ⁻¹²	± 20%	8912
PH ₂ ⁺	+ CH ₃ OH	→ CH ₂ OH ⁺ CH ₃ PH ⁺ H ₂ PO ⁺	+ PH ₃ + H ₂ O + ClI ₄	0.65 0.08 0.27	2.00 × 10 ⁻⁹	± 20%	8912
PH ₂ ⁺	+ CO ₂	→ Adduct		1.00	7.50 × 10 ⁻¹²	± 20%	8912
PII ₂ ⁺	+ COS	→ H ₂ PS ⁺	+ CO	1.00	9.90 × 10 ⁻¹⁰	± 20%	8912
PH ₃ ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹³		8912 8302
PH ₃ ⁺	+ D ₂	→ No Reaction			< 4.00 × 10 ⁻¹¹		8302
PH ₃ ⁺	+ CH ₄	→ No Reaction			< 1.00 × 10 ⁻¹³		8912 8302
PH ₃ ⁺	+ C ₂ H ₂	→ CH ₃ CP ⁺	+ H ₂	1.00	5.80 × 10 ⁻¹⁰	± 20%	8912
PH ₃ ⁺	+ C ₂ H ₄	→ Adduct		1.00	4.70 × 10 ⁻¹⁰	± 20%	8912

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
PH ₃ ⁺	+ CH ₃ CCH	→ C ₃ H ₅ ⁺ CH ₃ PH ₂ ⁺	+ PH ₂ + C ₂ H ₂	0.91 0.09	1.60 × 10 ⁻⁹ ± 20%	8912		
PH ₃ ⁺	+ NH ₃	→ NH ₄ ⁺ NH ₃ PH ₂ ⁺	+ PH ₂ + H	0.99 0.01	2.10 × 10 ⁻⁹ ± 20%	8912	8302	
PH ₃ ⁺	+ H ₂ O	→ No Reaction			< 1.00 × 10 ⁻¹³	8912		
PH ₃ ⁺	+ O ₂	→ No Reaction			< 2.00 × 10 ⁻¹³	8912		
PH ₃ ⁺	+ PH ₃	→ PH ₄ ⁺ P ₂ H ₄ ⁺ P ₂ H ₅ ⁺	+ PH ₂ + H ₂ + H	0.97 0.03 < 0.01	1.00 × 10 ⁻⁹ ± 20%	8912	8302 7011	
PH ₃ ⁺	+ H ₂ S	→ H ₃ S ⁺	+ PH ₂	1.00	1.00 × 10 ⁻⁹ ± 20%	8912		
PH ₃ ⁺	+ HCN	→ HCNH ⁺	+ PH ₂	1.00	2.60 × 10 ⁻⁹ ± 20%	8912		
PH ₃ ⁺	+ CH ₃ NH ₂	→ CH ₃ NH ₃ ⁺	+ PH ₂	1.00	1.90 × 10 ⁻⁹ ± 20%	8912		
PH ₃ ⁺	+ CO	→ No Reaction			< 1.00 × 10 ⁻¹³	8912		
PH ₃ ⁺	+ CH ₃ OH	→ CH ₃ OH ₂ ⁺	+ PH ₂	1.00	1.90 × 10 ⁻⁹ ± 20%	8912		
PH ₃ ⁺	+ CO ₂	→ No Reaction			< 1.00 × 10 ⁻¹³	8912		
PH ₃ ⁺	+ COS	→ H ₃ PS ⁺	+ CO	1.00	4.60 × 10 ⁻¹¹ ± 20%	8912		
PH ₄ ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹	8302		
PH ₄ ⁺	+ CH ₄	→ No Reaction			< 2.00 × 10 ⁻¹¹	8302		
PH ₄ ⁺	+ NH ₃	→ NH ₄ ⁺	+ PH ₃	1.00	2.10 × 10 ⁻⁹ ± 10%	8302	7011	
PH ₄ ⁺	+ PH ₃	→ No Reaction			< 1.00 × 10 ⁻¹¹	8302		
S ⁺	+ H ₂	→ No Reaction			< 2.00 × 10 ⁻¹⁴	9003	8603	8110
	M	No Reaction				7905	7506	
						8632		
S ⁺	+ HD	→ No Reaction			< 2.00 × 10 ⁻¹⁴	9003		
S ⁺	+ D ₂	→ No Reaction			< 2.00 × 10 ⁻¹⁴	9003		
S ⁺	+ CH ₄	→ HCS ⁺ CH ₂ SH ⁺	+ H ₂ + H	0.05 0.95	3.20 × 10 ⁻¹⁰ ± 30%	8401	8110	7905
						7305		b
S ⁺	+ C ₂ H ₂	→ HC ₂ S ⁺	+ H	1.00	9.70 × 10 ⁻¹⁰ ± 20%	8808	8401	
S ⁺	+ C ₂ H ₄	→ HCS ⁺ CH ₃ CS ⁺	+ CH ₃ + H	0.70 0.30	9.80 × 10 ⁻¹⁰ ± 30%	8808		
S ⁺	+ C ₂ H ₆	→ C ₂ H ₅ ⁺ CH ₂ SH ⁺ CH ₃ CHSH ⁺	+ SH + CH ₃ + H	0.70 0.25 0.05	9.90 × 10 ⁻¹⁰ ± 30%	8808		
S ⁺	+ CH ₃ CCH	→ C ₃ H ₅ ⁺ C ₃ H ₄ ⁺ HCS ⁺ CH ₂ CHCS ⁺	+ SH + S + C ₂ H ₂ + H	0.20 0.05 0.15 0.60	1.70 × 10 ⁻⁹ ± 30%	8808		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
S ⁺	+ C ₃ H ₆	→ C ₃ H ₅ ⁺ C ₃ H ₅ ⁺ HCS ⁺ CH ₂ S ⁺ CH ₃ CS ⁺ C ₂ H ₅ CS ⁺	+ SH + S + C ₂ H ₅ + C ₂ H ₄ + CH ₃ + H	0.40 0.30 0.10 0.10 0.05 0.05	1.20 × 10 ⁻⁹ ± 30%	8808	
S ⁺	+ NH ₃	→ NH ₃ ⁺ NHSH ⁺	+ S + H	0.92 0.08	1.50 × 10 ⁻⁹ ± 15%	8110 7410	7905 7507
S ⁺	+ N ₂	→ No Reaction			< 5.00 × 10 ⁻¹³	8110	
S ⁺	+ H ₂ O	→ No Reaction			< 1.00 × 10 ⁻¹²	8110	7905 7410
S ⁺	+ O ₂	→ SO ⁺	+ O	1.00	1.80 × 10 ⁻¹¹ ± 20%	8401 7903	8110 7905 7302
S ⁺	+ H ₂ S	→ S ₂ ⁺ S ₂ H ⁺ S ₂ H ₂ ⁺	+ H ₂ + H + hν	0.70 0.23 0.06	8.20 × 10 ⁻¹⁰ ± 15%	8401 7304	8110 7507 b
S ⁺	+ HCN	→ No Reaction			< 1.00 × 10 ⁻¹¹	8401	
S ⁺	+ CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺	+ SH + S	0.45 0.55	2.20 × 10 ⁻⁹ ± 20%	8110	
S ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³	8401	8110
S ⁺	+ H ₂ CO	→ H ₂ S ⁺ HCO ⁺	+ CO + SH	0.50 0.50	6.70 × 10 ⁻¹⁰ ± 10%	8401	
S ⁺	+ CO ₂	→ No Reaction			< 5.00 × 10 ⁻¹³	8401 7302	8110 7905
S ⁺	+ NO	→ NO ⁺	+ S	1.00	3.40 × 10 ⁻¹⁰ ± 15%	8401 7903	8110 7302 7905
S ⁺	+ SO ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹	8401	
S ⁺	+ COS	→ S ₂ ⁺	+ CO	1.00	9.10 × 10 ⁻¹⁰ ± 20%	8110	
HS ⁺	+ H	→ S ⁺	+ H ₂	1.00	1.10 × 10 ⁻¹⁰ ± 20%	8603	
HS ⁺	+ H ₂	→ M No Reaction Adduct			< 5.00 × 10 ⁻¹³	8603 8632	8110 7506
HS ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₂ SH ⁺	+ H ₂ S + H ₂	0.05 0.95	3.80 × 10 ⁻¹⁰ ± 60%	8401	8110 7305
HS ⁺	+ C ₂ H ₂	→ CH ₂ CS ⁺ CH ₃ CS ⁺	+ H + hν	0.96 0.04	1.05 × 10 ⁻⁹ ± 10%	8401	
HS ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₂ ⁺ NHSH ⁺ NH ₂ SH ⁺	+ SH + S + H ₂ + H	0.43 0.55 0.01 0.01	1.57 × 10 ⁻⁹ ± 20%	8110 7410	
HS ⁺	+ N ₂	→ No Reaction			< 5.00 × 10 ⁻¹³	8110	
HS ⁺	+ H ₂ O	→ H ₃ O ⁺	+ S	1.00	7.10 × 10 ⁻¹⁰ ± 15%	8110 7802	7410
HS ⁺	+ O ₂	→ No Reaction			< 5.00 × 10 ⁻¹³	8401	8110

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes			
HS ⁺	+ H ₂ S	→	H ₃ S ⁺ S ₂ H ⁺ S ₂ H ₂ ⁺	+ S + H ₂ + H	0.38 0.48 0.15	1.00 × 10 ⁻⁹	± 20%	8401	8110	7304	b
HS ⁺	+ HCN	→	HCNH ⁺	+ S	1.00	8.60 × 10 ⁻¹⁰	± 10%	8401			
HS ⁺	+ CH ₃ NH ₂	→	CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ H ₂ S + SH + S	0.35 0.50 0.15	2.20 × 10 ⁻⁹	± 20%	8110			
HS ⁺	+ CO	→	No Reaction			< 5.00 × 10 ⁻¹³		8401	8110		
HS ⁺	+ CO ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8401	8110		
HS ⁺	+ NO	→	NO ⁺	+ SH	1.00	3.70 × 10 ⁻¹⁰	± 15%	8401	8110		
HS ⁺	+ SO ₂	→	No Reaction			< 3.00 × 10 ⁻¹¹		8401			
HS ⁺	+ COS	→	S ₂ H ⁺	+ CO	1.00	9.70 × 10 ⁻¹⁰	± 20%	8110			
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H ₂ S ⁺	+ H	→	HS ⁺	+ H ₂	1.00	2.00 × 10 ⁻¹⁰	± 20%	8603			
H ₂ S ⁺	+ H ₂	→	H ₃ S ⁺	+ H	1.00	~ 5.00 × 10 ⁻¹²	± 40%	8603	8110	7506	
H ₂ S ⁺	+ D ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		7506			
H ₂ S ⁺	+ CH ₄	→	No Reaction			< 5.00 × 10 ⁻¹³		8110	7305		
H ₂ S ⁺	+ NH ₃	→	NH ₃ ⁺ NH ₄ ⁺	+ H ₂ S + SH	0.25 0.75	1.77 × 10 ⁻⁹	± 20%	8110	7410		
H ₂ S ⁺	+ N ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
H ₂ S ⁺	+ H ₂ O	→	H ₃ O ⁺	+ SH	1.00	7.60 × 10 ⁻¹⁰	± 10%	8110	7802	7410	
H ₂ S ⁺	+ O ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
H ₂ S ⁺	+ H ₂ S	→	H ₃ S ⁺ S ₂ H ₂ ⁺	+ SH + H ₂	0.99 0.01	7.60 × 10 ⁻¹⁰	± 30%	8110	7507	7304	
H ₂ S ⁺	+ CH ₃ NH ₂	→	CH ₂ NH ₂ ⁺ CH ₃ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ H ₂ S + H + H ₂ S + SH	0.20 0.40 0.40	1.90 × 10 ⁻⁹	± 20%	8110			
H ₂ S ⁺	+ CO	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
H ₂ S ⁺	+ CO ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
H ₂ S ⁺	+ NO	→	NO ⁺	+ H ₂ S	1.00	3.70 × 10 ⁻¹⁰	± 20%	8110			
H ₂ S ⁺	+ COS	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
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H ₃ S ⁺	+ H	→	H ₂ S ⁺	+ H ₂	1.00	6.00 × 10 ⁻¹¹	± 20%	8603			
H ₃ S ⁺	+ H ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8110	7506		
H ₃ S ⁺	+ D ₂	→	No Reaction			< 1.00 × 10 ⁻¹²		7506			
H ₃ S ⁺	+ CH ₄	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			
H ₃ S ⁺	+ NH ₃	→	NH ₄ ⁺	+ H ₂ S	1.00	1.90 × 10 ⁻⁹	± 20%	8110			
H ₃ S ⁺	+ N ₂	→	No Reaction			< 5.00 × 10 ⁻¹³		8110			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
H ₃ S ⁺	+ H ₂ O	→ H ₃ O ⁺	+ H ₂ S	1.00	3.30 × 10 ⁻¹²	± 40%	8110	7809
H ₃ S ⁺	+ O ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		8110	
*H ₃ S ⁺	+ H ₂ S \xrightarrow{M} Adduct	→ H ₃ S ⁺	+ *H ₂ S	1.00	5.90 × 10 ⁻¹⁰	± 20%	8110	8632
H ₃ S ⁺	+ HCN	→ HCNH ⁺	+ H ₂ S	1.00	1.70 × 10 ⁻⁹	± 30%	7813	7809
H ₃ S ⁺	+ CH ₃ NH ₂	→ CH ₃ NH ₃ ⁺	+ H ₂ S	1.00	1.60 × 10 ⁻⁹	± 20%	8110	
H ₃ S ⁺	+ CO	→ No Reaction			< 5.00 × 10 ⁻¹³		8110	
H ₃ S ⁺	+ H ₂ CO	→ CH ₂ OH ⁺	+ H ₂ S	1.00	2.60 × 10 ⁻⁹	± 25%	7906	7814
H ₃ S ⁺	+ CO ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		8110	
H ₃ S ⁺	+ CHO OH	→ CH(OH) ₂ ⁺	+ H ₂ S	1.00	2.00 × 10 ⁻⁹	± 30%	7820	
H ₃ S ⁺	+ NO	→ No Reaction			< 5.00 × 10 ⁻¹³		8110	
H ₃ S ⁺	+ COS	→ No Reaction			< 5.00 × 10 ⁻¹³		8110	
S ₂ ²⁺	+ H ₂	→ No Reaction			< 5.00 × 10 ⁻¹³		7701	
S ₂ ²⁺	+ H ₂ O	→ No Reaction			< 5.00 × 10 ⁻¹¹		7410	
S ₂ H ⁺	+ H ₂	→ No Reaction			< 1.00 × 10 ⁻¹²		7701	
S ₂ H ⁺	+ H ₂ O	→ H ₃ O ⁺	+ S ₂	1.00			7410	
S ₂ H ⁺	+ H ₂ S	→ H ₃ S ⁺	+ S ₂	1.00	2.90 × 10 ⁻¹⁰	± 10%	7304	
S ₂ H ₂ ²⁺	+ H ₂ O	→ No Reaction			< 5.00 × 10 ⁻¹¹		7410	
Cl ⁺	+ H ₂	→ HCl ⁺	+ H	1.00	7.20 × 10 ⁻¹⁰	± 20%	9013 8102	8312 7413
Cl ⁺	+ HD	→ Products		1.00	6.00 × 10 ⁻¹⁰	± 15%	8312	
Cl ⁺	+ D ₂	→ DCI ⁺	+ D	1.00	4.80 × 10 ⁻¹⁰	± 15%	9013	9010
Cl ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₄ ⁺ H ₂ Cl ⁺ CH ₂ Cl ⁺	+ HCl + Cl + CH ₂ + H ₂	0.40 0.20 0.25 0.15	1.20 × 10 ⁻⁹	± 20%	9013	
Cl ⁺	+ C ₂ H ₂	→ No Reaction			< 2.60 × 10 ⁻¹¹		9013	
Cl ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ HCl + Cl	0.17 0.83	1.20 × 10 ⁻⁹	± 20%	9013	
Cl ⁺	+ c-C ₆ H ₆	→ C ₆ H ₅ ⁺ c-C ₆ H ₆ ⁺	+ HCl + Cl	0.06 0.94	1.90 × 10 ⁻⁹	± 20%	9013	
Cl ⁺	+ NH ₃	→ NH ₂ ⁺ NH ₃ ⁺	+ HCl + Cl	0.04 0.96	7.80 × 10 ⁻¹⁰	± 20%	9013	
Cl ⁺	+ H ₂ O	→ H ₂ O ⁺	+ Cl	1.00	5.00 × 10 ⁻¹⁰	± 20%	9013	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
Cl ⁺	+ O ₂	→ O ₂ ⁺	+ Cl	1.00	4.75 × 10 ⁻¹⁰	± 20%	9013	7602
Cl ⁺	+ NO	→ NO ⁺	+ Cl	1.00	1.40 × 10 ⁻¹⁰	± 20%	9013	
Cl ⁺	+ H ₂ S	→ H ₂ S ⁺ HS ⁺ HCl ⁺	+ Cl + HCl + SH	0.63 0.28 0.09	1.60 × 10 ⁻⁹	± 20%	9013	
Cl ⁺	+ COS	→ COS ⁺	+ Cl	1.00	9.00 × 10 ⁻¹⁰	± 20%	9013	
HCl ⁺	+ H ₂	→ H ₂ Cl ⁺	+ H	1.00	8.20 × 10 ⁻¹⁰	± 40%	8312 <u>8102</u>	8201 7413 <u>8103</u> a
HCl ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₃ ⁺	+ HCl + Cl	0.30 0.70	1.22 × 10 ⁻⁹	± 20%	8201	
HCl ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ HCl + Cl	0.35 0.65	2.04 × 10 ⁻⁹	± 20%	8201	
HCl ⁺	+ O ₂	→ O ₂ ⁺	+ HCl	1.00	6.90 × 10 ⁻¹⁰	± 20%	8201	
HCl ⁺	+ H ₂ S	→ H ₂ S ⁺ H ₃ S ⁺	+ HCl + Cl	0.75 0.25	1.32 × 10 ⁻⁹	± 20%	8201	
HCl ⁺	+ Xe	→ Xe ⁺ XeH ⁺	+ HCl + Cl	0.80 0.20	6.30 × 10 ⁻¹⁰	± 20%	8201	
HCl ⁺	+ CO	→ HCO ⁺	+ Cl	1.00	7.10 × 10 ⁻¹⁰	± 20%	8201	
HCl ⁺	+ CO ₂	→ HCO ₂ ⁺	+ Cl	1.00	9.30 × 10 ⁻¹⁰	± 20%	8201	
HCl ⁺	+ NO	→ NO ⁺ HNO ⁺	+ HCl + Cl	0.63 0.37	6.40 × 10 ⁻¹⁰	± 20%	8201	
HCl ⁺	+ N ₂ O	→ HN ₂ O	+ Cl	1.00	1.01 × 10 ⁻⁹	± 20%	8201	
HCl ⁺	+ SO ₂	→ SO ₂ ⁺ HSO ₂ ⁺	+ HCl + Cl	0.40 0.60	1.90 × 10 ⁻⁹	± 20%	8201	
HCl ⁺	+ COS	→ COS ⁺ HCOS ⁺	+ HCl + Cl	0.72 0.28	1.36 × 10 ⁻⁹	± 20%	8201	
H ₂ Cl ⁺	+ H ₂ O	→ H ₃ O ⁺	+ HCl	1.00	1.35 × 10 ⁻⁹	± 60%	8623	8511
H ₂ Cl ⁺	+ CO	→ HCO ⁺	+ HCl	1.00	5.90 × 10 ⁻¹⁰	± 25%	8623	8511 <u>8502</u> a
Ar ⁺	+ H ₂	→ H ₂ ⁺ ArH ⁺	+ Ar + H	0.02 0.98	8.90 × 10 ⁻¹⁰	± 20%	9035 8715 8420 8020 6907	9016 8526 8319 7620 6702 <u>8927</u> <u>8504</u> <u>8210</u> <u>7002</u> <u>6605</u> ab
Ar ⁺	+ HD	→ HD ⁺ ArH ⁺ ArD ⁺	+ Ar + D + H	0.06 0.46 0.48	8.00 × 10 ⁻¹⁰	± 20%	<u>9016</u>	8526 a
Ar ⁺	+ D ₂	→ D ₂ ⁺ ArD ⁺	+ Ar + D	0.02 0.98	7.45 × 10 ⁻¹⁰	± 15%	9016 7620	8526 7013 8504 6907 a
Ar ⁺	+ CH ₄	→ CH ₂ ⁺ CH ₃ ⁺ CH ₄ ⁺	+ Ar + H ₂ + Ar + H + Ar	0.12 0.85 0.03	9.80 × 10 ⁻¹⁰	± 10%	8716 7909 7003	8319 <u>8317</u> 7702 a

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes				
Ar ⁺	+ C ₂ H ₆	→ Products		1.00	1.15 × 10 ⁻⁹	± 15%	8317	T = 700			
Ar ⁺	+ NH ₃	→ NH ₃ ⁺	+ Ar	1.00	1.60 × 10 ⁻⁹	± 20%	8716	8318	7003		
Ar ⁺	+ N ₂	→ N ₂ ⁺	+ Ar	1.00	1.10 × 10 ⁻¹¹	± 20%	9038	<u>9025</u>	<u>8927</u>	a b	
							8715	<u>8701</u>	<u>8622</u>		
							8411	<u>8210</u>	<u>8116</u>		
							8114	<u>8020</u>	<u>7702</u>		
							7204	<u>6605</u>			
Ar ⁺	+ H ₂ O	→ H ₂ O ⁺ ArH ⁺	+ Ar + OH	0.80 0.20	1.62 × 10 ⁻⁹	± 20%	8716	7910	7802		
							7801	7202	7006		
Ar ⁺	+ O ₂	→ O ₂ ⁺	+ Ar	1.00	4.60 × 10 ⁻¹¹	± 20%	9037	8928	<u>8927</u>	a b	
							8819	<u>8716</u>	<u>8318</u>		
							8210	<u>8127</u>	<u>8020</u>		
							7702	<u>7602</u>	<u>7002</u>		
							6605				
Ar ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺	+ Ar + Ar + Ar + Ar	+ H ₂ + H ₂ + H ₂ + H	0.02 0.08 0.12 0.78	3.90 × 10 ⁻¹¹	± 30%	9002			
Ar ⁺	+ H ₂ S	→ H ₂ S ⁺	+ Ar	1.00	1.30 × 10 ⁻⁹	± 30%	8716	8714			
Ar ⁺	+ HCl	→ HCl ⁺	+ Ar	1.00	2.40 × 10 ⁻¹⁰	± 25%	<u>9024</u>			a	
*Ar ⁺	+ Ar	→ Adduct					8632				
Ar ⁺	+ Kr	→ No Reaction			< 1.00 × 10 ⁻¹⁴		8715	7817			
Ar ⁺	+ Hg	→ No Reaction			< 5.00 × 10 ⁻¹³		8016	7317		b	
Ar ⁺	+ Xe	→ Xe ⁺	+ Ar	1.00	4.30 × 10 ⁻¹³	± 30%	8715				
Ar ⁺	+ CO	→ CO ⁺	+ Ar	1.00	4.40 × 10 ⁻¹¹	± 20%	9126	<u>8927</u>	8801	a b	
							8716	<u>8701</u>	<u>8318</u>		
							8210	<u>8020</u>	<u>7702</u>		
							6605				
Ar ⁺	+ CO ₂	→ CO ₂ ⁺	+ Ar	1.00	4.80 × 10 ⁻¹⁰	± 15%	8716	8319	8318	b	
							8210	8020	7702		
							6605				
Ar ⁺	+ CH ₃ SH	→ Products		1.00	1.70 × 10 ⁻⁹	± 10%	8714				
Ar ⁺	+ CS ₂	→ S ⁺ CS ₂ ⁺	+ CS + Ar	0.88 0.12	2.60 × 10 ⁻¹⁰	± 30%	8716	8614		b	
Ar ⁺	+ C ₂ H ₅ SH	→ Products		1.00	2.10 × 10 ⁻⁹	± 10%	8714				
Ar ⁺	+ (CH ₃) ₂ S	→ Products		1.00	1.60 × 10 ⁻⁹	± 10%	8714				
Ar ⁺	+ NO	→ NO ⁺	+ Ar	1.00	3.10 × 10 ⁻¹⁰	± 35%	8716	8319	8318	b	
							8020	7909	7702		
Ar ⁺	+ NO ₂	→ NO ⁺ NO ₂ ⁺	+ O + Ar	0.94 0.06	4.60 × 10 ⁻¹⁰	± 30%	8716				
Ar ⁺	+ N ₂ O	→ O ⁺ N ₂ ⁺ NO ⁺ N ₂ O ⁺	+ N ₂ + O + N + Ar	0.01 0.01 0.01 0.97	3.00 × 10 ⁻¹⁰	± 10%	8716	8319	8318		
							8210	8020	7702		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
Ar ⁺	+ SO ₂	→ SO ₂ ⁺	+ Ar	1.00	5.20 × 10 ⁻¹⁰	± 30%	8716	7606
Ar ⁺	+ COS	→ Products		1.00	1.30 × 10 ⁻⁹	± 20%	8210	
ArH ⁺	+ H ₂	→ H ₃ ⁺	+ Ar	1.00	6.30 × 10 ⁻¹⁰	± 40%	9016 7104	8211 7008
ArH ⁺	+ HD	→ H ₂ D ⁺	+ Ar	1.00	8.60 × 10 ⁻¹⁰	± 20%	9016	
ArH ⁺	+ D ₂	→ HD ₂ ⁺	+ Ar	1.00	7.15 × 10 ⁻¹⁰	± 20%	9016	8211
ArH ⁺	+ CH ₄	→ CH ₅ ⁺	+ Ar	1.00	1.02 × 10 ⁻⁹	± 30%	8211	7614
ArH ⁺	+ C ₂ H ₄	→ C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ H ₂ + Ar + Ar	0.73 0.27	1.17 × 10 ⁻⁹	± 15%	7614	7610
ArH ⁺	+ C ₂ H ₆	→ C ₂ H ₃ ⁺ C ₂ H ₅ ⁺	+ H ₂ + H + Ar + H ₂ + Ar	0.04 0.96	1.40 × 10 ⁻⁹	± 15%	7614	
ArH ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺	+ H + Ar	<0.25 >0.75	2.14 × 10 ⁻⁹	± 15%	7618	
ArH ⁺	+ N ₂	→ N ₂ H ⁺	+ Ar	1.00	8.00 × 10 ⁻¹⁰	± 30%	8211	
ArH ⁺	+ O ₂	→ HO ₂ ⁺	+ Ar	1.00	5.05 × 10 ⁻¹⁰	± 30%	8211	7512 7104
ArH ⁺	+ CO	→ HCO ⁺	+ Ar	1.00	1.25 × 10 ⁻⁹	± 30%	8211	
ArH ⁺	+ CO ₂	→ HCO ₂ ⁺	+ Ar	1.00	1.10 × 10 ⁻⁹	± 30%	8211	
ArH ⁺	+ N ₂ O	→ N ₂ H ⁺ OH ⁺ HN ₂ O ⁺	+ O + Ar + N ₂ + Ar + Ar	~0.05 ~0.10 >0.85			7618	
ArD ⁺	+ H ₂	→ H ₂ D ⁺	+ Ar	1.00	8.80 × 10 ⁻¹⁰	± 20%	9016	7612
ArD ⁺	+ HD	→ HD ₂ ⁺	+ Ar	1.00	8.10 × 10 ⁻¹⁰	± 20%	9016	
ArD ⁺	+ D ₂	→ D ₃ ⁺	+ Ar	1.00	4.65 × 10 ⁻¹⁰	± 65%	9016	7612
ArD ⁺	+ N ₂	→ N ₂ D ⁺	+ Ar	1.00	4.20 × 10 ⁻¹⁰	± 15%	7618	
ArD ⁺	+ O ₂	→ DO ₂ ⁺	+ Ar	1.00	5.00 × 10 ⁻¹⁰	± 15%	7618	
ArD ⁺	+ Ne	→ No Reaction			<1.00 × 10 ⁻¹³		7618	
ArD ⁺	+ Kr	→ KrD ⁺	+ Ar	1.00	5.00 × 10 ⁻¹⁰	± 15%	7618	
ArD ⁺	+ CO	→ DCO ⁺	+ Ar	1.00	7.80 × 10 ⁻¹⁰	± 15%	7618	
ArD ⁺	+ CO ₂	→ DCO ₂ ⁺	+ Ar	1.00	8.90 × 10 ⁻¹⁰	± 15%	7618	
ArD ⁺	+ COS	→ DS ⁺ DCOS ⁺	+ CO + Ar + Ar	<0.17 >0.83			7618	
ArH ₂ ⁺	+ H ₂	→ ArH ₃ ⁺	+ H	1.00	1.19 × 10 ⁻⁹	± 20%	9016	
ArHD ⁺	+ HD	→ ArH ₂ D ⁺ ArHD ₂ ⁺	+ D + Ar + H		6.50 × 10 ⁻¹⁰	± 20%	9016	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
ArD ₂ ⁺	+ D ₂	→ ArD ₃ ⁺	+ D	1.00	7.70 × 10 ⁻¹⁰ ± 20%	9016	a
ArH ₃ ⁺	+ H ₂	→ H ₅ ⁺	+ Ar	1.00	5.00 × 10 ⁻¹² ± 20%	9016	T = 80
Ar ₂ ⁺	+ H ₂	→ ArH ⁺ ArH ₂ ⁺	+ H + Ar + Ar	0.70 0.30	5.00 × 10 ⁻¹⁰ ± 20%	9016	a
Ar ₂ ⁺	+ HD	→ ArH ⁺ ArD ⁺ ArHD ⁺	+ D + Ar + H + Ar + Ar	0.40 0.40 0.20	4.30 × 10 ⁻¹⁰ ± 20%	9016	a
Ar ₂ ⁺	+ D ₂	→ ArD ⁺ ArD ₂ ⁺	+ D + Ar + Ar	0.74 0.26	3.60 × 10 ⁻¹⁰ ± 20%	9016	a
Ar ₂ ⁺	+ CS ₂	→ CS ₂ ⁺	+ Ar + Ar	1.00	7.00 × 10 ⁻¹⁰ ± 20%	8614	
K ⁺	+ H ₂ O	ℳ Adduct				8632	
K ⁺	+ O ₂	ℳ No Reaction Adduct		< 1.00 × 10 ⁻¹³		7103 8632	
K ⁺	+ O ₃	→ No Reaction		< 1.00 × 10 ⁻¹¹		6802	
K ⁺	+ CO ₂	ℳ Adduct				8632	
K ⁺	+ NO	→ No Reaction		< 1.00 × 10 ⁻¹³		7103	
Ca ⁺	+ H ₂	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8813	
Ca ⁺	+ HD	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8813	
Ca ⁺	+ D ₂	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8813	
Ca ⁺	+ O ₂	ℳ No Reaction Adduct		< 2.00 × 10 ⁻¹⁴		9001 8632	
Ca ⁺	+ O ₃	→ CaO ⁺	+ O ₂	1.00	1.60 × 10 ⁻¹⁰ ± 50%	6802	
Ca ⁺	+ CO	ℳ Adduct				8632	
Ca ⁺	+ N ₂ O	→ CaO ⁺	+ N ₂	1.00	~ 5.00 × 10 ⁻¹¹	7206	
Sc ⁺	+ H ₂	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8717	
Sc ⁺	+ HD	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8717	
Sc ⁺	+ D ₂	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8717	
Sc ⁺	+ CH ₄	→ No Reaction		< 2.00 × 10 ⁻¹⁴		8907	
Sc ⁺	+ C ₂ H ₆	→ ScC ₂ H ₄ ⁺	+ H ₂	1.00	2.40 × 10 ⁻¹¹ ± 20%	8907	
Sc ⁺	+ O ₂	→ ScO ⁺	+ O	1.00	4.00 × 10 ⁻¹⁰ ± 30%	9001	
Sc ⁺	+ CO	→ No Reaction		< 2.00 × 10 ⁻¹⁴		9127	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Ti ⁺	+ H ₂	→	No Reaction		<2.00 × 10 ⁻¹⁴	8717		
Ti ⁺	+ HD	→	No Reaction		<2.00 × 10 ⁻¹⁴	8815		
Ti ⁺	+ D ₂	→	No Reaction		<5.00 × 10 ⁻¹⁴	8717		
Ti ⁺	+ CH ₄	→	TiCH ₂ ⁺	+ H ₂	1.00	2.40 × 10 ⁻¹⁴ ± 20%	8816	
Ti ⁺	+ C ₂ H ₆	→	TiC ₂ H ₄ ⁺	+ H ₂	0.96	1.30 × 10 ⁻¹⁰ ± 20%	8901	
			TiC ₂ H ₂ ⁺	+ H ₂ + H ₂	0.04			
Ti ⁺	+ C ₃ H ₈	→	TiC ₃ H ₂ ⁺	+ H ₂ + H ₂ + H ₂	0.03	2.00 × 10 ⁻¹⁰ ± 20%	8901	
			TiC ₃ H ₄ ⁺	+ H ₂ + H ₂	0.03			
			TiC ₃ H ₆ ⁺	+ H ₂	0.94			
Ti ⁺	+ O ₂	→	TiO ⁺	+ O	1.00	4.00 × 10 ⁻¹⁰ ± 30%	9001	
Ti ⁺	+ CO	→	No Reaction		<2.00 × 10 ⁻¹⁴	9127		
V ⁺	+ H ₂	→	No Reaction		<1.00 × 10 ⁻¹³	8519		
V ⁺	+ HD	→	No Reaction		<1.00 × 10 ⁻¹³	8519		
V ⁺	+ D ₂	→	No Reaction		<1.00 × 10 ⁻¹³	8519		
V ⁺	+ CH ₄	→	No Reaction		<2.00 × 10 ⁻¹⁴	8721		
V ⁺	+ C ₂ H ₂	→	No Reaction		<1.00 × 10 ⁻¹⁴	8627		
V ⁺	+ C ₂ H ₄	→	VC ₂ H ₂ ⁺	+ H ₂	1.00	2.20 × 10 ⁻¹² ± 20%	8627	
V ⁺	+ C ₂ H ₆	→	VC ₂ H ₄ ⁺	+ H ₂	1.00	2.20 × 10 ⁻¹² ± 20%	8627	
V ⁺	+ NH ₃	→	VNH ⁺	+ H ₂	1.00	2.20 × 10 ⁻¹² ± 20%	9007	
V ⁺	+ O ₂	→	VO ⁺	+ O	1.00	2.70 × 10 ⁻¹⁰ ± 30%	9001	
V ⁺	+ CO	→	No Reaction		<2.00 × 10 ⁻¹⁴	9127		
Cr ⁺	+ H ₂	→	No Reaction		<2.00 × 10 ⁻¹⁴	8719	8124	
Cr ⁺	+ HD	→	No Reaction		<2.00 × 10 ⁻¹⁴	8719		
Cr ⁺	+ D ₂	→	No Reaction		<2.00 × 10 ⁻¹⁴	8719		
Cr ⁺	+ CH ₄	→	No Reaction		<2.00 × 10 ⁻¹⁴	8812		
Cr ⁺	+ C ₂ H ₄	→	No Reaction		<2.00 × 10 ⁻¹⁴	8905		
Cr ⁺	+ C ₂ H ₆	→	No Reaction		<2.00 × 10 ⁻¹⁴	8905		
Cr ⁺	+ c-C ₃ H ₆	→	No Reaction		<2.00 × 10 ⁻¹⁴	8905		
Cr ⁺	+ O ₂	→	No Reaction		<2.00 × 10 ⁻¹⁴	9001	8214	
Cr ⁺	+ N ₂ O	→	No Reaction		<2.00 × 10 ⁻¹²	8214		
Mn ⁺	+ H ₂	→	No Reaction		<2.00 × 10 ⁻¹⁴	8606		
Mn ⁺	+ HD	→	No Reaction		<2.00 × 10 ⁻¹⁴	8606		

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Mn ⁺	+ D ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8606		
Mn ⁺	+ C ₂ H ₄	→	No Reaction		<2.00×10 ⁻¹⁴	8906		
Mn ⁺	+ c-C ₃ H ₆	→	MnCH ₂ ⁺ + C ₂ H ₄	1.00	6.00×10 ⁻¹² ±30%	9012		
Mn ⁺	+ O ₂	→	No Reaction		<2.00×10 ⁻¹⁴	9001	8214	
Mn ⁺	+ c-CH ₂ CH ₂ O	→	MnCH ₂ ⁺ MnO ⁺ + H ₂ CO + C ₂ H ₄	0.20 0.80	2.00×10 ⁻¹¹ ±30%	9012		
Mn ⁺	+ (CH ₃) ₂ CO	→	Products	1.00	4.00×10 ⁻¹² ±30%	9012		
Mn ⁺	+ N ₂ O	→	No Reaction		<6.00×10 ⁻¹²	8214		
Fe ⁺	+ H ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8609	8423	
Fe ⁺	+ HD	→	No Reaction		<2.00×10 ⁻¹⁴	8609		
Fe ⁺	+ D ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8609		
Fe ⁺	+ CH ₄	→	No Reaction		<2.00×10 ⁻¹⁴	8817	8427	
Fe ⁺	+ C ₂ H ₆	→	FeC ₂ H ₄ ⁺ + H ₂	1.00	2.00×10 ⁻¹² ±20%	8817	8427	
Fe ⁺	+ c-C ₃ H ₆	→	No Reaction		<2.00×10 ⁻¹⁴	9109	8427	
Fe ⁺	+ C ₃ H ₈	→	FeC ₂ H ₄ ⁺ FeC ₃ H ₆ ⁺ + CH ₄ + H ₂	0.76 0.24	3.00×10 ⁻¹⁰ ±20%	8728	8427	
Fe ⁺	+ O ₂	→	No Reaction M Adduct		<2.00×10 ⁻¹⁴	9001	8903	8214 8632
Fe ⁺	+ O ₃	→	FeO ⁺ + O ₂	1.00	1.50×10 ⁻¹⁰ ±50%	6802		
Fe ⁺	+ CH ₃ CHO	→	FeCO ⁺ + CH ₄	1.00		8422		
Fe ⁺	+ N ₂ O	→	FeO ⁺ + N ₂	1.00	~1.00×10 ⁻¹⁰ ±50%	8214		
FeH ⁺	+ CH ₃ OH	→	CH ₃ OH ₂ ⁺ FeOCH ₃ ⁺ + Fe + H ₂	0.19 0.81		8423		
Fe ₂ ⁺	+ O ₂	→	Fe ⁺ + FeO ₂	1.00	1.50×10 ⁻¹⁰ ±20%	8904		
Fe ₃ ⁺	+ O ₂	→	Fe ⁺ Fe ₂ O ₂ ⁺ Fe ₂ O ₃ ²⁺ + FeO + Fe	0.12 0.37 0.51	3.00×10 ⁻¹⁰ ±20%	8904		
Co ⁺	+ H ₂	→	No Reaction		<5.00×10 ⁻¹⁴	8608		
Co ⁺	+ HD	→	No Reaction		<5.00×10 ⁻¹⁴	8608		
Co ⁺	+ D ₂	→	No Reaction		<5.00×10 ⁻¹⁴	8608	8107	
Co ⁺	+ C ₂ H ₄	→	No Reaction		<2.00×10 ⁻¹¹	8125		
Co ⁺	+ C ₂ H ₆	→	No Reaction		<2.00×10 ⁻¹⁴	8910		
Co ⁺	+ c-C ₃ H ₆	→	No Reaction		<2.00×10 ⁻¹²	9004		

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Co ⁺	+ C ₃ H ₈	→	CoC ₂ H ₄ ⁺ CoC ₃ H ₆ ⁺	+ CH ₄ + H ₂	0.33 0.67	1.40 × 10 ⁻¹⁰ ± 20%	8910	
Co ⁺	+ NH ₃	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9108	8909	
Co ⁺	+ O ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9001	8214	
Co ⁺	+ H ₂ CO	→	CoCO ⁺	+ H ₂	1.00		8422	
Co ⁺	+ CH ₃ CHO	→	CoCO ⁺	+ CH ₄	1.00		8422	
Co ⁺	+ c-CH ₂ CH ₂ O	→	Products		1.00	4.00 × 10 ⁻¹⁰ ± 20%	9004	
Co ⁺	+ N ₂ O	→	CoO ⁺	+ N ₂	1.00	~ 1.00 × 10 ⁻¹¹ ± 50%	8214	
Ni ⁺	+ H ₂	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608	8022	
Ni ⁺	+ HD	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608		
Ni ⁺	+ D ₂	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608		
Ni ⁺	+ C ₂ H ₆	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8910		
Ni ⁺	+ c-C ₃ H ₆	→	No Reaction		< 2.00 × 10 ⁻¹³	9004		
Ni ⁺	+ C ₃ H ₈	→	NiC ₂ H ₄ ⁺	+ CH ₄	1.00	2.80 × 10 ⁻¹⁰ ± 20%	8910	
Ni ⁺	+ NH ₃	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9108		
Ni ⁺	+ O ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9001	8214	
Ni ⁺	+ c-CH ₂ CH ₂ O	→	Products		1.00	4.50 × 10 ⁻¹⁰ ± 20%	9004	
Ni ⁺	+ N ₂ O	→	No Reaction		< 4.00 × 10 ⁻¹²	8214		
Cu ⁺	+ H ₂	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608		
Cu ⁺	+ HD	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608		
Cu ⁺	+ D ₂	→	No Reaction		< 5.00 × 10 ⁻¹⁴	8608		
Cu ⁺	+ C ₂ H ₆	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8910		
Cu ⁺	+ c-C ₃ H ₆	→	No Reaction		< 2.00 × 10 ⁻¹³	9004		
Cu ⁺	+ C ₃ H ₈	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8910		
Cu ⁺	+ NH ₃	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9108		
Cu ⁺	+ O ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴	9001		
Cu ⁺	+ CH ₃ NH ₂	→	CH ₂ NH ₂ ⁺	+ CuH	1.00	2.10 × 10 ⁻⁹ ± 10%	8911	
Cu ⁺	+ (CH ₃) ₂ NH	→	(CH ₃) ₂ N ⁺	+ CuH	1.00	1.70 × 10 ⁻⁹ ± 10%	8911	
Cu ⁺	+ (CH ₃) ₃ N	→	(CH ₃) ₂ NCH ₂ ⁺	+ CuH	1.00	1.50 × 10 ⁻⁹ ± 10%	8911	
Cu ⁺	+ c-CH ₂ CH ₂ O	→	CH ₃ CO ⁺	+ CuH	1.00	1.90 × 10 ⁻¹⁰ ± 20%	9004	
Zn ⁺	+ H ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8813		
Zn ⁺	+ HD	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8813		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
Zn ⁺	+ D ₂	→	No Reaction		<2.00×10 ⁻¹⁴	8813			
Zn ⁺	+ C ₂ H ₆	→	No Reaction		<2.00×10 ⁻¹⁴	8610			
Zn ⁺	+ C ₃ H ₈	→	No Reaction		<2.00×10 ⁻¹⁴	8610			
Zn ⁺	+ O ₂	→	No Reaction		<2.00×10 ⁻¹⁴	9001			
Zn ⁺	+ NO ₂	→	No Reaction		<2.00×10 ⁻¹⁴	9001			
Br ⁺	+ CH ₄	→	CH ₃ ⁺ CH ₂ Br ⁺	+ HBr + H ₂	0.80 0.20	8.40×10 ⁻¹⁰ ±20%	9013		
Br ⁺	+ C ₂ H ₂	→	C ₂ H ₂ ⁺	+ Br	1.00	8.90×10 ⁻¹⁰ ±20%	9013		
Br ⁺	+ C ₂ H ₄	→	C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ HBr + Br	0.25 0.75	1.10×10 ⁻⁹ ±20%	9013		
Br ⁺	+ c-C ₆ H ₆	→	c-C ₆ H ₆ ⁺	+ Br	1.00	1.40×10 ⁻⁹ ±20%	9013		
Br ⁺	+ NH ₃	→	NH ₃ ⁺	+ Br	1.00	2.10×10 ⁻⁹ ±20%	9013		
Br ⁺	+ O ₂	→	O ₂ ⁺	+ Br	1.00	7.10×10 ⁻¹⁰ ±20%	9013		
Br ⁺	+ H ₂ S	→	HS + H ₂ S ⁺	+ HBr + Br	0.12 0.88	9.70×10 ⁻¹⁰ ±20%	9013		
Br ⁺	+ NO	→	NO ⁺	+ Br	1.00	4.40×10 ⁻¹¹ ±20%	9013		
Br ⁺	+ COS	→	BrS ⁺ COS ⁺	+ CO + Br	0.16 0.84	1.10×10 ⁻⁹ ±20%	9013		
HBr ⁺	+ CH ₄	→	CH ₅ ⁺	+ Br	1.00	8.30×10 ⁻¹¹ ±25%	9030		
HBr ⁺	+ H ₂ S	→	H ₂ S ⁺ H ₃ S ⁺	+ HBr + Br	0.65 0.35	1.56×10 ⁻⁹ ±25%	9030		
HBr ⁺	+ CO ₂	→	HCO ₂ ⁺	+ Br	1.00	3.00×10 ⁻¹² ±25%	9030		
HBr ⁺	+ NO	→	NO ⁺	+ HBr	1.00	3.00×10 ⁻¹⁰ ±25%	9030		
HBr ⁺	+ N ₂ O	→	HN ₂ O ⁺	+ Br	1.00	9.60×10 ⁻¹⁰ ±25%	9030		
HBr ⁺	+ SO ₂	→	HSO ₂ ⁺	+ Br	1.00	1.60×10 ⁻⁹ ±25%	9030		
HBr ⁺	+ COS	→	COS ⁺ HCOS ⁺	+ HBr + Br	0.75 0.25	1.20×10 ⁻⁹ ±25%	9030		
Kr ⁺	+ H ₂	→	KrH ⁺	+ H	1.00	2.14×10 ⁻¹⁰ ±30%	8605 7504	8013 7416	7620
Kr ⁺	+ HD	→	KrH ⁺ KrD ⁺	+ D + H	0.45 0.55	5.80×10 ⁻¹⁰ ±35%	8605	8013	
Kr ⁺	+ D ₂	→	KrD ⁺	+ D	1.00	1.50×10 ⁻¹⁰ ±15%	8605	7620	
Kr ⁺	+ CH ₄	→	CH ₄ ⁺	+ Kr	1.00	1.02×10 ⁻⁹ ±15%	8319 7702	8318	8013
Kr ⁺	+ C ₂ H ₂	→	No Reaction		<1.00×10 ⁻¹²	8915			

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
Kr ⁺	+ C ₂ H ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺	+ H ₂ + Kr + H + Kr + Kr	0.45 0.45 0.10	7.40 × 10 ⁻¹⁰ ± 20%	8915	
Kr ⁺	+ C ₂ H ₆	→ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺	+ H ₂ + Kr + H + Kr	0.65 0.35	9.80 × 10 ⁻¹⁰ ± 20%	8915	
Kr ⁺	+ C ₃ H ₈	→ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ C ₃ H ₃ ⁺ C ₃ H ₅ ⁺ C ₃ H ₆ ⁺	+ CH ₄ + H + Kr + CH ₄ + Kr + CH ₃ + Kr + H ₂ + H + Kr + H ₂ + Kr	0.05 0.15 0.60 0.10 0.10	9.80 × 10 ⁻¹⁰ ± 20%	8915	
Kr ⁺	+ NH ₃	→ NH ₃ ⁺	+ Kr	1.00	7.50 × 10 ⁻¹⁰ ± 20%	8318	8013
Kr ⁺	+ H ₂ O	→ H ₂ O ⁺	+ Kr	1.00	1.20 × 10 ⁻⁹ ± 20%	8318	7006
Kr ⁺	+ O ₂	→ O ₂ ⁺	+ Kr	1.00	4.00 × 10 ⁻¹¹ ± 30%	8318	8013 7702
Kr ⁺	+ SiH ₄	→ Si ⁺ SiH ⁺ SiH ₂ ⁺ SiH ₃ ⁺	+ H ₂ + H ₂ + Kr + H ₂ + H + Kr + H ₂ + Kr + H + Kr	0.05 0.03 0.17 0.75	7.70 × 10 ⁻¹⁰ ± 20%	9002	
Kr ⁺	+ H ₂ S	→ S ⁺ H ₂ S ⁺ KrH ⁺	+ H ₂ + Kr + Kr + SH	0.30 0.35 0.35	1.00 × 10 ⁻⁹ ± 20%	8013	
Kr ⁺	+ HCl	→ HCl ⁺	+ Kr	1.00	4.05 × 10 ⁻¹¹ ± 25%	9024	8915
Kr ⁺	+ DCl	→ DCI ⁺	+ Kr	1.00	2.70 × 10 ⁻¹¹ ± 25%	9024	
*Kr ⁺	+ Kr	→ Kr ⁺ M Adduct	+ *Kr	1.00	8.30 × 10 ⁻¹⁰ ± 20%	7318 8632	T=373
Kr ⁺	+ Hg	→ No Reaction		< 1.00 × 10 ⁻¹²		8016	7317
Kr ⁺	+ CO	→ CO ⁺	+ Kr	1.00	1.50 × 10 ⁻¹⁰ ± 50%	8013	7702 7318
Kr ⁺	+ CO ₂	→ CO ₂ ⁺	+ Kr	1.00	6.15 × 10 ⁻¹⁰ ± 20%	8013	7702
Kr ⁺	+ NO	→ No Reaction		< 1.00 × 10 ⁻¹²			7702
Kr ⁺	+ N ₂ O	→ N ₂ O ⁺	+ Kr	1.00	4.00 × 10 ⁻¹⁰ ± 20%	8013	7702
Kr ⁺	+ COS	→ COS ⁺	+ Kr	1.00	4.30 × 10 ⁻¹⁰ ± 20%	8013	
KrH ⁺	+ H ₂	→ H ₃ ⁺	+ Kr	1.00	3.80 × 10 ⁻¹¹ ± 20%	8006	
KrH ⁺	+ CH ₄	→ CH ₃ ⁺	+ Kr	1.00	9.20 × 10 ⁻¹⁰ ± 20%	7613	
KrH ⁺	+ C ₂ H ₄	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺	+ H ₂ + Kr + Kr	0.72 0.28	1.10 × 10 ⁻⁹ ± 20%	7613	7610
KrH ⁺	+ C ₂ H ₆	→ C ₂ H ₃ ⁺	+ H ₂ + Kr	1.00	1.20 × 10 ⁻⁹ ± 20%	7613	
KrH ⁺	+ NH ₃	→ NH ₄ ⁺	+ Kr	1.00	1.50 × 10 ⁻⁹ ± 20%	7613	
KrH ⁺	+ N ₂	→ N ₂ H ⁺	+ Kr	1.00	5.80 × 10 ⁻¹⁰ ± 20%	8006	7415
KrH ⁺	+ O ₂	→ HO ₂ ⁺	+ Kr	1.00	3.70 × 10 ⁻¹¹ ± 20%	8006	
KrH ⁺	+ Ar	→ No Reaction		< 3.00 × 10 ⁻¹²		7618	

Table of Reactions — Continued

			Reactions	Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
Zr ⁺	+ O ₂	→	ZrO ⁺	+ O	1.00	5.50 × 10 ⁻¹⁰	± 10%	8528
Zr ⁺	+ CO ₂	→	ZrO ⁺	+ CO	1.00	4.00 × 10 ⁻¹⁰	± 10%	8528
Zr ⁺	+ NO	→	ZrO ⁺	+ N	1.00	4.80 × 10 ⁻¹⁰	± 10%	8528
Ag ⁺	+ NH ₃	ℳ	Adduct					8632
Ag ⁺	+ (CH ₃) ₂ NH	→	(CH ₃) ₂ N ⁺	+ AgH	1.00	1.60 × 10 ⁻⁹	± 10%	8911
Ag ⁺	+ (CH ₃) ₃ N	→	(CH ₃) ₂ NCH ₂ ⁺	+ AgH	1.00	1.40 × 10 ⁻⁹	± 10%	8911
Xe ⁺	+ H ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴			8908
Xe ⁺	+ HD	→	No Reaction		< 2.00 × 10 ⁻¹⁴			8908
Xe ⁺	+ D ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴			8908
Xe ⁺	+ CH ₄	→	No Reaction		< 2.00 × 10 ⁻¹³			8013
Xe ⁺	+ C ₂ H ₂	→	C ₂ H ₂ ⁺	+ Xe	1.00	5.00 × 10 ⁻¹⁰	± 20%	8915
Xe ⁺	+ C ₂ H ₄	→	C ₂ H ₂ ⁺ C ₂ H ₄ ⁺	+ H ₂ + Xe + Xe	0.25 0.75	8.50 × 10 ⁻¹⁰	± 20%	8915
Xe ⁺	+ C ₂ H ₆	→	C ₂ H ₂ ⁺ C ₂ H ₄ ⁺ C ₂ H ₆ ⁺	+ H ₂ + Xe + H + Xe + Xe	0.55 0.10 0.35	9.20 × 10 ⁻¹⁰	± 20%	8915
Xe ⁺	+ C ₃ H ₈	→	C ₃ H ₆ ⁺ C ₃ H ₇ ⁺ C ₃ H ₈ ⁺	+ H ₂ + Xe + H + Xe + Xe	0.30 0.65 0.05	8.80 × 10 ⁻¹⁰	± 20%	8915
Xe ⁺	+ NH ₃	→	NH ₃ ⁺	+ Xe	1.00	8.30 × 10 ⁻¹⁰	± 20%	8013
Xe ⁺	+ O ₂	→	O ₂ ⁺	+ Xe	1.00	1.10 × 10 ⁻¹⁰	± 20%	8013
Xe ⁺	+ SiH ₄	→	SiH ₂ ⁺ SiH ₃ ⁺	+ H ₂ + Xe + H + Xe	0.56 0.44	9.40 × 10 ⁻¹⁰	± 20%	9002
Xe ⁺	+ H ₂ S	→	H ₂ S ⁺	+ Xe	1.00	9.90 × 10 ⁻¹⁰	± 20%	8013
Xe ⁺	+ HCl	→	No Reaction		< 1.00 × 10 ⁻¹²			8915
Xe ⁺	+ Ar	ℳ	Adduct					8632
Xe ⁺	+ Xe	ℳ	Adduct					8632
Xe ⁺	+ C ₂ N ₂	ℳ	Adduct					8632
Xe ⁺	+ CO	→	No Reaction		< 1.00 × 10 ⁻¹²			8915
Xe ⁺	+ CO ₂	→	No Reaction		< 1.00 × 10 ⁻¹²			8915
Xe ⁺	+ N ₂ O	→	No Reaction		< 2.00 × 10 ⁻¹³			8013
Xe ⁺	+ COS	→	COS ⁺	+ Xe	1.00	8.70 × 10 ⁻¹⁰	± 20%	8013
Ba ⁺	+ D ₂	→	No Reaction		< 1.00 × 10 ⁻¹²			8023
Ba ⁺	+ O ₂	→	No Reaction		< 1.00 × 10 ⁻¹³			7103

T = 400

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
Ba ⁺	+ CO ₂	→ BaO ⁺ M Adduct	+ CO	1.00		7206 8632	
Ba ⁺	+ NO	→ No Reaction			<1.00 × 10 ⁻¹³	7103	
Ba ⁺	+ N ₂ O	→ BaO ⁺	+ N ₂	1.00		7206	
CN ⁺	+ H ₂	→ HCN ⁺ HNC ⁺	+ H + H	0.50 0.50	1.10 × 10 ⁻⁹ ± 30%	9116 8404 7701	
CN ⁺	+ D ₂	→ DCN ⁺	+ D	1.00	9.10 × 10 ⁻¹⁰ ± 20%	8404 8301	
CN ⁺	+ CH ₄	→ CH ₃ ⁺ CH ₄ ⁺ HCN ⁺ HCNH ⁺ CH ₂ CN ⁺	+ HCN + CN + CH ₃ + CH ₂ + H ₂	0.50 0.15 0.15 0.10 0.10	1.00 × 10 ⁻⁹ ± 15%	8404 8301 8012	b
CN ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺ CHCCN ⁺	+ CN + H	0.90 0.10	~1.50 × 10 ⁻⁹ ± 20%	8301	
CN ⁺	+ C ₂ D ₂	→ C ₂ D ₂ ⁺ CDCCN ⁺	+ CN + D	0.70 0.30	5.40 × 10 ⁻¹⁰ ± 30%	8404	
CN ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺ HCN ⁺ CHCCNH ⁺	+ CN + C ₂ H ₃ + H ₂	0.70 0.25 0.05	1.30 × 10 ⁻⁹ ± 30%	8404 8301	b
CN ⁺	+ C ₂ H ₆	→ C ₂ H ₃ ⁺ C ₂ H ₄ ⁺ C ₂ H ₅ ⁺	+ HCN + H ₂ + HCN + H + HCN	0.15 0.65 0.20	1.90 × 10 ⁻⁹ ± 20%	8301	
CN ⁺	+ NH ₃	→ NH ₂ ⁺ NH ₃ ⁺ HCN ⁺ HCNH ⁺	+ HCN + CN + NH ₂ + NH	0.05 0.60 0.20 0.15	2.00 × 10 ⁻⁹ ± 20%	8301	
CN ⁺	+ ND ₃	→ ND ₃ ⁺ DCN ⁺ DCND ⁺	+ CN + ND ₂ + ND	> 0.80 0.10 0.10	1.30 × 10 ⁻⁹ ± 30%	8404	
CN ⁺	+ N ₂	→ No Reaction			<4.30 × 10 ⁻¹² ± 30%	8404 8301	
CN ⁺	+ H ₂ O	→ H ₂ O ⁺ HCN ⁺ HCNH ⁺ HCO ⁺ HNCO ⁺	+ CN + OH + O + NH + H	0.10 0.50 0.15 0.05 0.20	3.20 × 10 ⁻⁹ ± 20%	8301	
CN ⁺	+ D ₂ O	→ D ₂ O ⁺ DCN ⁺ DCND ⁺ DNCO ⁺	+ CN + OD + O + D	0.40 0.40 0.10 0.10	2.10 × 10 ⁻⁹ ± 30%	8404	
CN ⁺	+ O ₂	→ O ₂ ⁺ NO ⁺ NCO ⁺	+ CN + CO + O	0.60 0.20 0.20	4.30 × 10 ⁻¹⁰ ± 30%	8404	
CN ⁺	+ H ₂ S	→ S ⁺ HS ⁺ H ₂ S ⁺	+ CN + H ₂ + HCN + CN	0.30 0.30 0.40	1.30 × 10 ⁻⁹ ± 30%	8404	
CN ⁺	+ Xe	→ Xe ⁺	+ CN	1.00	1.60 × 10 ⁻¹⁰ ± 30%	8404	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
CN ⁺	+ HCN	→ HCN ⁺ C ₂ N ₂ ⁺	+ CN + H	0.83 0.17	2.70 × 10 ⁻⁹	± 20%	8404	8301	7819
CN ⁺	+ CD ₃ CN	→ CD ₃ ⁺ C ₂ D ₃ ⁺ CD ₂ CN ⁺ CD ₂ CND ⁺	+ C ₂ N ₂ + CN ₂ + DCN + CN	0.20 0.10 0.20 0.50	3.40 × 10 ⁻⁹	± 30%	8404		
CN ⁺	+ C ₂ N ₂	→ C ₂ N ₂ ⁺ C ₂ N ₂ ⁺ C ₃ N ⁺	+ CN ₂ + CN + N ₂	0.03 0.93 0.05	1.75 × 10 ⁻⁹	± 30%	8515	8404	8301
CN ⁺	+ HC ₃ N	→ C ₃ N ⁺ CHCCN ⁺	+ HCN + CN	0.20 0.80	4.60 × 10 ⁻⁹	± 20%	8509	7911	b
CN ⁺	+ CO	→ CO ⁺ M Adduct	+ CN	1.00	4.40 × 10 ⁻¹⁰	± 60%	8404	8301	b
CN ⁺	+ CH ₃ OH	→ CH ₃ OH ⁺ CH ₂ OH ⁺ HCNH ⁺	+ CN + HCN + H ₂ CO	0.30 0.60 0.10	2.60 × 10 ⁻⁹	± 30%	8404		
CN ⁺	+ CO ₂	→ CO ₂ ⁺ C ₂ O ⁺ NCO ⁺	+ CN + NO + CO	0.40 0.30 0.30	1.10 × 10 ⁻⁹	± 50%	8404	8301	
CN ⁺	+ CHOOH	→ HCO ⁺	+ HNCO	1.00	5.30 × 10 ⁻⁹	± 30%	7821		
CN ⁺	+ NO	→ NO ⁺ NCO ⁺	+ CN + N	0.75 0.25	7.60 × 10 ⁻¹⁰	± 30%	8404		
CN ⁺	+ N ₂ O	→ NO ⁺ N ₂ O ⁺ NCO ⁺	+ CN ₂ + CN + N ₂	0.20 0.60 0.20	7.60 × 10 ⁻¹⁰	± 30%	8404		
CN ⁺	+ COS	→ COS ⁺ CSN ⁺ C ₂ SN ⁺	+ CN + CO + O	0.80 0.15 0.05	1.50 × 10 ⁻⁹	± 30%	8404		
HCN ⁺	+ D	→ D ⁺	+ HCN	1.00	3.70 × 10 ⁻¹¹	± 50%	7901		
HCN ⁺	+ H ₂	→ HCNH ⁺	+ H	1.00	8.80 × 10 ⁻¹⁰	± 20%	9116	7704	7701
HCN ⁺	+ CH ₄	→ C ₂ H ₃ ⁺ HCNH ⁺	+ NH ₂ + CH ₃	0.10 0.90	1.27 × 10 ⁻⁹	± 15%	9116	8101	8012
HCN ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺ C ₂ H ₃ ⁺ CHCCNH ⁺	+ HCN + CN + H	> 0.85 < 0.15 < 0.10	1.35 × 10 ⁻⁹	± 45%	9116	8012	8002
HCN ⁺	+ NH ₃	→ NH ₃ ⁺ NH ₄ ⁺ HCNH ⁺	+ HCN + CN + NH ₂	~ 0.60 < 0.05 ~ 0.30	2.80 × 10 ⁻⁹	± 10%	8101		
HCN ⁺	+ N ₂	→ No Reaction			< 1.00 × 10 ⁻¹¹		8101		
HCN ⁺	+ H ₂ O	→ H ₂ O ⁺ H ₃ O ⁺ HCNH ⁺	+ HCN + CN + OH	~ 0.50 ~ 0.50 < 0.05	3.60 × 10 ⁻⁹	± 10%	8101		
HCN ⁺	+ O ₂	→ O ₂ ⁺	+ HCN	1.00	4.10 × 10 ⁻¹⁰	± 30%	9039	8101	
HCN ⁺	+ HCN	→ HCNH ⁺	+ CN	1.00	1.45 × 10 ⁻⁹	± 45%	8101	7819	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes	
HCN ⁺	+ HC ₃ N	→ CHCCN ⁺ CHCCNH ⁺	+ HCN + CN	0.52 0.48	4.60 × 10 ⁻⁹	± 20%	8518	7911	b
HCN ⁺	+ CO	→ HCO ⁺ HNC ⁺	+ CN + CO	0.30 0.70	4.60 × 10 ⁻¹⁰	± 20%	9116	9039	8101
HCN ⁺	+ CO ₂	→ HCO ₂ ⁺ HNC ⁺	+ CN + CO ₂	0.42 0.58	5.00 × 10 ⁻¹⁰	± 25%	9116	9039	8101
HCN ⁺	+ CHO OH	→ HCO ⁺	+ H ₂ NCO	1.00	2.50 × 10 ⁻⁹	± 30%	7821		
HCN ⁺	+ N ₂ O	→ N ₂ O ⁺ HNCO ⁺	+ HCN + N ₂	> 0.90 < 0.10	1.20 × 10 ⁻⁹	± 25%	9039		
HNC ⁺	+ H ₂	→ HCNH ⁺	+ H	1.00	7.00 × 10 ⁻¹⁰	± 30%	9116		
HNC ⁺	+ CH ₄	→ HCNH ⁺	+ CH ₃	1.00	1.10 × 10 ⁻⁹	± 30%	9116		
HNC ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺ CHCCNH ⁺	+ HCN + H	~ 0.40 ~ 0.60	1.50 × 10 ⁻⁹	± 30%	9116		
HNC ⁺	+ O ₂	→ NO ⁺ HNCO ⁺	+ HCO + O	0.25 0.75	3.60 × 10 ⁻¹⁰	± 25%	9039		
HNC ⁺	+ CO	→ No Reaction			< 1.00 × 10 ⁻¹²		9039		
HNC ⁺	+ CO ₂	→ Products		1.00	1.20 × 10 ⁻¹²	± 25%	9039		
HNC ⁺	+ N ₂ O	→ NO ⁺ HNCO ⁺	+ HCN ₂ + N ₂	0.45 0.55	1.10 × 10 ⁻⁹	± 25%	9039		
HCNH ⁺ + H ₂	→ No Reaction				< 4.00 × 10 ⁻¹³		7711		
HCNH ⁺ + D ₂	→ No Reaction				< 2.50 × 10 ⁻¹²		7701		
HCNH ⁺ + C ₄ H ₂	→ C ₄ H ₃ ⁺	+ HCN		1.00	1.80 × 10 ⁻⁹	± 30%	9118		
HCNH ⁺ + NH ₃	→ NH ₄ ⁺	+ HCN		1.00	2.30 × 10 ⁻⁹	± 30%	7704	7701	7412
HCNH ⁺ + H ₂ O	→ H ₃ O ⁺	+ HCN		1.00	8.80 × 10 ⁻¹³	± 40%	7809		
HCNH ⁺ + H ₂ S	→ H ₃ S ⁺	+ HCN		1.00	3.20 × 10 ⁻¹⁰	± 30%	7813	7809	
HCNH ⁺ + CH ₃ NH ₂	→ CH ₂ NH ₂ ⁺ CH ₃ NH ₃ ⁺	+ HCN + H ₂		0.11 0.89	2.10 × 10 ⁻⁹	± 20%	9124		
HCNH ⁺ + CH ₃ CN	→ CH ₃ CNH ⁺	+ HCN		1.00	3.80 × 10 ⁻⁹	± 20%	8929		
HCNH ⁺ + HC ₃ N	→ CHCCNH ⁺	+ HCN		1.00	3.40 × 10 ⁻⁹	± 30%	7911		
HCNH ⁺ + H ₂ CO	→ CH ₂ OH ⁺	+ HCN		1.00	2.10 × 10 ⁻⁹	± 30%	7906	7814	7809
HCNH ⁺ + CHO OH	→ CH(OH) ₂ ⁺	+ HCN		1.00	1.40 × 10 ⁻⁹	± 30%	7820		
CH ₂ NH ₂ ⁺ + H ₂	→ No Reaction				< 4.00 × 10 ⁻¹⁴		7711		
CH ₂ NH ₂ ⁺ + CH ₃ NH ₂	→ CH ₃ NH ₃ ⁺	+ HCN + H ₂		1.00	1.80 × 10 ⁻⁹	± 20%	9124	8322	
CH ₂ NH ₂ ⁺ + (CH ₃) ₂ NH	→ (CH ₃) ₃ NH ₂ ⁺	+ HCN + H ₂		1.00	1.60 × 10 ⁻⁹	± 20%	9124		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
CH ₃ NH ₂ ⁺ + CH ₃ NH ₂	→	CH ₂ NH ₃ ⁺	+ CH ₂ NH ₂	1.00	1.90 × 10 ⁻⁹	± 20%	9124
CH ₃ NH ₂ ⁺ + (CH ₃) ₂ NH	→	(CH ₃) ₂ NH ⁺ (CH ₃) ₂ NH ₂ ⁺	+ CH ₃ NH ₂ + CH ₂ NH ₂	0.55 0.45	1.70 × 10 ⁻⁹	± 20%	9124
CH ₃ NH ₂ ⁺ + (CH ₃) ₃ N	→	(CH ₃) ₃ N ⁺ (CH ₃) ₃ NH ⁺	+ CH ₃ NH ₂ + CH ₂ NH ₂	0.92 0.08	1.60 × 10 ⁻⁹	± 20%	9124
CH ₃ NH ₃ ⁺ + CH ₃ NH ₂	M	Adduct					8632
CH ₃ NH ₃ ⁺ + (CH ₃) ₂ NH	→	(CH ₃) ₂ NH ₂ ⁺	+ CH ₃ NH ₂	1.00	1.60 × 10 ⁻⁹	± 20%	9124
CH ₃ NH ₃ ⁺ + (CH ₃) ₃ N	→	(CH ₃) ₃ NH ⁺	+ CH ₃ NH ₂	1.00	9.30 × 10 ⁻¹⁰	± 20%	9124
CNC ⁺ + H ₂	→	No Reaction		< 1.00 × 10 ⁻¹³			8802 8012
CNC ⁺ + CH ₄	→	C ₂ H ₃ ⁺ CHCCNH ⁺	+ HCN + H ₂		4.20 × 10 ⁻¹²	± 20%	8802 8301 8012
CNC ⁺ + C ₂ H ₂	→	C ₃ H ⁺ HCNH ⁺ HC ₄ N ⁺	+ HCN + C ₃ + H	0.92 0.08 ?	8.00 × 10 ⁻¹⁰	± 40%	8802 8301 8012 b
CNC ⁺ + C ₂ H ₄	→	C ₂ H ₄ ⁺ C ₃ H ₃ ⁺ CH ₂ CN ⁺ H ₂ C ₄ N ⁺	+ C ₂ N + HCN + C ₂ H ₂ + H ₂	0.10 0.30 0.50 0.10	1.30 × 10 ⁻⁹	± 20%	8301
CNC ⁺ + C ₂ H ₆	→	C ₂ H ₅ ⁺ C ₃ H ₅ ⁺ C ₃ H ₆ ⁺ C ₄ H ₆ ⁺ CH ₂ CN ⁺	+ CH ₃ CN + HC ₂ N + HCN + H ₂ + HCN + C ₂ H ₄	0.10 0.25 0.30 0.10 0.25	1.20 × 10 ⁻⁹	± 20%	8301
CNC ⁺ + NH ₃	→	HCNH ⁺ N ₂ H ⁺	+ HCN + C ₂ H ₃	0.95 0.05	1.85 × 10 ⁻⁹	± 10%	8802 8301 8012
CNC ⁺ + N ₂	→	No Reaction		< 1.00 × 10 ⁻¹³			8802 8301
CNC ⁺ + H ₂ O	→	CHCN ⁺ HCO ⁺	+ OH + HCN	0.25 0.75	7.00 × 10 ⁻¹¹	+ 40%	8802 8301 8012
CNC ⁺ + O ₂	→	No Reaction		< 1.00 × 10 ⁻¹³			8802
CNC ⁺ + H ₂ S	→	HCS ⁺	+ HCN	1.00	1.20 × 10 ⁻⁹	± 20%	8012
CNC ⁺ + HCN	→	No Reaction M Adduct			< 3.00 × 10 ⁻¹¹		8301 7819 8802 b
CNC ⁺ + CH ₃ CN	→	C ₂ H ₃ ⁺	+ C ₂ N ₂	1.00	4.10 × 10 ⁻⁹	± 20%	8012
CNC ⁺ + C ₂ N ₂	→	No Reaction			< 1.00 × 10 ⁻¹¹		8301
CNC ⁺ + HC ₃ N	→	C ₃ H ⁺	+ C ₂ N ₂	1.00	3.30 × 10 ⁻⁹	± 20%	8518 8509
CNC ⁺ + CO	→	No Reaction			< 1.00 × 10 ⁻¹¹		8301
CNC ⁺ + CO ₂	→	No Reaction			< 1.00 × 10 ⁻¹³		8802 8301
CNC ⁺ + N ₂ O	→	Products		1.00	4.00 × 10 ⁻¹⁰	± 40%	8802

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
CCN ⁺	+ H ₂	→ HCNH ⁺ CH ₂ CN ⁺	+ H	0.90 0.10	9.00 × 10 ⁻¹⁰ ± 40%	8802	
CCN ⁺	+ CH ₄	→ C ₂ H ₃ ⁺ HCNH ⁺ CHCCNH ⁺	+ HCN + C ₂ H ₂ + H ₂	0.60 0.10 0.30	7.00 × 10 ⁻¹⁰ ± 40%	8802	
CCN ⁺	+ C ₂ H ₂	→ C ₃ H ⁺ HCNH ⁺	+ HCN + C ₃	0.92 0.08	1.60 × 10 ⁻⁹ ± 40%	8802	
CCN ⁺	+ NH ₃	→ HCNH ⁺	+ HCN	1.00	1.90 × 10 ⁻⁹ ± 40%	8802	
CCN ⁺	+ N ₂	→ No Reaction			<1.00 × 10 ⁻¹³	8802	
CCN ⁺	+ H ₂ O	→ HCNH ⁺ HCO ⁺	+ CO + HCN	0.08 0.92	1.63 × 10 ⁻⁹ ± 40%	8802	
CCN ⁺	+ O ₂	→ O ₂ ⁺ C ₂ NO ⁺	+ C ₂ N + O	<0.03 >0.97	~4.00 × 10 ⁻¹⁰ ± 40%	8802	
CCN ⁺	+ HCN	→ Adduct		1.00	4.20 × 10 ⁻¹⁰ ± 40%	8802	
CCN ⁺	+ CO ₂	→ C ₂ NO ⁺	+ CO	1.00	1.10 × 10 ⁻⁹ ± 40%	8802	
CCN ⁺	+ N ₂ O	→ NO ⁺ N ₂ O ⁺ m/e = 54	+ C ₂ N ₂ + C ₂ N + m = 28	0.22 0.05 0.73	1.00 × 10 ⁻⁹ ± 40%	8802	
CH ₂ CNH ⁺ + CO	→ Adduct	CH ₃ CO ⁺	+ CN	0.40 0.60	2.10 × 10 ⁻¹³ ± 30%	8804	
CH ₂ CNH ⁺ + CO ₂	→ No Reaction				<1.50 × 10 ⁻¹³	8804	
CH ₃ CNH ⁺ + CH ₃ CN	→ Adduct		+ hν	1.00	8.00 × 10 ⁻¹³ ± 20%	9032	
(CH ₃) ₂ NH ⁺ + (CH ₃) ₂ NH →	(CH ₃) ₂ NH ₂ ⁺		+ CH ₃ NH(CH ₂)	1.00	1.30 × 10 ⁻⁹ ± 20%	9124	
(CH ₃) ₂ NH ₂ ⁺ + (CH ₃) ₂ NH	→ Adduct	M				8632	
C ₂ N ₂ ⁺	+ H ₂	→ HC ₂ N ₂ ⁺	+ H	1.00	9.60 × 10 ⁻¹⁰ ± 20%	8932	
C ₂ N ₂ ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺	+ C ₂ N ₂	1.00	5.80 × 10 ⁻¹⁰ ± 20%	8932	
C ₂ N ₂ ⁺	+ C ₂ H ₄	→ C ₂ H ₄ ⁺	+ C ₂ N ₂	1.00	1.30 × 10 ⁻⁹ ± 20%	8932	
C ₂ N ₂ ⁺	+ H ₂ O	→ H ₂ O ⁺ HC ₂ N ₂ ⁺	+ C ₂ N ₂ + OH	0.09 0.91	2.60 × 10 ⁻⁹ ± 20%	8932	
C ₂ N ₂ ⁺	+ HCN	→ HNC ⁺ HC ₂ N ₂ ⁺ Adduct	+ C ₂ N ₂ + CN	0.20 0.75 0.05	2.70 × 10 ⁻⁹ ± 25%	9039	
C ₂ N ₂ ⁺	+ C ₂ N ₂	→ C ₄ N ₄ ⁺		1.00		8507	8515
C ₂ N ₂ ⁺	+ HC ₃ N	→ CHCCN ⁺	+ C ₂ N ₂	1.00	1.60 × 10 ⁻⁹ ± 30%	8509	
C ₂ N ₂ ⁺	+ CO	→ Adduct		1.00	1.10 × 10 ⁻¹⁰ ± 20%	8932	
C ₂ N ₂ ⁺	+ CO ₂	→ C ₂ N ₂ O ⁺ Adduct	+ CO	0.58 0.42	4.10 × 10 ⁻¹² ± 20%	8932	

Table of Reactions — Continued

Reactions			Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
HC_2N_2^+ + C_2H_4	$\xrightarrow{\text{M}}$ Adduct	C_2H_5^+	+ C_2N_2	1.00	8.00×10^{-10} ± 20%	8932	8702	8412
HC_2N_2^+ + H_2O	\rightarrow	H_3O^+	+ C_2N_2	1.00	5.10×10^{-10} ± 30%	8412		
HC_2N_2^+ + CH_3OH	\rightarrow	CH_3OH_2^+	+ C_2N_2	1.00	1.50×10^{-9} ± 30%	8412		
C_3N^+ + H_2	\rightarrow	CHCCN^+ CHCCNH^+	+ H	0.90 0.10	9.10×10^{-10} ± 20%	8518		
CHCCN^+ + H_2	\rightarrow	C_2H_2^+ CHCCNH^+	+ HCN + H	0.37 0.63	4.45×10^{-12} ± 80%	8616	8518	
CHCCN^+ + CH_4	\rightarrow	C_3H_4^+ CH_3CNH^+ CHCCNH^+	+ IICN + C_2H_2 + CH_3	0.10 0.50 0.30	5.90×10^{-10} ± 30%	8616		
CHCCN^+ + C_2H_2	\rightarrow	C_2H_2^+ C_4H_2^+	+ HC_3N + HCN	0.20 0.80	6.40×10^{-10} ± 30%	8616		
CHCCN^+ + C_2H_4	\rightarrow	C_2H_4^+ CHCCNH^+	+ HC_3N + C_2H_3	0.80 0.20	6.70×10^{-10} ± 30%	8616		
CHCCN^+ + C_4H_2	\rightarrow	C_4H_2^+	+ HC_3N	1.00	8.90×10^{-10} ± 30%	8616		
CHCCN^+ + H_2O	\rightarrow	CHCCNH^+	+ OH	1.00	6.70×10^{-10} ± 30%	8616		
CHCCN^+ + O_2	\rightarrow	HCO^+ Adduct	+ C_2NO	0.40 0.60	2.50×10^{-12} ± 30%	8616		
CHCCN^+ + HCN	\rightarrow	Adduct		1.00	8.90×10^{-10} ± 30%	8616		
CHCCN^+ + HC_3N	\rightarrow	HC_3N^+ HC_2N_2^+ $\text{H}_2\text{C}_2\text{N}_2^+$ $\xrightarrow{\text{M}}$ Adduct	+ HCN + H + $\text{h}\nu$	0.90 0.05 0.05	1.30×10^{-9} ± 20%	9115		b
CHCCN^+ + CO	\rightarrow	Adduct		1.00	3.40×10^{-11} ± 30%	8616		
CHCCN^+ + COS	\rightarrow	COS^+ HC_3SN^+	+ HC_3N + CO	0.80 0.20	7.20×10^{-10} ± 30%	8616		
CHCCNH^+ + H_2	\rightarrow	No Reaction			$< 1.00 \times 10^{-13}$	8616		
CHCCNH^+ + C_4H_2	\rightarrow	Adduct		1.00	8.70×10^{-10} ± 30%	8616		
CHCCNH^+ + CH_3CN	\rightarrow	CH_3CNH^+	+ HC_3N	1.00	3.60×10^{-9} ± 30%	8412		
CHCCNH^+ + CO	\rightarrow	No Reaction			$< 1.00 \times 10^{-12}$	8616		
CHCCNH^+ + CH_3OH	\rightarrow	CH_3OH_2^+	+ HC_3N	1.00	1.90×10^{-9} ± 20%	8518		
CHCCNH^+ + CH_3CHO	\rightarrow	$\text{CH}_3\text{COH}_2^+$	+ HC_3N	1.00	2.40×10^{-9} ± 20%	8518		
CHCCNH^+ + $(\text{CH}_3)_2\text{CO}$	\rightarrow	$(\text{CH}_3)_2\text{COH}^+$	+ HC_3N	1.00	1.30×10^{-9} ± 30%	8412		

Table of Reactions — Continued

Reactions			Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
CH ₂ CHCN ⁺ + H ₂	→	CH ₂ CHCNH ⁺ + H	1.00	1.20 × 10 ⁻¹²	± 30%	9117	
CH ₂ CHCN ⁺ + CH ₄	→	CH ₂ CNH ⁺ + C ₂ H ₄ CH ₂ CHCNH ⁺ + CH ₃ H ₆ C ₄ N ⁺ + H	0.70 0.25 0.05	2.60 × 10 ⁻¹¹	± 30%	9117	
CH ₂ CHCN ⁺ + C ₂ H ₂	→	C ₃ H ₃ ⁺ m/e = 52 + CH ₃ CN + m = 27 H ₂ C ₅ N ⁺ + H ₂ + H H ₄ C ₅ N ⁺ + H	0.08 0.55 0.21 0.16	9.30 × 10 ⁻¹⁰	± 30%	9117	
CH ₂ CHCN ⁺ + NH ₃	→	NH ₃ ⁺ NH ₄ ⁺ + CH ₂ CHCN + H ₂ C ₃ N	0.66 0.34	1.90 × 10 ⁻⁹	± 30%	9117	
CH ₂ CHCN ⁺ + N ₂	→	No Reaction		< 5.00 × 10 ⁻¹³		9117	
CH ₂ CHCN ⁺ + H ₂ O	→	CH ₃ COH ⁺ C ₃ H ₄ NO ⁺ Adduct	+ HCN + H	0.68 0.31 0.01	2.10 × 10 ⁻¹⁰	± 30%	9117
CH ₂ CHCN ⁺ + HCN	→	HC ₄ N ₂ ⁺ H ₂ C ₄ N ₂ ⁺ H ₃ C ₃ N ₂ ⁺ Adduct	+ H ₂ + H + H ₂ + H	0.09 0.38 0.20 0.33	1.90 × 10 ⁻¹⁰	± 30%	9117
CH ₂ CHCN ⁺ + CH ₂ CHCN	→	Adduct		1.00	2.00 × 10 ⁻⁹	± 30%	9117
CH ₂ CHCN ⁺ + CO	→	CO ⁺ + CH ₂ CHCN	1.00	7.00 × 10 ⁻¹²	± 30%	9117	
(CH ₃) ₃ N ⁺ + (CH ₃) ₃ N	→	(CH ₃) ₃ NH ⁺ + (CH ₃) ₂ NCH ₂	1.00	1.10 × 10 ⁻⁹	± 20%	9124	
C ₄ N ⁺ + H ₂	→	C ₃ H ⁺ + HCN	1.00	2.20 × 10 ⁻¹¹	± 30%	8727	
C ₄ N ⁺ + CH ₄	→	H ₃ ⁺ C ₂ H ₃ ⁺ C ₄ H ₂ ⁺ C ₄ H ₃ ⁺ HCN ⁺ CHCCNH ⁺ H ₂ C ₅ N ⁺	+ HC ₅ N + HC ₃ N + H ₂ CN + HCN + C ₄ H ₂ + C ₂ H ₂ + H ₂	0.05 0.22 0.01 0.32 0.08 0.26 0.06	6.35 × 10 ⁻¹⁰	± 20%	8922 8727
C ₄ N ⁺ + C ₂ H ₂	→	C ₅ H ⁺ Adduct	+ HCN	> 0.70 < 0.30	8.00 × 10 ⁻¹⁰	± 30%	8727
C ₄ N ⁺ + C ₄ H ₂	→	C ₇ H ⁺ Adduct	+ HCN	0.40 0.60	1.60 × 10 ⁻⁹	± 30%	8727
C ₄ N ⁺ + ND ₃	→	ND ₃ ⁺ DCND ⁺ CDCCND ⁺	+ C ₄ N + DC ₃ N + DCN	0.65 0.15 0.20	1.20 × 10 ⁻⁹	± 30%	8727
C ₄ N ⁺ + H ₂ O	→	HCO ⁺ CHCCNH ⁺ Adduct	+ HC ₃ N + CO	0.40 0.50 0.10	1.50 × 10 ⁻⁹	± 30%	8727
C ₄ N ⁺ + H ₂ S	→	HCS ⁺ CHCCS ⁺ C ₂ SN ⁺ Adduct	+ HC ₃ N + HCN + C ₂ H ₂	0.60 0.10 0.25 0.15	8.90 × 10 ⁻¹⁰	± 30%	8727
C ₄ N ⁺ + HCN	→	HC ₅ N ₂ ⁺ M Adduct	+ hν	1.00	3.80 × 10 ⁻¹⁰	± 30%	8924 8727

b

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
C ₄ N ⁺	+ CH ₃ CN	→ C ₂ H ₃ ⁺ HC ₄ N ₂ ⁺	+ C ₄ N ₂ + C ₂ H ₂	0.60 0.40	3.10 × 10 ⁻⁹ ± 30%	8727	
C ₄ N ⁺	+ HC ₃ N	→ Adduct		1.00	1.00 × 10 ⁻⁹ ± 30%	8727	
C ₄ N ⁺	+ CO	→ Adduct		1.00	9.60 × 10 ⁻¹¹ ± 30%	8727	
C ₅ N ⁺	+ CH ₄	→ CH ₃ ⁺ C ₂ H ₃ ⁺ C ₃ H ₃ ⁺ C ₅ H ₃ ⁺ HCNH ⁺ H ₂ C ₄ N ⁺ HC ₅ N ⁺ H ₂ C ₆ N ⁺	+ HC ₅ N + HC ₄ N + HC ₃ N + HCN + C ₅ H ₂ + C ₂ H ₂ + CH ₃ + H ₂	0.23 0.07 0.07 0.05 0.08 0.09 0.37 0.04	7.50 × 10 ⁻¹⁰ ± 30%	8922	
C ₅ N ⁺	+ HCN	→ HC ₅ N ⁺ C ₆ N ₂ ⁺ HC ₆ N ₂ ⁺	+ CN + H + hν	0.27 0.57 0.16	9.40 × 10 ⁻¹⁰ ± 30%	8924	
HC ₅ N ⁺ + HCN	→ No Reaction			< 3.20 × 10 ⁻¹³		8924	
HC ₅ N ⁺ + HC ₃ N	→ H ₂ C ₈ N ₂ ⁺	+ hν		1.00	5.00 × 10 ⁻¹⁰ ± 20%	9115	
C ₆ N ⁺	+ HCN	→ HC ₇ N ₂ ⁺	+ hν	1.00	3.80 × 10 ⁻¹⁰ ± 30%	8924	
HC ₆ N ₂ ⁺ + HC ₃ N	→ CHCCNH ⁺	+ C ₆ N ₂		1.00		9115	
H ₂ C ₆ N ₂ ⁺ + H ₂	→ No Reaction			< 1.00 × 10 ⁻¹³		8616	
H ₂ C ₆ N ₂ ⁺ + CO	→ No Reaction			< 1.00 × 10 ⁻¹²		8616	
CO ⁺	+ H	→ H ⁺	+ CO	1.00	7.50 × 10 ⁻¹⁰ ± 30%	8403	
CO ⁺	+ D	→ D ⁺	+ CO	1.00	9.00 × 10 ⁻¹¹ ± 20%	7901	
CO ⁺	+ H ₂	→ HCO ⁺ HO ⁺	+ H + H	0.52 0.48	1.40 × 10 ⁻⁹ ± 15%	8711 7506 7207	8403 7423 6702
CO ⁺	+ D ₂	→ DCO ⁺	+ D	1.00	9.60 × 10 ⁻¹⁰ ± 10%	7901	
CO ⁺	+ CH ₄	→ CH ₃ ⁺ HCO ⁺ CH ₃ CO ⁺	+ CO + CH ₃ + H	0.67 0.28 0.05	1.34 × 10 ⁻⁹ ± 10%	8001	7805 7209
CO ⁺	+ C ₂ H ₂	→ C ₂ H ₂ ⁺	+ CO	1.00	4.10 × 10 ⁻¹⁰	7209	
CO ⁺	+ N	→ No Reaction			< 2.00 × 10 ⁻¹¹	7201	
CO ⁺	+ NH ₃	→ NH ₃ ⁺	+ CO	1.00	1.85 × 10 ⁻⁹ ± 15%	8318 7711	8001 7805
CO ⁺	+ N ₂	→ Adduct				8632	
CO ⁺	+ O	→ O ⁺	+ CO	1.00	1.40 × 10 ⁻¹⁰ ± 50%	7201	
CO ⁺	+ H ₂ O	→ H ₂ O ⁺ HCO ⁺	+ CO + OH	0.65 0.35	2.40 × 10 ⁻⁹ ± 10%	8001 7202	7805 7802

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.			Footnotes		
CO ⁺	+ O ₂	→	O ₂ [‡]	+ CO		1.00	1.50 × 10 ⁻¹⁰	± 30%	8409 7010	7805 6602	a
CO ⁺	+ H ₂ S	→	H ₂ S ⁺ HCO ⁺	+ CO + SH		0.94 0.06	2.10 × 10 ⁻⁹	± 20%	8401	7507	b
CO ⁺	+ Kr	→	Kr ⁺	+ CO		1.00	2.20 × 10 ⁻⁹	± 20%	7318		T = 373
CO ⁺	+ HCN	→	HCO ⁺ HCN ⁺	+ CN + CO		< 0.10 > 0.90	3.40 × 10 ⁻⁹	± 10%	8101		
CO ⁺	+ CH ₃ CN	→	CH ₂ CN ⁺ CH ₂ CNH ⁺	+ H + CO		0.25 0.75	3.00 × 10 ⁻⁹	± 30%	8804		
CO ⁺	+ HC ₃ N	→	CHCCN ⁺	+ CO		1.00	3.10 × 10 ⁻⁹	± 25%	8518	8509	7911
*CO ⁺	+ CO	→	CO ⁺ <u>M</u> Adduct	+ *CO		1.00	6.30 × 10 ⁻¹⁰	± 50%	7611 8632	7318	
CO ⁺	+ H ₂ CO	→	HCO ⁺ H ₂ CO ⁺	+ HCO + CO		0.55 0.45	3.00 × 10 ⁻⁹	± 20%	7805		
CO ⁺	+ CH ₃ OH	→	CH ₂ OH ⁺	+ HCO		1.00	2.40 × 10 ⁻⁹	± 20%	7805		
CO ⁺	+ CO ₂	→	CO ₂ [‡]	+ CO		1.00	1.10 × 10 ⁻⁹	± 10%	8001 7209	7805 6602	7602
CO ⁺	+ CHOOH	→	HCO ⁺	+ HCO ₂		1.00	4.10 × 10 ⁻⁹	± 30%	7821		
CO ⁺	+ NO	→	NO ⁺	+ CO		1.00	4.20 × 10 ⁻¹⁰	± 30%	7209	7201	
CO ⁺	+ N ₂ O	→	Products			1.00	1.15 × 10 ⁻⁹		7209		
CO ⁺	+ SO ₂	→	SO ⁺ SO ₂ [‡]	+ CO ₂ + CO		> 0.90 > 0.10	2.40 × 10 ⁻⁹	± 40%	7507	7209	
CO ⁺	+ COS	→	S ⁺ COS ⁺	+ CO + CO		0.10 0.90	1.41 × 10 ⁻⁹	± 20%	7805	7209	
HCO ⁺	+ D	→	DCO ⁺	+ H		1.00	4.25 × 10 ⁻¹¹	± 20%	8522	8503	a
HCO ⁺	+ H ₂	→	No Reaction <u>M</u> Adduct				< 2.00 × 10 ⁻¹⁴		8505 7711 8632	7805	a
HCO ⁺	+ D ₂	→	DCO ⁺	+ HD		1.00	1.80 × 10 ⁻¹¹	± 50%	7701		
HCO ⁺	+ CH ₄	→	No Reaction				< 1.00 × 10 ⁻¹³		7805	7104	
HCO ⁺	+ C ₂ H ₂	→	C ₂ H ₃ [‡]	+ CO		1.00	1.36 × 10 ⁻⁹	± 25%	7713		
HCO ⁺	+ C ₂ H ₆	→	C ₂ H ₇ [‡]	+ CO		1.00	1.20 × 10 ⁻¹⁰	± 20%	8117		
HCO ⁺	+ NH ₃	→	NH ₄ ⁺	+ CO		1.00	2.25 × 10 ⁻⁹	± 15%	7805 7516	7711 7415	7701
HCO ⁺	+ N ₂	→	No Reaction				< 4.00 × 10 ⁻¹⁴		7805		
HCO ⁺	+ H ₂ O	→	H ₃ O ⁺	+ CO		1.00	2.60 × 10 ⁻⁹	± 30%	8208 7510	7805	7802
HCO ⁺	+ O ₂	→	No Reaction				< 2.00 × 10 ⁻¹³		8505	7805	
HCO ⁺	+ H ₂ S	→	H ₃ S ⁺	+ CO		1.00	1.60 × 10 ⁻⁹	± 30%	7507		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes		
HCO ⁺	+ HCl	→	H ₂ Cl ⁺	+ CO	1.00	4.00 × 10 ⁻¹²	± 20%	8511	<u>8502</u>	ab
HCO ⁺	+ Ar	→	No Reaction			< 1.00 × 10 ⁻¹¹		8505		
HCO ⁺	+ HCN	→	HCNH ⁺	+ CO	1.00	3.50 × 10 ⁻⁹	± 15%	<u>8512</u>	7819	7704
						7605				
HCO ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺	+ CO	1.00	4.10 × 10 ⁻⁹	± 25%	7605		
HCO ⁺	+ HC ₃ N	→	CHCCNH ⁺	+ CO	1.00	3.80 × 10 ⁻⁹	± 20%	8518	8412	7911
*HCO ⁺	+ CO	→	HCO ⁺	+ *CO	1.00	2.60 × 10 ⁻¹⁰	± 20%	<u>8005</u>		a
HCO ⁺	+ CO	→	No Reaction ^M Adduct			< 4.00 × 10 ⁻¹⁴		7805		
						8632				
HCO ⁺	+ H ₂ CO	→	CH ₂ OH ⁺	+ CO	1.00	3.30 × 10 ⁻⁹	± 15%	7906	7902	7805
HCO ⁺	+ CH ₃ OH	→	CH ₃ OH ₂ ⁺	+ CO	1.00	2.60 × 10 ⁻⁹	± 15%	7902	7805	
HCO ⁺	+ CO ₂	→	No Reaction			< 2.00 × 10 ⁻¹³		7805		
HCO ⁺	+ CHOOH	→	CH(OH) ₂ ⁺	+ CO	1.00	1.80 × 10 ⁻⁹	± 15%	7902	7820	7818
HCO ⁺	+ CH ₂ CO	→	CH ₃ CO ⁺	+ CO	1.00	1.80 × 10 ⁻⁹	± 15%	7902		
HCO ⁺	+ CH ₃ CHO	→	C ₂ H ₅ O ⁺	+ CO	1.00	3.30 × 10 ⁻⁹	± 15%	8617	7902	
HCO ⁺	+ C ₂ H ₅ OH	→	H ₃ O ⁺ C ₂ H ₅ OH ₂ ⁺	+ C ₂ H ₄ + CO + CO	0.45 0.55	2.20 × 10 ⁻⁹	± 15%	7902		
HCO ⁺	+ (CH ₃) ₂ O	→	(CH ₃) ₂ OH ⁺	+ CO	1.00	2.10 × 10 ⁻⁹	± 15%	7902		
HCO ⁺	+ CH ₃ COOH	→	CH ₃ CO ⁺ CH ₃ C(OH) ₂ ⁺	+ H ₂ O + CO + CO	0.20 0.80	2.50 × 10 ⁻⁹	± 30%	7818		
HCO ⁺	+ CS ₂	→	HCS ₂ ⁺	+ CO	1.00	2.00 × 10 ⁻⁹	± 20%	8204		
HCO ⁺	+ N ₂ O	→	HN ₂ O ⁺	+ CO	1.00	3.30 × 10 ⁻¹²	± 15%	8710	7512	7313
HCO ⁺	+ COS	→	HCOS ⁺	+ CO	1.00	1.10 × 10 ⁻⁹	± 20%	7805		
DCO ⁺	+ H	→	HCO ⁺	+ D	1.00	1.50 × 10 ⁻¹¹	± 30%	8521	<u>8503</u>	a
HOC ⁺	+ H ₂	→	H ₃ ⁺ HCO ⁺	+ CO + H ₂	0.57 0.43	4.70 × 10 ⁻¹⁰	± 20%	8711	8505	b
HOC ⁺	+ CH ₄	→	CH ₃ ⁺	+ CO	1.00	1.10 × 10 ⁻⁹	± 20%	8711		
HOC ⁺	+ N ₂	→	N ₂ H ⁺	+ CO	1.00	6.70 × 10 ⁻¹⁰	± 20%	8505		
HOC ⁺	+ O ₂	→	HO ₂ ⁺	+ CO	1.00	1.90 × 10 ⁻¹⁰	± 20%	8711		
HOC ⁺	+ Ar	→	No Reaction			< 1.00 × 10 ⁻¹²		8711		
HOC ⁺	+ Kr	→	KrH ⁺	+ CO	1.00	4.00 × 10 ⁻¹⁰	± 20%	8711		
HOC ⁺	+ Xe	→	XeH ⁺	+ CO	1.00	~ 1.00 × 10 ⁻⁹	± 40%	8711		
HOC ⁺	+ CO	→	IICO ⁺	+ CO	1.00	6.00 × 10 ⁻¹⁰	± 20%	8711		
HOC ⁺	+ CO ₂	→	HCO ₂ ⁺	+ CO	1.00	9.45 × 10 ⁻¹⁰	± 20%	8711	8505	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
HOC ⁺	+ NO	→	HNO ⁺	+ CO	1.00	7.10×10^{-10}	± 20%	8711
HOC ⁺	+ N ₂ O	→	HN ₂ O ⁺	+ CO	1.00	1.17×10^{-9}	± 20%	8710 8505
DOC ⁺	+ H ₂	→	H ₂ D ⁺	+ CO	0.57	6.20×10^{-10}	± 20%	8711
			HCO ⁺	+ HD	0.43			
H ₂ CO ⁺	+ H ₂	→	No Reaction			$< 4.00 \times 10^{-14}$		7805 7711
H ₂ CO ⁺	+ D ₂	→	No Reaction			$< 5.00 \times 10^{-12}$		7701
H ₂ CO ⁺	+ CH ₄	→	CH ₃ OH ⁺	+ CH ₃	0.85	1.10×10^{-10}	± 20%	7805
			C ₂ H ₅ O ⁺	+ H	0.15			
H ₂ CO ⁺	+ NH ₃	→	NH ₃ ⁺	+ H ₂ CO	0.37	2.00×10^{-9}	± 15%	7805 7711 7701
			NH ₄ ⁺	+ HCO	0.63			
H ₂ CO ⁺	+ N ₂	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
H ₂ CO ⁺	+ H ₂ O	→	H ₃ O ⁺	+ HCO	1.00	2.10×10^{-9}	± 20%	7805 7802
H ₂ CO ⁺	+ O ₂	→	H ₂ O ₂ ⁺	+ CO	0.30	1.10×10^{-10}	± 20%	7805
			HCO ⁺	+ HO ₂	0.70			
H ₂ CO ⁺	+ HCN	→	HCNH ⁺	+ HCO	1.00	1.40×10^{-9}	± 10%	7701
H ₂ CO ⁺	+ CO	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
H ₂ CO ⁺	+ H ₂ CO	→	CH ₂ OH ⁺	+ HCO	1.00	3.20×10^{-9}	± 30%	7805
H ₂ CO ⁺	+ CH ₃ OH	→	CH ₂ OH ⁺	+ CH ₃ O	0.10	2.40×10^{-9}	± 30%	7805
			CH ₃ OH ₂ ⁺	+ HCO	0.90			
H ₂ CO ⁺	+ CO ₂	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
H ₂ CO ⁺	+ COS	→	H ₂ S ⁺	+ CO + CO	0.56	1.00×10^{-9}	± 20%	7805
			HCO ₂ ⁺	+ HCO	0.41			
			H ₂ COS ⁺	+ CO	0.03			
CH ₂ OH ⁺	+ H ₂	→	No Reaction			$< 2.00 \times 10^{-14}$		7805 7711
CH ₂ OH ⁺	+ CH ₄	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
CH ₂ OH ⁺	+ C ₄ H ₂	→	C ₄ H ₃ ⁺	+ H ₂ CO	1.00	9.30×10^{-10}	± 20%	8702
CH ₂ OH ⁺	+ NH ₃	→	NH ₄ ⁺	+ H ₂ CO	1.00	2.05×10^{-9}	± 15%	7906 7805 7711
CH ₂ OH ⁺	+ N ₂	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
CH ₂ OH ⁺	+ H ₂ O	→	H ₃ O ⁺	+ H ₂ CO	1.00	2.30×10^{-10}	± 10%	7805 7802
CH ₂ OH ⁺	+ O ₂	→	No Reaction			$< 4.00 \times 10^{-14}$		7805
CH ₂ OH ⁺	+ H ₂ S	→	H ₃ S ⁺	+ H ₂ CO	1.00	4.00×10^{-10}	± 40%	7814 7809 7701 b
CH ₂ OH ⁺	+ HCN	→	HCNH ⁺	+ H ₂ CO	1.00	1.30×10^{-9}	± 30%	7814 7809 b
CH ₂ OH ⁺	+ CO	→	No Reaction			$< 4.00 \times 10^{-14}$		7711
CH ₂ OH ⁺	+ H ₂ CO	M	Adduct					8632

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
CH ₂ OH ⁺	+ CH ₃ OH	→	CH ₃ OH ₂ ⁺	+ H ₂ CO	1.00	1.90 × 10 ⁻⁹	± 30%	7805
CH ₂ OH ⁺	+ CO ₂	→	No Reaction		< 4.00 × 10 ⁻¹⁴		7805	
CH ₂ OH ⁺	+ CHOOH	→	CH(OH) ₂ ⁺	+ H ₂ CO	1.00	2.00 × 10 ⁻⁹	± 30%	7820
CH ₂ OH ⁺	+ COS	→	No Reaction		< 4.00 × 10 ⁻¹³		7805	
CH ₃ OH ₂ ⁺	+ C ₄ H ₂	→ <u>M</u>	No Reaction Adduct		< 2.00 × 10 ⁻¹¹		8702 9118	
CH ₃ OH ₂ ⁺	+ CH ₃ OH	→ <u>M</u>	(CH ₃) ₂ OH ⁺ Adduct	+ H ₂ O	1.00	7.60 × 10 ⁻¹¹	± 30%	9119 8632
CH ₃ CHO ⁺	+ CH ₃ CHO	→	C ₂ H ₅ O ⁺	+ CH ₃ CO	1.00	3.00 × 10 ⁻⁹	± 30%	8617
CH ₃ CHOH ⁺	+ CH ₃ CHO	→ <u>M</u>	Adduct				8632	
(CH ₃) ₂ OH ⁺	+ (CH ₃) ₂ O	→	Adduct	+ hν	1.00	2.00 × 10 ⁻¹²	± 20%	9032
(CH ₃) ₂ COH ⁺	+ (CH ₃) ₂ CO	→ <u>M</u>	Adduct Adduct	+ hν	1.00	9.20 × 10 ⁻¹²	± 20%	9032 8632
CO ₂ [‡]	+ H	→	H ⁺ HCO ⁺	+ CO ₂ + O	~0.17 ~0.83	3.25 × 10 ⁻¹⁰	± 60%	8417 7101
CO ₂ [‡]	+ D	→	D ⁺ DCO ⁺	+ CO ₂ + O	< 0.24 > 0.76	8.40 × 10 ⁻¹¹	± 25%	7901
CO ₂ [‡]	+ H ₂	→	HCO ₂ [‡]	+ H	1.00	6.20 × 10 ⁻¹⁰	± 35%	8401 7901 7211
CO ₂ [‡]	+ D ₂	→	DCO ₂ [‡]	+ D	1.00	5.00 × 10 ⁻¹⁰	± 20%	7912
CO ₂ [‡]	+ CH ₄	→	CH ₄ ⁺ HCO ₂ [‡]	+ CO ₂ + CH ₃	0.25 0.27	1.05 × 10 ⁻⁹	± 10%	8314 7424
CO ₂ [‡]	+ N	→	No Reaction			< 1.00 × 10 ⁻¹¹		7004
CO ₂ [‡]	+ NH ₃	→	NH ₃ ⁺	+ CO ₂	1.00	1.90 × 10 ⁻⁹	± 10%	8318
CO ₂ [‡]	+ O	→	O ⁺ O ₂ [‡]	+ CO ₂ + CO	~0.37 ~0.63	2.60 × 10 ⁻¹⁰	± 50%	7004
CO ₂ [‡]	+ H ₂ O	→	H ₂ O ⁺ HCO ₂ [‡]	+ CO ₂ + OH	0.75 0.25	2.40 × 10 ⁻⁹	± 15%	8001
CO ₂ [‡]	+ O ₂	→	O ₂ [‡]	+ CO ₂	1.00	5.50 × 10 ⁻¹¹	± 15%	8506 8203 <u>7417</u> 7912 7004
CO ₂ [‡]	+ H ₂ S	→	H ₂ S ⁺	+ CO ₂	1.00	1.55 × 10 ⁻⁹	± 20%	8401
CO ₂ [‡]	+ Xe	→	Xe ⁺	+ CO ₂	1.00	6.00 × 10 ⁻¹⁰	± 30%	8314
CO ₂ [‡]	+ HCN	→	HCN ⁺ HCO ₂ [‡]	+ CO ₂ + CN	~0.90 ~0.10	9.00 × 10 ⁻¹⁰	± 10%	8101
CO ₂ [‡]	+ CH ₃ CN	→	CH ₂ CNH ⁺	+ CO ₂	1.00	2.50 × 10 ⁻⁹	± 30%	8804
*CO ₂ [‡]	+ CO ₂	→ <u>M</u>	CO ₂ [‡] Adduct	+ *CO ₂	1.00	3.70 × 10 ⁻¹⁰	± 10%	7611 8632

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes		
CO ₂ ⁺	+ NO	→	NO ⁺	+ CO ₂	1.00	1.23 × 10 ⁻¹⁰ ± 20%	8314 7004	8203	8123
CO ₂ ⁺	+ SO ₂	→	SO ₂ ⁺	+ CO ₂	1.00	1.50 × 10 ⁻⁹ ± 20%	8203		
CO ₂ ⁺	+ COS	→	COS ⁺	+ CO ₂	1.00	9.60 × 10 ⁻¹⁰ ± 20%	8203		
HCO ₂ ⁺	+ CH ₄	→	CH ₅ ⁺	+ CO ₂	1.00	7.20 × 10 ⁻¹⁰ ± 15%	8006 7310	7424	7313
HCO ₂ ⁺	+ C ₂ H ₂	→	C ₂ H ₃ ⁺	+ CO ₂	1.00	1.37 × 10 ⁻⁹ ± 25%	7713		
HCO ₂ ⁺	+ N ₂	→	N ₂ H ⁺	+ CO ₂	1.00	< 2.00 × 10 ⁻¹⁵	7607		
HCO ₂ ⁺	+ H ₂ O	→	H ₃ O ⁺	+ CO ₂	1.00	2.65 × 10 ⁻⁹ ± 20%	8208	7510	
HCO ₂ ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺	+ CO ₂	1.00	4.10 × 10 ⁻⁹ ± 25%	7605		
HCO ₂ ⁺	+ NO	→	HNO ⁺	+ CO ₂	1.00	< 1.00 × 10 ⁻¹⁰	7104		
CH(OH) ₂ ⁺	+ C ₂ H ₄	→	C ₂ H ₅ ⁺ C ₂ H ₅ O ⁺	+ CHO OH + H ₂ CO		6.20 × 10 ⁻¹⁰ ± 25%	8612		
CH(OH) ₂ ⁺	+ C ₂ H ₆	→	No Reaction			< 1.00 × 10 ⁻¹²	8612		
CH(OH) ₂ ⁺	+ C ₄ H ₂	→	C ₄ H ₃ ⁺ <u>M</u> Adduct	+ CHO OH	1.00	6.20 × 10 ⁻¹⁰ ± 20%	9118	8702	
							9118		b
CH(OH) ₂ ⁺	+ NH ₃	→	NH ₃ ⁺ NH ₃ OH ⁺	+ CHO OH + H ₂ CO		1.20 × 10 ⁻⁹ ± 25%	8612		
CH(OH) ₂ ⁺	+ ND ₃	→	NHD ₃ ⁺ ND ₃ OH ⁺	+ CHO OH + H ₂ CO		1.40 × 10 ⁻⁹ ± 25%	8612		
*CH(OH) ₂ ⁺	+ H ₂ O	→	H ₃ O ⁺	+ CHO OH	1.00	2.10 × 10 ⁻¹¹ ± 25%	8612		
CH(OH) ₂ ⁺	+ D ₂ O	→	HD ₂ O ⁺	+ CHO OH	1.00	2.60 × 10 ⁻¹¹ ± 25%	8612		
CH(OH) ₂ ⁺	+ H ₂ S	→	H ₃ S ⁺ CH ₂ OH ⁺ HSO ⁺ H ₃ SO ⁺	+ CHO OH + H ₂ SO + CH ₃ OH + H ₂ CO		7.40 × 10 ⁻¹⁰ ± 25%	8612		
CH(OH) ₂ ⁺	+ CO ₂	→	No Reaction			< 1.00 × 10 ⁻¹²	8612		
CH(OH) ₂ ⁺	+ COS	→	H ₃ SO ⁺ HCO ₂ S ⁺	+ CO + CO + H ₂ CO		8.60 × 10 ⁻¹⁰ ± 25%	8612		
CS ⁺	+ H ₂	→	HCS ⁺	+ H	1.00	4.30 × 10 ⁻¹⁰ ± 15%	8401	8303	7414
CS ⁺	+ CH ₄	→	HCS ⁺	+ CH ₃	1.00	7.30 × 10 ⁻¹⁰ ± 45%	8303	7414	
CS ⁺	+ O ₂	→	COS ⁺	+ O	1.00	1.02 × 10 ⁻¹⁰ ± 20%	8401	8303	
									b
HCS ⁺	+ H ₂	→	No Reaction			< 5.00 × 10 ⁻¹³	8517	8401	8303
HCS ⁺	+ CH ₄	→	No Reaction			< 1.00 × 10 ⁻¹²	8525	8517	
HCS ⁺	+ NH ₃	→	NH ₄ ⁺	+ CS	1.00	2.00 × 10 ⁻⁹ ± 20%	8525	8517	
HCS ⁺	+ N ₂	→	No Reaction			< 1.00 × 10 ⁻¹²	8525	8517	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
HCS ⁺	+ H ₂ O	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ O ₂	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ H ₂ S	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ IICN	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ CO	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ H ₂ CO	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ CO ₂	→	No Reaction		<1.00×10 ⁻¹²	8525	8517	
HCS ⁺	+ C ₂ H ₅ OH	→	C ₂ H ₅ OH ₂ ⁺	+ CS	1.00	8.20×10 ⁻¹⁰ ± 20%	8525	
HCS ⁺	+ (CH ₃) ₂ CO	→	(CH ₃) ₂ COH ⁺	+ CS	1.00	2.40×10 ⁻⁹ ± 20%	8525	
HCS ⁺	+ CH ₃ SH	→	CH ₃ SH ₂ ⁺	+ CS	1.00	4.50×10 ⁻¹⁰ ± 20%	8525	8517
CS ₂ ⁺	+ Xe	→	No Reaction		<5.00×10 ⁻¹⁴		9105	
CS ₂ ⁺	+ CS ₂	M	Adduct				8632	
HCS ₂ ⁺	+ C ₂ H ₄	→	C ₂ H ₅ ⁺	+ CS ₂	1.00	4.50×10 ⁻¹¹ ± 10%	8807	a
HCS ₂ ⁺	+ H ₂ O	→	H ₃ O ⁺	+ CS ₂	1.00	2.05×10 ⁻⁹ ± 70%	8807	8208
CCl ⁺	+ H ₂	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ CH ₄	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ NH ₃	→	HCNH ⁺ CHNH ₂ ⁺	+ HCl + Cl	0.99 0.01	1.30×10 ⁻⁹ ± 20%	8623	8511 8502
CCl ⁺	+ N ₂	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ H ₂ O	→	No Reaction		<3.00×10 ⁻¹¹	8511		
CCl ⁺	+ O ₂	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ HCN	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ CO	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
CCl ⁺	+ H ₂ CO	→	CH ₂ Cl ⁺	+ CO	1.00	5.30×10 ⁻¹⁰ ± 20%	8623	8511
CCl ⁺	+ CO ₂	→	No Reaction		<1.00×10 ⁻¹²	8511	8502	
HCCl ⁺	+ H ₂	→	CH ₂ Cl ⁺	+ H	1.00	6.00×10 ⁻¹² ± 20%	8502	
HCCl ⁺	+ CH ₄	→	No Reaction		<1.00×10 ⁻¹²	8502		
HCCl ⁺	+ NH ₃	→	NH ₄ ⁺	+ CCl	1.00	~2.50×10 ⁻⁹ ± 50%	8502	
HCCl ⁺	+ N ₂	→	No Reaction		<1.00×10 ⁻¹²	8502		
HCCl ⁺	+ O ₂	→	No Reaction		<1.00×10 ⁻¹²	8502		
HCCl ⁺	+ HCN	→	No Reaction		<1.00×10 ⁻¹²	8502		

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
HCCl ⁺	+ CO	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
HCCl ⁺	+ CO ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
CH ₂ Cl ⁺	+ H ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	8511	8502	
CH ₂ Cl ⁺	+ CH ₄	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
CH ₂ Cl ⁺	+ NH ₃	→	NH ₄ ⁺ CH ₂ NH ₂ ⁺	+ HCl	0.50 0.50	~ 1.50 × 10 ⁻⁹ ± 50%	8502	
CH ₂ Cl ⁺	+ N ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
CH ₂ Cl ⁺	+ H ₂ O	→	CH ₂ OH ⁺	+ HCl	1.00	1.20 × 10 ⁻¹⁰ ± 10%	7802	
CH ₂ Cl ⁺	+ O ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
CH ₂ Cl ⁺	+ HCN	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
CH ₂ Cl ⁺	+ CO	→	No Reaction		< 1.00 × 10 ⁻¹²	8511	8502	
CH ₂ Cl ⁺	+ CO ₂	→	No Reaction		< 1.00 × 10 ⁻¹²	8502		
NO ⁺	+ H ₂	→	No Reaction		< 1.00 × 10 ⁻¹³	8010	7701	
NO ⁺	+ CH ₄	→	No Reaction Adduct		< 1.00 × 10 ⁻¹¹	8018	8632	
NO ⁺	+ i-C ₄ H ₈	→	i-C ₄ H ₈ ⁺	+ NO	1.00	1.27 × 10 ⁻⁹ ± 20%	9040	
NO ⁺	+ c-C ₆ H ₆	→	c-C ₆ H ₆ ⁺	+ NO	1.00	1.43 × 10 ⁻⁹ ± 20%	9040	
NO ⁺	+ NH ₃	→	Adduct				8632	
NO ⁺	+ N ₂	→	Adduct				8632	
NO ⁺	+ H ₂ O	→	Adduct				8632	
NO ⁺	+ O ₂	→	No Reaction Adduct		< 1.00 × 10 ⁻¹¹	8018	8632	
NO ⁺	+ O ₃	→	No Reaction Adduct		< 1.00 × 10 ⁻¹⁴	7303	8632	
NO ⁺	+ Na	→	Na ⁺	+ NO	1.00	7.70 × 10 ⁻¹¹ ± 30%	6901	
NO ⁺	+ H ₂ S	→	Adduct				8632	
NO ⁺	+ Kr	→	Adduct				8632	
NO ⁺	+ CH ₃ NH ₂	→	CH ₃ NH ₂ ⁺	+ NO	1.00	8.20 × 10 ⁻¹⁰ ± 20%	8010	
NO ⁺	+ CO	→	Adduct				8632	
NO ⁺	+ H ₂ CO	→	Adduct				8632	
NO ⁺	+ CH ₃ OH	→	Adduct				8632	
NO ⁺	+ CO ₂	→	No Reaction Adduct		< 1.00 × 10 ⁻¹¹	8018	8632	
NO ⁺	+ CH ₃ CHO	→	CH ₃ CO ⁺	+ HNO	1.00	3.50 × 10 ⁻¹⁰ ± 20%	9040	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
NO ⁺	+ NO	ℳ	Adduct			8632		
NO ⁺	+ NO ₂	→	No Reaction		<3.00 × 10 ⁻¹²	8018		
NO ⁺	+ N ₂ O	→	No Reaction		<1.00 × 10 ⁻¹¹	8018		
		ℳ	Adduct			8632		
NO ⁺	+ COS	ℳ	Adduct			8632		
HNO ⁺	+ CH ₄	→	CH ₃ ⁺	+ NO	1.00 >1.00 × 10 ⁻¹⁰	7104		
HNO ⁺	+ N ₂	→	N ₂ H ⁺	+ NO	1.00 <1.00 × 10 ⁻¹⁰	7104		
HNO ⁺	+ H ₂ O	→	H ₃ O ⁺	+ NO	1.00 2.30 × 10 ⁻⁹ ±25%	8208		
HNO ⁺	+ CO	→	HCO ⁺	+ NO	1.00 >1.00 × 10 ⁻¹⁰	7104		
HNO ⁺	+ CO ₂	→	HCO ₂ ⁺	+ NO	1.00 >1.00 × 10 ⁻¹⁰	7104		
HNO ⁺	+ NO	→	NO ⁺	+ HNO	1.00 7.00 × 10 ⁻¹⁰ ±30%	7005		
NO ₂ [‡]	+ N	→	No Reaction		<8.00 × 10 ⁻¹²	7717		
NO ₂ [‡]	+ O	→	No Reaction		<8.00 × 10 ⁻¹²	7717		
NO ₂ [‡]	+ H ₂ O	ℳ	Adduct			8632		
NO ₂ [‡]	+ NO	→	NO ⁺	+ NO ₂	1.00 2.75 × 10 ⁻¹⁰ ±30%	8314	6904	
N ₂ O ⁺	+ H ₂	→	N ₂ H ⁺	+ OH	0.29 3.60 × 10 ⁻¹⁰ ±40%	7423	7210	6702
			HN ₂ O ⁺	+ H	0.71			
N ₂ O ⁺	+ CH ₄	→	HNO ⁺	+ HCN + H ₂	0.03 1.00 × 10 ⁻⁹ ±10%	7424	7210	
			HN ₂ O ⁺	+ CH ₃	0.97			
N ₂ O ⁺	+ N ₂	→	No Reaction		<1.00 × 10 ⁻¹²	8402		
N ₂ O ⁺	+ O ₂	→	O ₂ [‡]	+ N ₂ O	0.83 2.70 × 10 ⁻¹⁰ ±20%	8402		
			NO ⁺	+ NO ₂	0.17			
N ₂ O ⁺	+ CO	→	CO ₂ [‡]	+ N ₂	0.37 3.00 × 10 ⁻¹⁰ ±20%	8402		
			NO ⁺	+ NCO	0.63			
N ₂ O ⁺	+ CO ₂	ℳ	Adduct			8632		
N ₂ O ⁺	+ NO	→	NO ⁺	+ N ₂ O	1.00 2.30 × 10 ⁻¹⁰ ±40%	8402	8314	
N ₂ O ⁺	+ NO ₂	→	NO ⁺	+ N ₂ + O ₂	0.66 6.50 × 10 ⁻¹⁰ ±50%	8402		
			NO ₂ [‡]	+ N ₂ O	0.34			
N ₂ O ⁺	+ N ₂ O	→	NO ⁺	+ N ₂ + NO	1.00 ~1.20 × 10 ⁻¹¹	8402		
		ℳ	Adduct			8632		
HN ₂ O ⁺	+ C ₂ H ₂	→	C ₂ H ₃ ⁺	+ N ₂ O	1.00 1.21 × 10 ⁻⁹ ±25%	7713		
HN ₂ O ⁺	+ C ₂ H ₆	→	C ₂ H ₅ ⁺	+ N ₂ O + H ₂	0.05 1.08 × 10 ⁻⁹ ±20%	8117	7415	
			C ₂ H ₇ ⁺	+ N ₂ O	0.95			
HN ₂ O ⁺	+ NH ₃	→	NH ₄ ⁺	+ N ₂ O	1.00 2.10 × 10 ⁻⁹ ±20%	7415		
HN ₂ O ⁺	+ H ₂ O	→	H ₃ O ⁺	+ N ₂ O	1.00 2.83 × 10 ⁻⁹ ±25%	8208	7510	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.		Footnotes
HN ₂ O ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺	+ N ₂ O	1.00	3.80 × 10 ⁻⁹	± 25%	7605
HN ₂ O ⁺	+ CO	→	HCO ⁺	+ N ₂ O	1.00	5.30 × 10 ⁻¹⁰	± 20%	8006 7512 7313
HNNO ⁺	+ CH ₄	→	CH ₃ [‡]	+ N ₂ O	1.00	1.00 × 10 ⁻¹¹	± 25%	9031
NNOH ⁺	+ CH ₄	→	No Reaction		< 1.00 × 10 ⁻¹²		9031 7104	
MgO ⁺	+ N ₂	→	No Reaction		< 1.00 × 10 ⁻¹²		8113	
MgO ⁺	+ O	→	Mg ⁺	+ O ₂	1.00	~ 1.00 × 10 ⁻¹⁰		6802
MgO ⁺	+ D ₂ O	→	MgOD ⁺	+ OD	1.00	1.30 × 10 ⁻⁹	± 30%	8113
MgO ⁺	+ O ₃	→	Mg ⁺	+ O ₂ + O ₂	1.00	8.00 × 10 ⁻¹⁰	± 50%	8113
MgO ⁺	+ CO	→	Mg ⁺	+ CO ₂	1.00	3.20 × 10 ⁻¹⁰	± 30%	8113
MgO ⁺	+ NO	→	Mg ⁺	+ NO ₂	1.00	4.30 × 10 ⁻¹⁰	± 30%	8113
MgOH ⁺	+ H ₂ O ₂	→	Mg(OH) ₂ ⁺	+ OH	1.00	~ 1.00 × 10 ⁻⁹	± 50%	8113
SiNH ₂ [‡]	+ NH ₃	→	NH ₄ ⁺	+ SiNH	1.00	9.00 × 10 ⁻¹⁰	± 30%	8824
SiNH ₂ [‡]	+ (CH ₃) ₂ CO	→	SiNHCH ₃ [‡] Adduct	+ CH ₃ CHO	0.85 0.15	2.40 × 10 ⁻⁹	± 30%	8824
SiNH ₂ [‡]	+ (CH ₃) ₂ S	→	CH ₃ SCH ₂ [‡] SiNHCH ₃ [‡] Adduct	+ SiNH ₃ + CH ₃ SH	0.70 0.05 0.25	1.50 × 10 ⁻⁹	± 30%	8824
SiO ⁺	+ H ₂	→	SiOH ⁺	+ H	1.00	3.20 × 10 ⁻¹⁰	± 30%	8111
SiO ⁺	+ D ₂	→	SiOD ⁺	+ D	1.00	2.00 × 10 ⁻¹⁰	± 30%	8111
SiO ⁺	+ N	→	Si ⁺ NO ⁺	+ NO + Si	~ 0.70 ~ 0.30	~ 3.00 × 10 ⁻¹⁰	± 50%	6903
SiO ⁺	+ O	→	Si ⁺	+ O ₂	1.00	~ 2.00 × 10 ⁻¹⁰	± 50%	6903
SiO ⁺	+ O ₂	→	No Reaction		< 2.00 × 10 ⁻¹³		8918	
SiO ⁺	+ NO ₂	→	NO ⁺ NO ₂ ⁺ SiO ₂ ⁺	+ SiO ₂ + SiO + NO	0.63 0.35 0.02	1.50 × 10 ⁻⁹	± 30%	8918
SiO ⁺	+ N ₂ O	→	SiO ₂ ⁺	+ N ₂	1.00	4.80 × 10 ⁻¹⁰	± 30%	8918
SiOH ⁺	+ H ₂	→	No Reaction		< 2.00 × 10 ⁻¹³		8705	
SiOH ⁺	+ CH ₂ CCH ₂	→	C ₃ H ₅ [‡] Adduct	+ SiO	0.20 0.80	3.10 × 10 ⁻¹¹	± 30%	8933
SiOH ⁺	+ NH ₃	→	NH ₄ ⁺	+ SiO	1.00	2.25 × 10 ⁻⁹	± 30%	8933 8111
SiOH ⁺	+ H ₂ O	→	Adduct		1.00	1.00 × 10 ⁻¹¹	± 30%	8705
SiOH ⁺	+ CH ₃ CN	→	CH ₃ CNH ⁺ Adduct	+ SiO	0.45 0.55	4.80 × 10 ⁻¹⁰	± 30%	8933

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
SiOH^+ + H_2S → No Reaction				$< 1.00 \times 10^{-12}$		8933	
SiOH^+ + CO → No Reaction				$< 3.00 \times 10^{-13}$		8705	
SiOH^+ + CH_3OH	→ SiOCH_3^+ Adduct	+ H_2O		0.90 0.10	1.15×10^{-9} $\pm 30\%$	8705	
SiOH^+ + CHOOH	→ SiO_2H_3^+ Adduct	+ CO		≥ 0.90 ≤ 0.10	1.00×10^{-9} $\pm 30\%$	8705	
SiOH^+ + $\text{C}_2\text{H}_5\text{OH}$	→ SiH_2OH^+ SiO_2H_3^+ $\text{SiOC}_2\text{H}_5^+$ $\text{C}_2\text{H}_5\text{OH}_2^+$	+ CH_3CHO + C_2H_4 + H_2O + SiO		0.03 0.60 0.30 0.07	2.40×10^{-9} $\pm 30\%$	8705	
SiOH^+ + $(\text{CH}_3)_2\text{O}$	→ $(\text{CH}_3)_2\text{OH}^+$ Adduct	+ SiO		0.20 0.80	9.50×10^{-10} $\pm 30\%$	8933	
$\text{SiOH}^+ + \text{CH}_3\text{COOH}$	→ CH_3CO^+ $\text{CH}_3\text{C}(\text{OH})_2^+$	+ SiO_2H_2 + SiO		0.90 0.10	2.30×10^{-9} $\pm 30\%$	8705	
SiO_2^+ + O ₂	→ No Reaction			$< 1.00 \times 10^{-13}$		8111	
SiO_2H_3^+ + H ₂ O	→ Adduct			1.00		8705	
SiO_2H_3^+ + HCOOH	→ SiO_3H_5^+ $\text{SiO}_3\text{CH}_3^+$	+ CO + H ₂ O		0.10 0.90		8705	
SiO_2H_3^+ + C ₂ H ₅ OH	→ SiO_3H_5^+ $\text{SiO}_2\text{C}_2\text{H}_7^+$ Adduct	+ C ₂ H ₄ + H ₂ O				8705	
SO ⁺ + H ₂	→ No Reaction			$< 6.00 \times 10^{-12}$		8401	
SO ⁺ + N	→ NS ⁺	+ O		1.00	$- 5.00 \times 10^{-11}$ $\pm 50\%$	7302	
SO ⁺ + NH ₃	→ NH ₃ ⁺	+ SO		1.00	1.30×10^{-9} $\pm 30\%$	7507	
SO ⁺ + O ₂	→ No Reaction			$< 2.20 \times 10^{-11}$		8401	
SO ⁺ + H ₂ S	→ S ₂ ⁺	+ H ₂ O		1.00	1.10×10^{-9} $\pm 30\%$	7507	
SO ⁺ + CO	→ No Reaction			$< 1.00 \times 10^{-12}$		7302	
SO ⁺ + SO ₂	→ No Reaction			$< 1.00 \times 10^{-11}$		8401	
SO ₂ ⁺ + H ₂	→ HSO ₂ ⁺	+ H		1.00	1.70×10^{-11} $\pm 40\%$	8401	
SO ₂ ⁺ + O ₂	→ O ₂ ⁺	+ SO ₂		1.00	2.65×10^{-10} $\pm 20\%$	8401	7302
SO ₂ ⁺ + CO	→ SO ⁺	+ CO ₂		1.00	3.00×10^{-10} $\pm 20\%$	7302	
SO ₂ ⁺ + CO ₂	→ M Adduct					8632	
SO ₂ ⁺ + NO	→ NO ⁺	+ SO ₂		1.00	7.00×10^{-11} $\pm 30\%$	8314	
SO ₂ ⁺ + SO ₂	→ No Reaction M Adduct			$< 1.00 \times 10^{-11}$		8401	
						8632	

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes
H ₂ O ⁺	+ H ₂ O	→	H ₃ O ⁺ + SO ₂	1.00	2.13 × 10 ⁻⁹ ± 25%	8208	
H ₂ O ⁺	+ C ₂ N ₂	→	HC ₂ N ₂ ⁺ + SO ₂	1.00	8.20 × 10 ⁻¹⁰ ± 30%	8412	
CrO ⁺	+ H ₂	→	No Reaction		< 4.00 × 10 ⁻¹²	8628	
CrO ⁺	+ CH ₄	→	No Reaction		< 4.00 × 10 ⁻¹²	8628	
CrO ⁺	+ C ₂ H ₆	→	Cr ⁺ + C ₂ H ₅ OH	1.00	~ 1.00 × 10 ⁻¹⁰ ± 50%	8628	
FeO ⁺	+ CH ₄	→	No Reaction		< 1.00 × 10 ⁻¹¹	8427	
FeO ⁺	+ C ₂ H ₆	→	Fe ⁺ + H ₂ O + C ₂ H ₄	0.10		8427	
			FeC ₂ H ₄ ⁺ + H ₂ O	0.70			
			FeH ₂ O ⁺ + C ₂ H ₄	0.20			
FeO ⁺	+ <i>c</i> -C ₃ H ₆	→	No Reaction		< 1.00 × 10 ⁻¹¹	8427	
FeO ⁺	+ C ₃ H ₈	→	Fe ⁺ + H ₂ O + C ₃ H ₆	0.20		8427	
			FeC ₃ H ₆ ⁺ + H ₂ O	0.50			
			FeCH ₂ O ⁺ + C ₃ H ₆	0.10			
			HOFeC ₂ H ₄ ⁺ + CH ₃	0.20			
ZrO ⁺	+ O ₂	→	ZrO ₂ ⁺ + O	1.00	5.00 × 10 ⁻¹² ± 75%	8528	
ZrO ⁺	+ CO ₂	→	ZrO ₂ ⁺ + CO	1.00	1.00 × 10 ⁻¹² ± 75%	8528	
ZrO ⁺	+ NO	→	ZrO ₂ ⁺ + N	1.00	2.50 × 10 ⁻¹² ± 75%	8528	
SiS ⁺	+ H ₂	→	No Reaction		< 2.00 × 10 ⁻¹⁴	8918	
SiS ⁺	+ O ₂	→	SO ⁺ + SiO	0.70	8.90 × 10 ⁻¹¹ ± 30%	8918	
			SiO ⁺ + SO	0.30			
SiS ⁺	+ CO	→	No Reaction		< 4.00 × 10 ⁻¹⁴	8918	
SiS ⁺	+ COS	→	SiS ₂ ⁺ + CO	1.00	1.40 × 10 ⁻⁹ ± 30%	8918	
SiSH ⁺	+ C ₂ H ₄	→	Adduct	1.00	1.80 × 10 ⁻¹¹ ± 30%	8933	
SiSH ⁺	+ NH ₃	→	NH ₄ ⁺ + SiS	1.00	9.70 × 10 ⁻¹⁰ ± 30%	8933	
SiSH ⁺	+ H ₂ O	→	SiOH ⁺ + H ₂ S	1.00	1.10 × 10 ⁻⁹ ± 30%	8933	
SiSH ⁺	+ H ₂ S	→	H ₃ S ⁺ + SiS	1.00	2.90 × 10 ⁻¹⁰ ± 30%	8933	
SiSH ⁺	+ HCN	→	HCNH ⁺ + SiS	1.00	6.10 × 10 ⁻¹⁰ ± 30%	8933	
COS ⁺	+ H ₂	→	No Reaction		< 5.00 × 10 ⁻¹³	8401	8110
COS ⁺	+ CH ₄	→	No Reaction		< 5.00 × 10 ⁻¹³		8110
COS ⁺	+ C ₂ H ₂	→	C ₂ H ₂ ⁺ + COS	0.02	4.80 × 10 ⁻¹⁰ ± 30%	9123	
			CH ₂ CS ⁺ + CO	0.98			
COS ⁺	+ NH ₃	→	NH ₃ ⁺ + COS	1.00	2.30 × 10 ⁻⁹ ± 20%	8110	
COS ⁺	+ N ₂	→	No Reaction		< 5.00 × 10 ⁻¹³		8110

Table of Reactions — Continued

Reactions				Prod. Dist.	Rate Const. (cm ³ /s)	Ref.	Footnotes	
COS ⁺	+ H ₂ O	→	No Reaction		<1.00 × 10 ⁻¹²	8110		
COS ⁺	+ O ₂	→	No Reaction		<5.00 × 10 ⁻¹³	8110		
		ℳ	Adduct			8632		
COS ⁺	+ H ₂ S	→	H ₂ S ⁺	+ COS	1.00	1.40 × 10 ⁻⁹	±20%	8110
COS ⁺	+ CH ₃ NH ₂	→	CH ₂ NH ₂ ⁺	+ HCOS	0.60	1.60 × 10 ⁻⁹	±20%	8110
			CH ₃ NH ₂ ⁺	+ COS	0.40			
COS ⁺	+ CO	→	No Reaction		<5.00 × 10 ⁻¹³	8110		
		ℳ	Adduct			8632		
COS ⁺	+ CO ₂	→	No Reaction		<5.00 × 10 ⁻¹³	8110		
COS ⁺	+ NO	→	NO ⁺	+ COS	1.00	7.00 × 10 ⁻¹¹	±20%	8110
*COS ⁺	+ COS	→	COS ⁺	+ *COS	1.00	7.20 × 10 ⁻¹⁰	±20%	8110
		ℳ	Adduct			8632		
HCOS ⁺	+ H ₂ O	→	H ₃ O ⁺	+ COS	1.00	3.40 × 10 ⁻⁹	±25%	8208
HCOS ⁺	+ C ₂ N ₂	→	HC ₂ N ₂ ⁺	+ COS	1.00			8702

^a Temperature dependent study made.^b See "Notes on Reactions."

9. References Used in the Table of Reactions

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10. Notes on Reactions

H^+/CH_4	Averaged rate con. Disregarded the 7401 prod. distribution, discussion in 8421 shows that it has the more thermal value.	C^+/O_2	Disregarded 7601 and 6602.
H^+/HCN	Disregarded 7701, as it is an unpublished reference.	C^+/HC_2N	Averaged 8518 and 8509.
H^+/CO_2	Used weighted average using known error limits.	C^+/CH_3OH	Averaged rate constants, assumed the tandem ICR experiment may have had some excess energy and effected the ICR prod. distribution.
D^+/H_2	Averaged 8212 and 8109.	C^+/CO_2	Choose the 90/10 prod. distribution.
H_2^+/N_2	Disregarded 7423.	C^+/N_2O	Used 7009, because it was the only measurement at 300K.
H_2^+/Ar	Used 7620 for rate con. and 6907 for the prod. distribution.	C^+/SO_2	Used 7507, because it was the only measurement at 300K.
H_2^+/CO	Averaged the rate con. of 7503 and 7423. Used the prod. distribution of 7503, disregarding 7207.	CH^+/CH_4	Disregarded 7012.
H_2^+/CO_2	Assumed 7608 was the most reliable, since it is a rework of 7207. The rate con. of 7423 and 7211 were not used since they are faster than the collision rate of $2.9E-9$. There is a possibility of a CO_2^+ reaction channel, but it was not observed in 7608 using similar equipment.	CH^+/H_2S	Assumed that the earlier ICR results were in error, the large H_3S^+ peak could easily been lost in the same peak produced in the H_2S^+/H_2S reaction.
D_2^+/Ar	Used 7620 only.	CH^+/HCN	Used prod. distribution from 8501, because it was the only sure measurement.
H_3^+/CH_4	Disregarded 7005.	CH_2^+/CH_4	Used 7705 for the prod. distribution. The $C_2H_3^+$ and $C_2H_2^+$ channels were measured by 7402 indicated that the CH_2^+ reactant ion was probably "hot." They are endothermic by 4.4 and 3.9 kcal/mol respectively.
H_3^+/C_2H_2	Disregarded 7005.	CH_2^+/NH_3	Averaged 8001 and 7707.
H_3^+/C_2H_4	Disregarded 7005. Did not average 7405 in the prod. distribution.	CH_2^+/H_2O	Averaged 8001 and 7705 (Large error bars are reported in both studies. This reaction needs more work).
H_3^+/C_2H_6	Disregarded 7005. There is a possible 1 or 2% channel leading to $C_2H_5^+$.	CH_2^+/H_2S	Averaged the 8401 and 7803 rate con. Assumed that 8401 was a rework of 7305. Assumed the H_3S^+ channel, which is endothermic by 6.5 kcal/mol. was due to some excited states of the CH_2^+ ion.
H_3^+/NH_3	Disregarded 7005.		Disregarded 7707 and 7305.
H_3^+/N_2	Disregarded 7005 and 6907.		Averaged 8401 and 7803
H_3^+/H_2O	Disregarded 7005.		Assumed 8501 and 8003 were correct.
H_3^+/O_2	Disregarded 7312		Used 8929 (ICR) results. Assumed 8510 (SIFT) results were pressure saturated.
H_3^+/Ar	Disregarded 7104, because it reported a lower limit and also agreed with the rate constant reported in 6907.		Disregarded 7911.
H_3^+/CO	Disregarded 7005. Used 8310 for isotopic ratio.		Used the prod. distribution of 7804 and the rate con. from 7803.
H_3^+/CH_3OH	Disregarded the 7316 prod. distribution. H_3^+ has been shown to be energetic from the tandem source.		(Unresolved differences)
$H_3^+/CHOOH$	Decided that the 7818 prod. distribution would be consistent with the 7821 report.		Used the prod. distribution of 7804 and the rate con. from 7609.
H_3^+/SO_2	Disregarded 8926, because it was only at 30K.		Averaged 8001 and 7707 only.
He^+/H_2	Used 8004 and 7407.		Disregarded 7802.
He^+/D_2	Assumed that 8004 updated the 7407 rate con.		Averaged 8401 and 7705 only.
He^+/CH_4	Averaged the prod. distributions, assuming 7402 missed the H^+ channel. Averaged the rate con. of 8317, 7908, 7801, and 7602.		Used the more recent value in 8501.
He^+/NH_3	Used a weighted averaged of 7515 and 7502 using known error limits.		Used the 8001 prod. distribution.
He^+/H_2O	Assumed 7502 missed the H^+ channel.		Used the 7210 prod. distribution.
He^+/O_2	Disregarded 6905 and 6601. Assumed the prod. distribution of 7602 was correct.		Used 8308.
He^+/Ne	Assumed that latest values were correct.		Disregarded 7424.
He^+/H_2S	Disregarded 8703, because the experiments did not get above 67K.		Used the prod. distribution from 8501.
He^+/HCl	Disregarded 8703, because the experiments did not get above 67K.		Assumed that there was some unknown problem with the prod. distributions of 8509, since the main channel C_3N^+ is endothermic by 12.2 kcal/mol.
He^+/HCN	Used a weighted average using known error limits.		Disregarded the prod. distribution from 7105.
He^+/HC_3N	Disregarded the 7911 prod. distribution.		Rate con. were averaged. A SIFT study (J.S. Knight. Ph.D. Thesis, University of Canterbury, 1986) was used as a reasonable compromise.
He^+/N_2O	8822 was only interested in the charge transfer process.		Rate con. were averaged. Assumed that 8509 had a mass assignment problem and averaged the prod. distributions.
He^+/SO_2	Disregarded 8703, because the experiments did not get above 67K.		Disregarded 7409.
He^+/N_2	Assumed that 7417 superseded 6804.		Disregarded the prod. distribution from 7203.
C^+/H_2	Used 8607, because the others were only upper limits and they were consistent with 8607.		Averaged the 9029 and 7721 prod. distributions.
C^+/D_2	Used 8607, because the other was only an upper limit and it was consistent with 8607.		Disregarded 7911 as an early measurement.
C^+/CH_4	Disregarded the prod. distribution of 7905, because the C^+ was made by electron impact ionization.		9029 was at 15K.
C^+/NH_3	Averaged the prod. distributions from 7905, 7707, and 7601.		Assumed 7901 is in error.
C^+/H_2O	Choose the 90/10 prod. distribution.		Used the arguments in 8501.
			Used 7712.
			Disregarded 7911.
			Assume the adduct channel was probably a 3-body component.
			Assumed 7901 is in error.

$\text{C}_2\text{H}_4^+/\text{C}_2\text{H}_4$	Used the rate con. from 7712 and averaged prod. distributions from 7712 and 7203.	$\text{NH}_2^+/\text{H}_2\text{O}$	Disregarded 8617, because the rate con. was much larger than the collision rate and the prod. distributions were so much different from the other techniques.
$\text{C}_2\text{H}_4^+/\text{HCN}$	Used the 8501 (ICR) result. Assumed that the adduct observed in 8011 (SIFT) is the result of a 3-body reaction.	$\text{NH}_2^+/\text{H}_2\text{S}$	Assumed that the ICR results overlooked the smaller and overlapping peaks in the spectrometer.
$\text{C}_2\text{H}_5^+/\text{H}$	Assumed 7901 is in error.	$\text{NH}_3^+/\text{H}_2\text{O}$	8313 has shown the very sensitive nature of this reaction to internal energy of the NH_3^+ ion. 8313 was judged the most thorough analysis and therefore the most accurate. It is not clear why 8010 saw no reaction.
$\text{C}_2\text{H}_5^+/\text{C}_2\text{H}_2$	Assumed that 7005 measured the saturated 3-body rate con. Assumed that the C_3H_5^+ channel measured in 7703 is in error, since it is endothermic by 49.2 kcal/mol. Assumed that ICR is much better at measuring rate con. than SCT. Assumed that 7703, using tandem mass spectrometer may have driven the C_3H_5^+ channel, but the isotopic exchange reaction measured was not driven.	$\text{NH}_3^+/\text{H}_2\text{S}$ N_2^+/D N_2^+/H_2 N_2^+/O N_2^+/O_2 N_2^+/Ar	Disregarded 7410. Assumed 7901 is in error. Disregarded 7209, 6907, or 6702 in average. Disregarded 6501. Disregarded 7209 and 6603.
$\text{C}_2\text{H}_5^+/\text{C}_2\text{H}_4$	Assumed 7005 had a 3-body contribution.		This reaction is 4.1 kcal/mol endothermic. The expected rate con. is therefore $\sim 8E-13$. This supports the suggested value and also is reasonable for the plots in 9107.
$\text{C}_2\text{H}_5^+/\text{C}_2\text{H}_6$	Averaged the more accurate rate con. measurements, 8305 and 7712. Assumed that the ICR results, 7712, might have missed the C_3H_5^+ channel.		Disregarded 8718.
$\text{C}_2\text{H}_5^+/\text{C}_2\text{N}_2$	Assumed that the $\text{PA}(\text{C}_2\text{N}_2) = 161 \text{ mKcal/mol}$. This results in a back reaction of $\sim 8E-11$. This is consistent with both 8932 and 8702.		Averaged the rate con., but used the SIFT prod. distributions since it is more reliable than FA.
$\text{C}_2\text{H}_6^+/\text{H}$	Assumed 7901 is in error.		Disregarded 6702.
C_3^+/D_2	Assumed that the adduct was from a 3-body contribution.		Averaged rate con. of 8006 and 8001. Used the prod. distribution from 8006.
$\text{C}_3\text{H}^+/\text{HCN}$	Selected the 8924 data because it was consistent with cooler reactant ions. The proton transfer reaction is endothermic by 13.4 kcal/mol.		Disregarded 7410.
$\text{C}_3\text{H}^+/\text{CH}_3\text{CN}$	Used the last in the series of the publications as the final result. There is concern about the association channel that is reported. Generally, the association channels reported in SIFT measurements are not from 2-body kinetics.		Have not weighted 7806 very heavy, since it has been shown to have large discrepancies in other cases. In this case 7806 has a rate constant much higher than the collision rate. Averaged the other references.
$\text{C}_3\text{H}^+/\text{CH}_3\text{OH}$	Used the last in the series of the publications as the final result.		Disregarded 7806, since it has been shown to have large discrepancies in other cases. In this case 7806 has a rate con. much higher than the other rates. Disregarded the prod. distribution of 8104 because it was not strong enough to contradict the other results..
$l\text{-C}_3\text{H}_5^+/\text{C}_2\text{H}_2$	It was assumed that 8624 was incorrect.		Used the prod. distribution of 8001.
$l\text{-C}_3\text{H}_5^+/\text{C}_2\text{H}_2$	C_5H_5^+ can only be made from $l\text{-C}_3\text{H}_5^+$ and not from $c\text{-C}_3\text{H}_5^+$. It was assumed that 8708 was generating $l\text{-C}_3\text{H}_5^+$ and was disregarded. The results of 9041 are not understood in light of the 8708 results.		Disregarded 7806.
$\text{C}_4\text{H}^+/\text{HCN}$	Both the CN loss and the H loss channels are endothermic by 24.4 and 38.7 kcal/mol respectively. It is not clear if one is more thermal than the other. A simple average was made.		Disregarded 7806. Disregarded the endothermic channel CO^+ reported in 8818.
$\text{C}_4\text{H}_4^+/\text{C}_2\text{H}_2$	Disregarded 7105 and 8709.		Disregarded 7806.
$\text{C}_4\text{H}_4^+/\text{C}_2\text{H}_2$	Disregarded 7422 and 8709.		Disregarded 7314.
$\text{C}_4\text{H}_4^+/\text{C}_2\text{H}_2$	Assumed 8709 measured the saturated 3-body process. Averaged the rest compensating for the formation of $c\text{-C}_4\text{H}_4^+$.		Disregarded 6603.
$\text{C}_6\text{H}^+/\text{C}_2\text{H}_2$	Assumed 8709 measured the saturated 3-body process.		There is obviously something wrong with the prod. distribution measurement of 7801. This can be seen when a comparison is made of the charge transfer reactions in the series He^+ , Ne^+ , Ar^+ , and Kr^+ . Ne^+ would not produce more dissociation than He^+ .
$\text{C}_6\text{H}_2^+/\text{C}_2\text{H}_2$	Assumed 8709 measured the saturated 3-body process.		Assumed authors superseded their earlier data.
$ac\text{-C}_6\text{H}_5^+/\text{H}_2$	Assumed 8814 accurately determined most C_6H_5^+ from benzene is acyclic.		Assumed 9110 had some interfering 3-body component.
$c\text{-C}_6\text{H}_5^+/\text{H}_2$	Assumed 8814 accurately determined most C_6H_5^+ from benzene is acyclic.		Assumed 9111 had some interfering 3-body component.
N^+/H_2	Disregarded 8307.		Used the collision rate con., 8723 exceeded the collision rate con. and showed that 7213 and 7214 are consistent with the energy dependence determined.
N^+/CH_4	Disregarded 8514.		Favored 8722, because it is estimated that the 7609 channel is 56 kcal/mol endothermic
$\text{N}^+/\text{H}_2\text{O}$	Disregarded 7905.		Favored 7214 over 7313, the SiH_3^+ channel in 7313 is 25.8 kcal/mol endothermic, also the tandem experiment states that the kinetic energy of the ion is 1 eV. Picked the 7214 rate con., since the tandem experiment is known to have energy effects.
N^+/O_2	Disregarded 6603. Did not average in the 8619 prod. distribution, because they did not measure the other channels.		Assumed that the ICR results might have missed the NH_3^+ peak, due to the large amount of NH_3^+ produced in a NH_3 environment.
N^+/CO	Disregarded 8514.		Used a weighted average using known error limits.
N^+/CO_2	Disregarded 6701 in the averaging of the prod. distribution.		Assumed 8912 had a 3-body contribution.
N^+/NO	Disregarded 6603.		Used a weighted average using known error limits.
NH_2^+/H_2	Disregarded 6702.		Used a weighted average using known error limits.
$\text{NH}_2^+/\text{CH}_4$	Choose 8010 over 7305.		Used a weighted average using known error limits.

PH^+/PH_3	Used a weighted average using known error limits.	$\text{CN}^+/\text{C}_2\text{H}_4$	Used the SIFT prod. distributions, assumed that there was some energetics problem with the tandem ICR's CH_3^+ -beam effecting the prod. distribution.
PH^+/HCN	Assumed 8912 had a 3-body contribution.	$\text{CN}^+/\text{HC}_3\text{N}$	Used the SIFT value for the prod. distribution.
S^+/CH_4	Averaged all, weighted the latest results heavier.	CN^+/CO	Disregarded the adduct product of the SIFT experiment.
$\text{S}^+/\text{H}_2\text{S}$	Averaged all, weighted the latest results heavier.	$\text{HCN}^+/\text{C}_2\text{H}_2$	A reasonable compromise was made for a prod. distribution. The H_2CN^+ channel was proven not to exist by the SIFT experiments. Some of the $\text{H}_2\text{C}_3\text{N}^+$ could be coming from a HNC^+ reaction.
$\text{HS}^+/\text{H}_2\text{O}$	Averaged all, weighted the latest results heavier.	$\text{HCN}^+/\text{HC}_3\text{N}$	Used authors most recent results.
$\text{HS}^+/\text{H}_2\text{S}$	Assumed 8401 superseded 7304, averaged 8401 and 8110 for the rate con. Assumed 8401 for the prod. distribution, since 8110 had measured the H_2S^+ channel which is 1.9 kcal/mol endothermic and should not be larger than 4%.	HCN^+/CO	Assumed 8101 missed the rearrangement channel and under estimated the rate con.
$\text{H}_2\text{S}^+/\text{CH}_4$	Used 8110, since the proton transfer reaction is 7.0 kcal/mol endothermic. This corresponds to an expected rate con. of about $8E-15$.	HCN^+/CO_2	Assumed 8101 missed the rearrangement channel and under estimated the rate con.
$\text{H}_3\text{S}^+/\text{H}_2\text{O}$	This value agrees with that calculated from the proton affinities and the expected equilibrium con.	$\text{CNC}^+/\text{C}_2\text{H}_2$	Averaged the 8802 and 8012 rate con. Used the 8802 prod. distribution.
Ar^+/H_2	Disregarded 8020.	CNC^+/HCN	Assumed the two SIFT results represented saturated 3-body reactions.
Ar^+/N_2	Used only the latest 4 references. There is some indication in Liao et al, JCP 85, 3874 (1986) that the ground vibrational state of Ar^+ is unreactive with N_2 .	$\text{CHCCN}^+/\text{HC}_3\text{N}$	Assumed 8616 had a 3-body contribution.
Ar^+/O_2	Disregarded 6605.	$\text{C}_4\text{N}^+/\text{HCN}$	Assumed 8727 had a 3-body contribution.
Ar^+/Hg	Used 8016, which discounts 7317 and had the same authors.	$\text{HC}_2\text{N}_2^+/\text{C}_2\text{H}_4$	Assumed that the adduct was from a 3-body contribution.
Ar^+/CO	Disregarded 6605.	CO^+/H_2	Disregarded 6702.
Ar^+/CO_2	Disregarded 6605.	$\text{CO}^+/\text{H}_2\text{O}$	Used the ICR value for the prod. distribution.
Ar^+/CS_2	Assumed that the authors superseded their earlier work 8614 with the results in 8716.	$\text{CO}^+/\text{H}_2\text{S}$	Used the ICR value for the prod. distribution.
Ar^+/NO	Disregarded 8020.	HCO^+/HCl	The thermodynamics agrees with the SIFT results more closely.
ArH^+/H_2	Disregarded 7702.	HOC^+/H_2	Used a weighted average using known error limits.
ArH^+/CH_4	Used the 8211 prod. distribution, since 7614 had noted that their ArH^+ was initially hot and had evidence of it cooling during the experiment and that the production of CH_3^+ is an endothermic process.	$\text{CH}_2\text{OH}^+/\text{H}_2\text{O}$	Used a weighted average using known error limits.
ArD^+/H_2	Assumed that the SIFT experiment, 9016, is more reliable than the TICR experiment, 7612. The TICR results showed that the amount of H_2D^+ was continually decreasing.	$\text{CH}_2\text{OH}^+/\text{H}_2\text{S}$	Used a weighted average using known error limits.
Kr^+/Hg	Used 8016, which discounts 7317 and had the same authors.	$\text{CH}_2\text{OH}^+/\text{HCN}$	Used a weighted average using known error limits.
Kr^+/CO	Disregarded 7318.	$\text{CH}_3\text{OH}_2^+/\text{C}_4\text{H}_2$	Assumed 9118 had a 3-body contribution.
$\text{Kr}^+/\text{N}_2\text{O}$	Used 8013, because it was clear which electronic state was been investigated.	CO_2^+/H	Disregarded 7901. The 7101 prod. distribution seemed the most reliable.
CN^+/CH_4	Used the SIFT prod. distributions. Assumed that there was some energetics problem with the tandem ICR CH_3^+ beam effecting the prod. distribution.	CO_2^+/H_2	Disregarded 7207 and 6702.
		CO_2^+/O_2	Disregarded 6804.
		$\text{CO}_2^+/\text{H}_2\text{S}$	Disregarded the upper limit on the HCO_2^+ channel.
		$\text{CH}(\text{OH})_2^+/\text{C}_4\text{H}_2$	Assumed 9118 had a 3-body contribution.
		CS^+/H_2	Disregarded 7414.
		CS^+/O_2	Used 8401 for prod. distributions, since the O_2^+ channel observed by 8303 is 15.4 kcal/mol. endothermic and suggest that the 8303 prod. distribution is for hot CS^+ ions.