Appendix A. Calculations of Rate Coefficients

We provide a few further details and comments for the rate constants that were analyzed theoretically as part of this effort (cf. Table B.15). These calculations focused on the reactions of major molecules and radicals for which improved rate estimates were expected to improve the quality of the overall modeling. For the more important of these reactions, the altitude dependence of the predicted rate coefficients is compared with that employed in a number of other modeling studies in Figures A.1 through A.4.

Appendix A.1. Radical-Molecule Reactions with a Barrier

Table A.1 contains a list of the predicted barrier heights, energy transfer parameter, and electronic structure methodology employed in the analysis of the kinetics of the set of radical-molecule reactions with a barrier that were studied here.

Table A.1: Radical-molecule reaction properties.

Reactants	Products	TS E[(a)]	Product E[(a)]	Rovib Method	Energy Method	ΔE_{down} A,n[(b)]	Ref.
$H + C_2H_2$	C_2H_3	4.29	-34.7	QCISD(T)/cc-pVTZ	QCISD(T)/CBS(T,Q)	60, 1.35	Miller and Klippenstein (2004)
$H + C_2H_4$	C_2H_5	2.81	-35.0	QCISD(T)/cc-pVTZ	QCISD(T)/CBS(T,Q)	60, 1.35	Miller and Klippenstein (2004)
$H + CH_2CCH_2$	CH_3CCH_2	3.09	-35.9	CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
	$H + CH_3CCH$	***2.13***		CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
	CH_2CHCH_2	4.76	-55.8	CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
$H + CH_3CCH$	CH_3CCH_2	***3.25***	-34.8	CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
	$H + CH_2CCH_2$	4.21		CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
	CH_3CHCH	***5.16***	-34.8	CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
	$C_2H_2 + CH_3$	2.41		CCSD(T)/cc-pVTZ	ANL0	80, 0.7	Present work
$H + C_3H_6$	$n{-}C_3H_7$	***3.66***	-31.7	CCSD(T)/cc-pVTZ	QCISD(T)/CBS(T,Q)	110, 1.0	Miller and Klippenstein (2013)
	$C_2H_4 + CH_3$	***-1.41***		CCSD(T)/cc-pVTZ	QCISD(T)/CBS(T,Q)	110, 1.0	Miller and Klippenstein (2013)
	$i{-}C_3H_7$	***2.72***	-34.7	CCSD(T)/cc-pVTZ	QCISD(T)/CBS(T,Q)	60, 1.0	Miller and Klippenstein (2013)
	$C_3H_5 + H_2$	7.58		CCSD(T)/cc-pVTZ	ANL0		Present work
$H + C_4H_2$	$i{-}C_4H_3$	***1.71***	-42.7	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 1.0	Klippenstein and Miller (2005)
$H + C_4H_4$	CH_3CHCCH	1.82	-43.5	CCSD(T)/cc-pVTZ	HL	200, 0.85	Present work
	CH_2CHCCH_2	2.81	-44.0	B2PLYP-D3/VTZ	HL	200, 0.85	Present work
$H + C_6H_6$	C_6H_7	***5.09***	21.3	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 1.0	Present work
$CH_3 + C_3H_3$[(c)]	$^3C_3H_2 + CH_4$	12.5	-7.0	B2PLYP-D3/cc-pVTZ	CCSD(T)/CBS(T,Q)		Present work
$C_2H_3 + C_2H_2$	C_4H_5	5.97		B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)		Present work
$C_2H_3 + C_2H_4$	C_4H_7	4.15		B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)		Present work
$n{-}C_4H_3 + C_2H_2$	C_6H_5	3.73		B3LYP/6-311++G**	QCISD(T)/TZ MP2/QZ		Present work
$C_6H_5 + C_2H_2$	C_8H_7	3.58	-39.2	B3LYP/6-311G**	G2M		Mebel et al. (2017)
$^3CH_2 + c{-}C_3H_2$[(d)]	$C_4H_3 + H$	0.75	-55.9	CCSD(T)/cc-pVTZ	CCSD(T)-F12/CBS-F12(T,Q)		Present work
H+HCN	H_2CN	6.47	-24.5	CCSD(T)/cc-pVTZ	ANL0	60, 1.35	Present work
H+HNC	HCNH	2.45	-27.3	CCSD(T)/cc-pVTZ	ANL0		Present work
	H + HCN	-4.0		CCSD(T)/cc-pVTZ	CCSD(T)/cc-pVTZ		Present work
$H + CH_2NH$	CH_3NH	3.71	-29.4	CCSD(T)/cc-pVTZ	ANL0	200, 0.85	Present work
	CH_2NH_2	3.85	-36.5	CCSD(T)/cc-pVTZ	ANL0	200, 0.85	Present work
	$H_2CN + H_2$	4.90		CCSD(T)/cc-pVTZ	ANL0		Present work
$H + HC_3N$	H_2CCCN	3.93	-41.0	CCSD(T)/cc-pVTZ	ANL0		Present work
$C_2H + HCN$	CHCCHN	1.36	-46.2	CCSD(T)/cc-pVTZ	ANL0		Present work
	HCCCN + H	-16.1	-24.7	CCSD(T)/cc-pVTZ	ANL0		Present work
$C_2H + HNC$	CHCCHN	1.36	-46.2	CCSD(T)/cc-pVTZ	ANL0	100, 1.0	Present work
	$H + HC_3N$	-16.1		CCSD(T)/cc-pVTZ	ANL0	100, 1.0	Present work
$C_2H_3 + HCN$	CH_2CHCHN	6.78	-28.1	CCSD(T)/cc-pVTZ	ANL0		Present work
	$H + CH_2CHCN$	2.92		CCSD(T)/cc-pVTZ	CCSD(T)/cc-pVTZ		Present work
$N(^2D)$ + HCN	CHNN	0.59	-85.0 ANL0	CI+QC(7,7)/cc-pVTZ	CI+QC(7,7)/cc-pVQZ		Present work
CN + HCN	CNCHN	3.18	-36.2	CCSD(T)/cc-pVTZ	ANL0		Present work

Table A.1 – Continued from previous page

Reactants	Products	TS E[(a)]	Product E[a]	Rovib Method	Energy Method	ΔE_{down} A,n[(b)]	Ref.
	H + NCCN	-2.02		CCSD(T)/cc-pVTZ	ANL0		Present work
H_2CN + HCN	H_2CNCHN	15.3	1.9	CCSD(T)/cc-pVTZ	CCSD(T)/cc-pVTZ		Present work
H + CO	HCO	3.96	-13.80	CCSD(T)/cc-pVQZ	CCSD(T)/cc-pVQZ	63, 0.85	Present work
CH_3 + CO	CH_3CO	7.4	-9.0	B3LYP/6-311++G**	QCISD(T)/CBS		Present work

[(a)] Energies in kcal/mol. Numbers in bold italics include empirical adjustment.
[(b)] Average downwards energy transfer parameter in exponential down model = $A(T/300)^n$ cm^{-1}.
[(c)] Although the $CH_3 + C_3H_3$ reaction is a radical-radical reaction, we are interested in the triplet abstraction, which has a barrier and so is more like a radical molecule reaction with a positive barrier.
[(d)] For the $^3CH_2$ + c$-C_3H_2$ reaction one might consider both species to be radicals (i.e, the c$-C_3H_2$ species has some degree of singlet biradical character), but there is a positive saddle point for the addition and so this reaction is more like a radical molecule reaction.

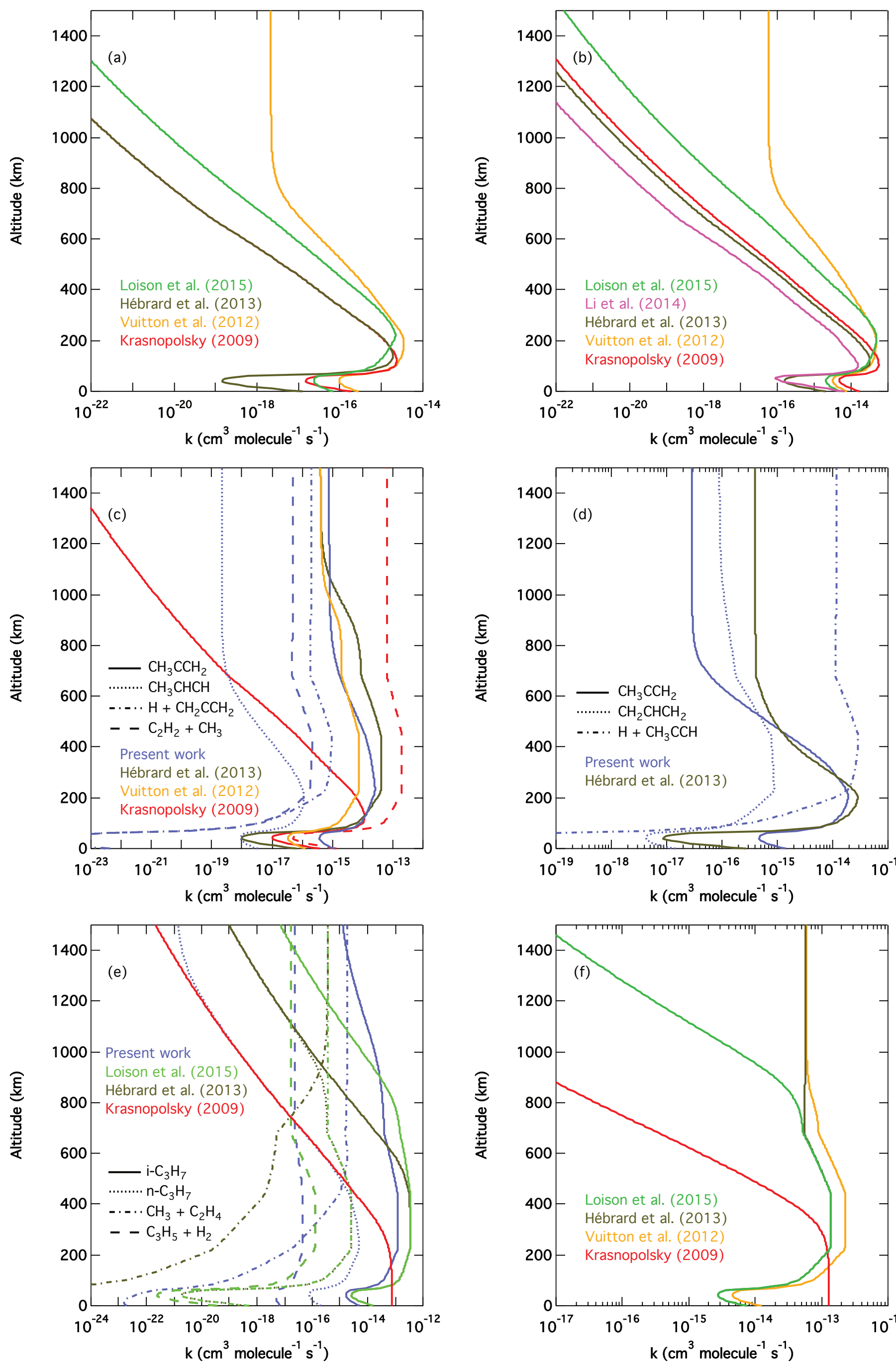

Figure A.1: Rate coefficient versus altitude in Krasnopolsky (2009); Hébrard et al. (2013); Li et al. (2014); Loison et al. (2015) and this work (or after Vuitton et al. (2012)). (a) H + C_2H_2 → C_2H_3 (Rn7), (b) H + C_2H_4 → C_2H_5 (Rn9), (c) H + CH_3CCH → C_3H_5 / H + CH_2CCH_2 / C_2H_2 + CH_3 (Rn15), (d) H + CH_2CCH_2 → C_3H_5 / H + CH_3CCH (Rn16), (e) H + C_3H_6 → C_3H_7 / CH_3 + C_2H_4 / C_3H_5 + H_2 (Rn18), (f) H + C_4H_2 → C_4H_3 (Rn21). For those reactions, the rate coefficients presented in Dobrijevic et al. (2016) are almost identical to that in Loison et al. (2015) and are not reproduced here for the sake of clarity.

For the $H + C_2H_2 \rightarrow C_2H_3$ and $H + C_2H_4 \rightarrow C_2H_5$ reactions the analysis of Vuitton et al. (2012) is a simple extension of an earlier AITSTME study (Miller and Klippenstein, 2004) to lower temperatures and includes the effects of radiative stabilization. As seen in Figures A.1a and A.1b, the predicted rate coefficients are quite similar to those of previous photochemical models up until about 400 km. At higher altitude, our inclusion of radiative stabilization yields order of magnitude larger rate coefficients.

The $H + CH_3CCH$ and $H + CH_2CCH_2$ reactions were studied previously as part of a combustion related AITSTME study of reactions on the C_3H_5 potential energy surface by Miller et al. (2008). Here we extend that analysis to lower temperatures and pressures after first updating the parameters with higher-level electronic structure data (ANL0). Furthermore, for simplicity we reduce the analysis to a set of three independent single well problems corresponding to the H-atom fissions in CH_3CCH_2 and CH_2CHCH_2, and the H- and CH_3-fissions in CH_3CHCH. This reduction to single well problems, which facilitates the rate fitting, is appropriate at the low temperatures of relevance to Titan's atmosphere because the isomerization barriers lie at or above the entrance and exit barriers. Nevertheless, for simplicity, we ultimately amalgamate all wells into a single C_3H_5 species.

The rate predictions for the $H + CH_3CCH$ and $H + CH_2CCH_2$ reactions are contrasted with those from other modeling studies in Figures A.1c and A.1d. The rate estimates from Loison et al. (2015) are also based to some extent on the work of Miller et al. (2008) as well as an early version of our rate predictions (Vuitton et al., 2012). As such, they tend to be quite similar to the present predictions, although they neglect the $H + CH_2CCH_2 \rightarrow H + CH_3CCH$ forming channel, which is the dominant channel for that reaction. Krasnopolsky (2009), who considers only the $H + CH_3CCH$ channel, neglects radiative association and so severely underestimate the association channels at high altitudes. He also uses orders of magnitude larger rate coefficients for the $C_2H_2 + CH_3$ channel.

The present rate predictions for $H + C_3H_6$ arise from an extension to lower temperature of the AITSTME work of Miller and Klippenstein (2013) for the C_3H_7 system. We again reduce the problem to separate single well analyses for H-fissions in $i{-}C_3H_7$ and H and CH_3-fissions in $n{-}C_3H_7$. For the abstraction reaction, $H + C_3H_6 \rightarrow H_2 + C_3H_5$ we performed new high-level ANL0 calculations. As seen in Figure A.1e, for the $H + C_3H_6 \rightarrow i{-}C_3H_7$ channel the largely empirical estimates of Loison et al. (2015) are higher than the present predictions (by $\sim$ a factor of 3) up to 900 km and then are increasingly lower at higher altitudes, due to their neglect of radiative stabilization. For the abstraction channel the empirical estimates of Loison et al. are fairly similar to present calculations. For the $H + C_3H_6 \rightarrow CH_3 + C_2H_4$ channel the values of Loison et al. are about a factor of 3 lower at high altitude. However, at low altitude we predict that stabilization to $n{-}C_3H_7$ replaces $CH_3 + C_2H_4$ formation. Loison et al. ignore that channel and so at low altitudes their $H + C_3H_6 \rightarrow CH_3 + C_2H_4$ estimates are similar to our $H + C_3H_6 \rightarrow n{-}C_3H_7$ rate predictions. Meanwhile, Krasnopolsky (2009) considers only the $H + C_3H_6 \rightarrow i{-}C_3H_7$ channel, and, due to the neglect of radiative stabilization, underestimates that rate constant by many orders of magnitude except below 200 km.

For the $H + C_4H_2 \rightarrow C_4H_3$ reaction our analysis is a simple extension of the AITSTME study of Klippenstein and Miller (2005) to lower temperature. We again reduce to a one-well system and consider only the formation of $i-C_4H_3$ as the barrier to formation of $n-C_4H_3$ is 4 kcal/mol higher. The present predictions are about a factor of two higher than the values of Loison et al. (2015) up to 800 km (cf. Figure A.1f), at which point the Loison et al. decay towards zero (due to their neglect of radiative stabilization), while our prediction is nearly altitude independent.

The present rate analyses for $H + C_4H_4 \rightarrow CH_3CHCCH$ and $H + C_4H_4 \rightarrow CH_2CHCCH_2$ builds off the AITSTME work of Miller et al. (2000) for the $C_2H_3 + C_2H_2$ reaction. Here we incorporate higher level electronic structure results, extend the calculations to lower temperature, add the CH_3CHCCH channel, and include the effects of radiative stabilization. Although we have calculated the rate constants for both H-addition channels, we only include the data for the formation of CH_3CHCCH as that channel dominates the kinetics. Again, we reduce the system to a one-well system (CH_3CHCCH). At low altitudes the present rate predictions are about an order of magnitude lower than those employed in previous models (cf. Figure A.2a), while at higher altitudes our inclusion of radiative stabilization again yields a dramatically increased rate constant. The values of Loison et al. are based on the room temperature capture rate of 3.3×10^{-12} cm^3 s^{-1}, measured by Schwanebeck and Warnatz (1975), and which is presumed to be temperature independent. The present determination of a 1.8 kcal/mol barrier indicates that this rate constant should decay with temperature. Notably, at room temperature our a priori calculations predict a rate coefficient of 1.7×10^{-12} cm^3 s^{-1}, which is in reasonable agreement with the experimental value.

For the $H+C_6H_6 \rightarrow C_6H_7$ reaction we performed a new AITSTME rate analysis. These rate predictions are based on a QCISD(T)/CBS(TZ,QZ)//B3LYP/6-311++G(d,p) analysis with the barrier adjusted down by 0.4 kcal/mol to obtain agreement with the experimental measurements of Sauer and Ward (1967). Loison et al. (2015) have estimated this rate constant through comparison with $H + C_2H_2$, which results in a 106 times smaller $k_\circ$, a 10 times larger k_∞, while k_R is ignored.

For the C_2H_3+C_2H_2, C_2H_3+C_2H_4, C_6H_5+C_2H_2, and C_4H_3+C_2H_2 reactions we have used AITST to predict the high-pressure addition rates. For the first three of these reactions, our predicted rates were so small (2×10^{-21}, 7×10^{-20}, and 1×10^{-18} cm^3 s^{-1}, respectively, at 140 K) that they were not included in the mechanism. A similarly small rate was predicted for the $C_4H_3 + C_2H_2 \rightarrow C_6H_5$ reaction (5×10^{-19} cm^3 s^{-1} at 140 K). Nevertheless, for completeness this rate was included in the modeling. In doing so, we presumed that due to the relatively large size and strong bonding in C_6H_5, radiative stabilization is efficient and only the capture rate is needed. The predictions for the C_6H_5 + C_2H_2 recombination involve a simple extension of the study of Mebel et al. (2017), while the other predictions arise from new analyses performed as part of this study.

Appendix A.1.2. Nitrogen chemistry

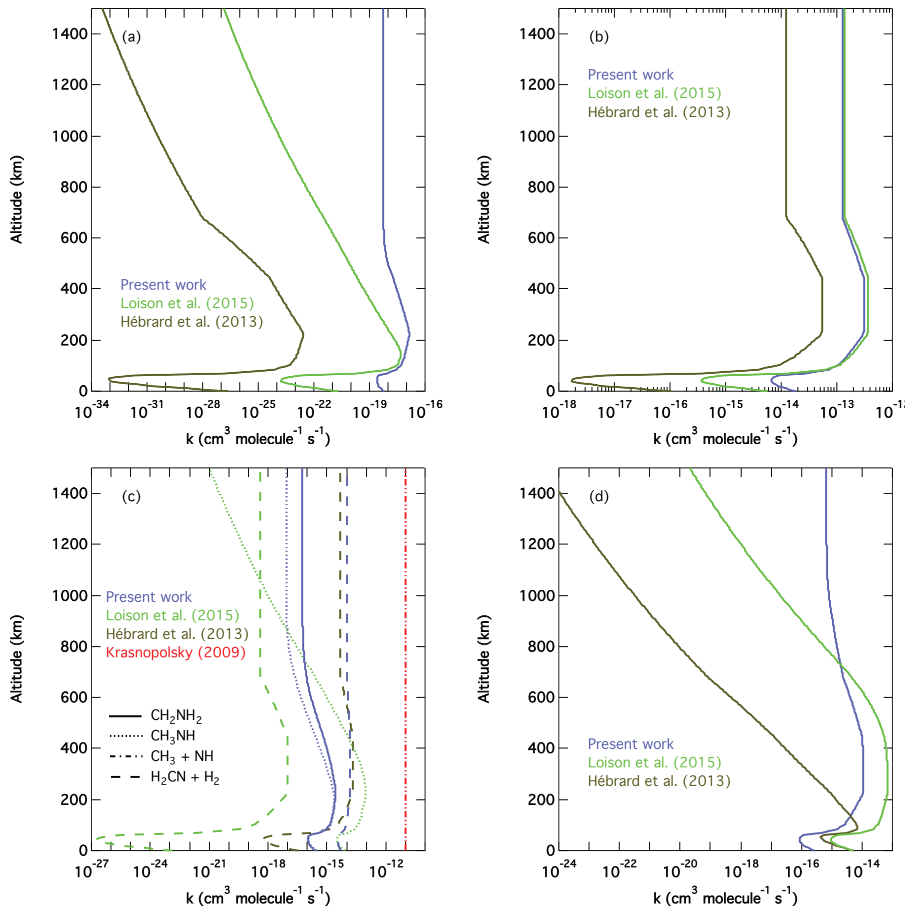

Figure A.2: Rate coefficient versus altitude in Krasnopolsky (2009); Hébrard et al. (2013); Loison et al. (2015) and this work. (a) H + HCN $\rightarrow$ H_2CN (R_n254), (b) H + HNC $\rightarrow$ H + HCN (R_n255), (c) H + CH_2NH $\rightarrow$ CH_3NH / CH_2NH_2 / CH_3 + NH / H_2CN + H_2 (R_n256), (d) H + HC_3N $\rightarrow$ H_2C_3N (R_n258). In Dobrijevic et al. (2016), the rate coefficients of those reactions are almost identical to that in Loison et al. (2015) at the exception of H + HCN $\rightarrow$ H_2CN that has been omitted.

The present AITSTME predictions for the H + HCN $\rightarrow$ H_2CN rate constant, which are based on high-level ANL0 electronic structure evaluations, are compared in Figure A.2b with those from Loison et al. (2015), who also performed an AITSTME analyses, but with lower level methods (M062X version of DFT and RRKM theory) and neglecting radiative stabilization. The primary difference between the present calculations and those of Loison et al. arises from our inclusion of radiative stabilization, which is particularly effective for this reaction due to the slowness of the tunneling back to reactants from the incipient adduct. Interestingly, this need for tunneling through a relatively high barrier greatly results in a radiative stabilization probability that is a atypically large for the size of the reactants. The values from Hébrard et al. (2012), which are from an unspecified source, are 5 or more orders of magnitude smaller.

For the H + HNC reaction we considered both the formation of the HCNH complex and the decomposition of this complex to H + HCN. The latter channel dominates the kinetics, due to the difficulty of stabilizing a small complex (HCNH) in the presence of a negative energy (relative to reactants) exit channel saddlepoint. Thus, this channel is the only one included in the model. The present AITSTME treatment again employs high-level ANL0 electronic structure results, which predict an entrance barrier of 2.45 kcal/mol. In contrast, the study of Hébrard et al. (2012) employs the AITST predictions of Sumathi, which are based on the CCSD(T)/6-311++(3df,3pd)/CCSD(T)/6-311++G(d,p) calculated barrier of 3.3 kcal/mol. As a result, the present predictions are about an order of magnitude higher than those of Hébrard et al. (2012) (cf. Figure A.2c). The value employed by Loison et al. (2015) appears to be based on the same data as that of Hébrard et al. (2012), but for unknown reasons is an order of magnitude larger.

For the H + CH_2NH reaction we consider additions to the C and N atoms separately as well as direct abstraction. The two additions are treated as uncoupled single well single channel addition systems. For simplicity in the modeling we amalgamate the two addition products into one and label it as the more stable CH_2NH_2 isomer. The predicted rate constants for these three channels are contrasted in Figure A.2d with the values employed in other modeling studies. The estimates of Loison et al. typically differ by two or more orders of magnitude from the present work. This is perhaps not too surprising given that their estimate for the CH_3NH channel is based on simple analogy with the $H + C_2H_4$ reaction, while their AITST calculation of the abstraction rate constant is based on a DFT analysis (M062X). They neglect the CH_2NH_2 formation channel. In contrast, Hébrard et al. (2012) consider only the abstraction channel, with their estimated rate constant agreeing with our prediction to within a factor of two throughout. Unfortunately, it is not clear how this rate estimate was obtained. Krasnopolsky (2009) considers the products of this reaction to be CH_3 + NH, which are 47 kcal/mol endothermic.

For the $H + HC_3N$ addition reaction we predict that the entrance barrier is 2.2 kcal/mol higher than for $H + C_4H_2$, while the well depth is 1.7 kcal/mol less. Furthermore, there are three fewer vibrational modes, which also implies a lower stabilization probability. We employ an estimate based on our calculations for $H + C_4H_2$. For reference purposes, our predicted high pressure rate constant is 2.02×10^{-33} $T^{7.97}$ exp(307/T) cm^3 s^{-1}.

For the $C_2H + HCN$ and $C_2H_3 + HCN$ reactions we used AITST to calculate the capture rates, which at 140 K are predicted to be 3×10^{-14} and 3×10^{-23} cm^3 s^{-1}, respectively. For the C_2H + HCN reaction we have considered addition to both the C and N atoms and find that addition to the N has a 3 kcal/mol higher barrier, and so is insignificant at Titan temperatures. A similarly high barrier is expected for addition of C_2H_3 to the N atom of HCN. The high exothermicity of the HC_3N + H product channel suggests that these products are formed with a rate coefficient given by the capture rate independent of pressure, as is verified with limited master equation simulations. For the C_2H_3 + HCN case, the smallness of the capture rate suggests the reaction is likely unimportant. Thus, for this case we also simply presume that C_3H_3N + H is formed at a pressure independent rate equal to the capture rate.

For the $N(^2D)$ + HCN reaction we report the results of an AITST calculation of the capture, with the presumption that all HCNN adducts dissociate to CH+ N_2. The latter channel is highly exothermic and the reverse CH+N_2 association is barrierless, so this presumption is well justified. The wavefunction for the $N(^2D)$ atom, as well as the addition TS, has a great deal of multireference character. Thus, we employ the Davidson corrected multireference configuration interaction (MRCI+Q) method for this AITST analysis. The active space is taken to consist of the π, π^* orbitals for HCN as well as the three 2p orbitals of the N atom.

For the CN + HCN reaction, we report the results of an AITST calculation which yields a capture rate of 4×10^{-17} cm^3 s^{-1} at 140 K. The submerged barrier for the H loss from the initially formed NCCHN adduct, together with the small number of atoms and moderate well depth, suggests that the NCCN + H products will be formed at effectively the reported capture rate. Near room temperature, our predicted rates are in reasonably satisfactory agreement with the measurements of Yang et al. (1992a).

For the H_2CN+HCN reaction, the entrance barrier evaluated at the CCSD(T)/cc-pVTZ level is 15 kcal/mol. Thus, this reaction is safely ignored.

Appendix A.1.3. Oxygen chemistry

For the H + CO, CH + CO, and CH_3 + CO reactions we have performed AITSTME calculations to predict the radiative association rates. For the CH_3+ CO reaction, this analysis builds off of the earlier work of Senosiain et al. (2005). The pressure dependent stabilization rate parameters for these reactions are taken from the review of Baulch et al. (2005).

Appendix A.2. Radical-Radical Reactions

Table A.2 lists the exothermicity, energy transfer parameter, and electronic structure methodology employed in the analysis of the radical-radical reactions.

Table A.2: Radical-radical reaction properties.

Reactants	Products	Product E$^{(a)}$	Rovib Method	Energy Method	ΔE_{down} A,n$^{(b)}$	Ref.
$H + CH_3$	CH_4	-103.4	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	220, 0.85	Miller and Klippenstein (2002)
$H + C_2H_3$	C_2H_4	-109.2	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	Klippenstein and Harding (1999)
	$C_2H_2 + H_2$	-15.3(TS)	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	
$H + C_4H$	C_4H_2	-132.5	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	300, 0.85	Present work
$H + C_4H_3$	C_4H_4	-91.4	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	200, 0.85	Harding et al. (2007)
$H + C_6H$	C_6H_2	-130.2	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	Present work
$H + C_6H_5$	C_6H_6	-111.5	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	400, 0.7	Present work
$CH_3 + CH_3$	C_2H_6	-87.6	B3LYP/6-31G*	QCISD(T)/CBS(T,Q)	60, 0.9	Klippenstein and Harding (1999)
$CH_3 + C_2H_3$	C_3H_6	-99.4			150, 0.85	Ye et al. (2015)
	$C_3H_5 + H$	-12.9			150, 0.85	
$CH_3 + C_2H_5$	C_3H_8	-86.8	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	Sivaramakrishnan et al. (2011)
	$C_2H_4 + CH_4$	Roaming TS	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	
$CH_3 + C_6H_5$	C_7H_8	-103.5	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	500, 0.90	Klippenstein et al. (2007)
	$C_7H_7 + H$	-15.2	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)		
$H + H_2CN$	CH_2NH	-86.9	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	Present work
	$HNC + H_2$	-1.3(TS), -0.8(TS)	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	100, 0.85	
	$HCN + H_2$	-78.6	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)		Present work
$^3NH + CH_3$	CH_3NH	-76.35	CCSD(T)/cc-pVTZ	ANL0		Present work
	$CH_2NH + H$	-46.73	CCSD(T)/cc-pVTZ	ANL0		
$OH + CH_3$	CH_3OH	-90.3	CCSD(T)/cc-pVTZ	ANL0	150, 0.85	Jasper et al. (2007)
	$H_2O + {}^1CH_2$	0.0, -7.3(TS)	CCSD(T)/cc-pVTZ	ANL0	150, 0.85	
	$H_2CO + H_2$	-0.3(TS)	CCSD(T)/cc-pVTZ	ANL0	150, 0.85	
	cis-CHOH + H_2	-2.2(TS)	CCSD(T)/cc-pVTZ	ANL0	150, 0.85	
	trans-CHOH + H_2	-4.8(TS)	CCSD(T)/cc-pVTZ	ANL0	150, 0.85	

$^{(a)}$Energies in kcal/mol.
$^{(b)}$Average downwards energy transfer parameter in exponential down model = $A(T/300)^n$ cm^{-1}.

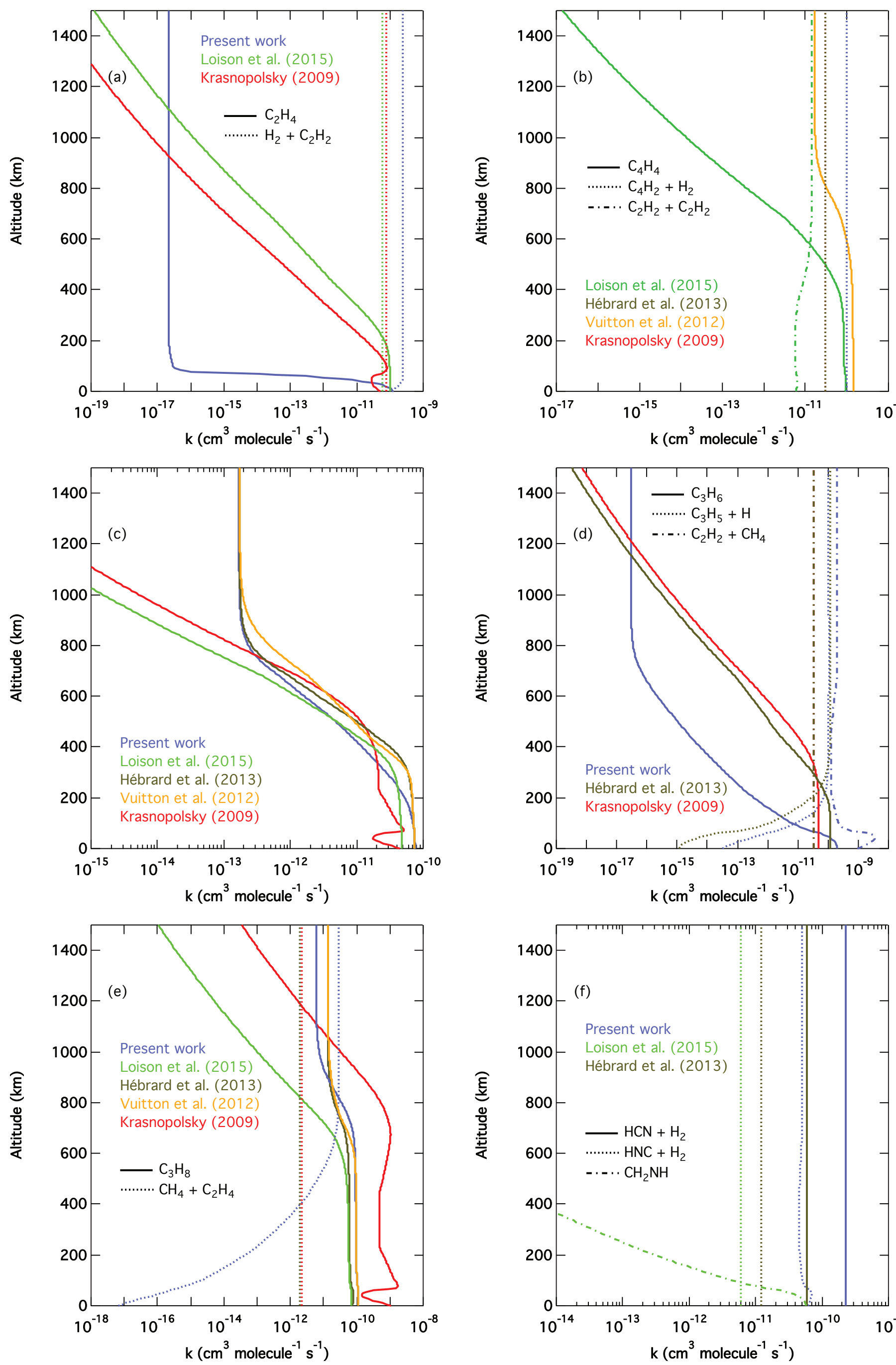

Figure A.3: Rate coefficient versus altitude in Krasnopolsky (2009); Hébrard et al. (2013); Loison et al. (2015) and this work (or after Vuitton et al. (2012)). (a) H + C_2H_3 → C_2H_4 / $H_2 + C_2H_2$ (Rn8), (b) H + C_4H_3 → C_4H_4 / $C_4H_2 + H_2$ / $C_2H_2 + C_2H_2$ (Rn22), (c) $CH_3 + CH_3$ → C_2H_6 (Rn90), (d) $CH_3 + C_2H_3$ → C_3H_6 / C_3H_5 + H / $C_2H_2 + CH_4$ (Rn92), (e) $CH_3 + C_2H_5$ → C_3H_8 / $CH_4 + C_2H_4$ (Rn93), (f) H + H_2CN → HCN + H_2 / HNC + H_2 / CH_2NH (Rn395).

For the $H + CH_3 \to CH_4$ reaction we performed new AITSTME calculations that are closely related to those presented in Miller and Klippenstein (2002). The entrance flux is obtained from a dynamically corrected VRC-TST analysis employing CI+QC/aug-cc-pVQZ interaction energies in close analogy with Klippenstein et al. (2002). The IR intensities for the radiative emission calculations are obtained from B3LYP/6-311++G(d,p) calculations.

For the $H + C_2H_3 \to C_2H_4$ and $H + C_2H_3 \to C_2H_2 + H_2$ reactions we performed new AITSTME calculations extending those from Klippenstein and Harding (1999) to lower temperature, including radiative emission, and incorporating revised electronic structure estimates. Our treatment of the $C_2H_3 + H$ capture rate is again based on multireference based VRC-TST treatment. Our analysis for the formation of $C_2H_2 + H_2$ includes a contribution from both direct abstraction and from addition-elimination through the C_2H_4 complex. The presence of a low energy bimolecular loss channel ($C_2H_2 + H_2$) from the intial adduct (C_2H_4) results in a complex pressure dependence in the ranges of temperature and pressure of relevance to Titan's atmospheric chemistry. Thus, for this one reaction, we have chosen to employ interpolation of a Table of data at various temperatures and pressures in place of the modified Troe forms. Our analysis predicts a more rapid approach to the low pressure limit than do the literature based estimates of Loison et al. (2015) and Krasnopolsky (2009) (cf. Figure A.3a). Our predicted rate constant for forming $C_2H_2 + H_2$ is a factor of three greater than in those two studies.

For the $H + C_4H \to C_4H_2$ reaction we performed new AITSTME calculations. The capture rate was modeled with phase space theory (PST) normalized to yield a capture rate of $\sim 3.5 \times 10^{-10}$ cm^3 s^{-1} at T=140 K, which is a typical capture rate for H atom recombination with radicals. The AITSTME calculations yield pressure dependent rate constants for the stabilization to C_4H_2.

For the $H + C_4H_3 \to C_4H_4$ reaction a new AITSTME analysis was performed as part of Vuitton et al. (2012). This analysis considered only the ground state i-C_4H_3 species (CH_2CCCH) and the formation of CH_2CCCH_2. The direct addition to form CH_2CHCCH was shown by Harding et al. (2007) to be relatively minor, and for simplicity isomerizations from the initial adduct were ignored. For the entrance flux, the direct CASPT2 calculated VRC-TST capture rate from Harding et al. (2007) was extended to low temperature. The abstraction rate to form $H_2 + C_4H_2$ was presumed to be temperature independent at ½ that of the room temperature total capture rate from Harding et al. (2007).

The plots in Figure A.3b provide a comparison of our $H + C_4H_3$ rate predictions with those from Loison et al. (2015) and Hébrard et al. (2012). At 400 km and below our predictions for the stabilization channel (C_4H_4) are similar to those of Loison et al. Above that altitude, our inclusion of radiative stabilization and the inclusion by Loison et al. of a $C_2H_2 + C_2H_2$ bimolecular product channel lead to increasingly divergent results. Our estimated abstraction rate is 3 times that of Loison et al. and Hbrard et al.

For $H + C_6H \to C_6H_2$ reaction our AITSTME analysis suggests that, due to the very large bond energy, the radiative emission rate constant is essentially identical to the capture rate constant, at least for the temperatures of relevance to Titan. We have presumed that this capture rate constant is 3×10^{-10} cm^3 s^{-1}, which is typical of that for H atoms adding to radicals.

For the $H+C_6H_5 \rightarrow C_6H_6$ reaction a new AITSTME analysis was performed as part of Vuitton et al. (2012). The entrance flux was evaluated with a direct CASPT2(2e,2o)/aug-cc-pVDZ based direct VRC-TST approach. This VRC-TST analysis included one-dimensional CASPT2/CBS corrections. Although our form includes pressure dependence, this reaction is effectively in the high-pressure limit at all pressures due to radiative stabilization.

For the $CH_3 + CH_3 \rightarrow C_2H_6$ reaction we extended the earlier AITSTME analysis of Klippenstein and Harding (1999) to lower temperatures, incorporated radiative stabilization, and improved the the VRC-TST part of the analysis to employ direct CASPT2(2e,2o)/CBS(DZ,TZ) energies. A closely related analysis was employed in our earlier study (Vuitton et al., 2012). Figure A.3c provides a comparison of our predictions with the values employed by Loison et al. (2015), Hébrard et al. (2012), and Krasnopolsky (2009). At low altitudes the various results are roughly equivalent (i.e., generally within a factor of 3), while above 800 km the values of Loison et al., and of Krasnopolsky deviate substantially due to their neglect of radiative stabilization.

For the $CH_3+C_2H_3$ reaction we performed AISTME calculations of the stabilization to form C_3H_6 and the bimolecular formation of C_3H_5 + H. Prior VRC-TST treatments yielded high-pressure recombination rate constants of $\sim 1 \times 10^{-10}$ and $\sim 4 \times 10^{-10}$ cm^3 s^{-1} for the $CH_3 + C_2H_3$ (Ye et al., 2015) and C_3H_5 + H (Harding et al., 2007) barrierless recombination reactions, respectively. The present work extends these analyses to lower temperature and includes a treatment of radiative stabilization. These predictions are compared in Figure A.3d with the estimates of Hébrard et al. (2012), which are based on experimental data near room temperature and pressures of 1 to 200 Torr. Above 200 km, our predicted rate for the C_3H_5+H channel is nearly identical to that employed by Hébrard et al. (2012), with only modest differences at lower altitude. In contrast, for the stabilization channel, the two altitude dependences are very different, with our estimate falling off more rapidly with altitude at low altitude, but then reaching a constant altitude independent value, while the Hbrard et al. values continue to decline. Our predicted rate coefficient for the $CH_4+C_2H_2$ channel is about a factor of 10 greater than that of Hbrard et al.

Our AITSTME treatment of the $CH_3 + C_2H_5 \rightarrow C_3H_8$ and $CH_3 + C_2H_5 \rightarrow C_2H_4 + CH_4$ reactions is an extension of the study of Sivaramakrishnan et al. (2011) to lower temperatures and to include approximate treatments of direct abstraction and roaming induced abstraction. The inclusion of roaming yields only minor changes relative to that presented earlier in Vuitton et al. (2012). In contrast, our inclusion of radiative emission yields a much larger stabilization rate coefficient at high altitudes than estimated by Loison et al. (2015) and Krasnopolsky (2009) (cf. Figure A.3e). The present estimate for the abstraction rate coefficient at high altitudes is about an order of magnitude larger than that or earlier estimates.

For the $CH_3 + C_6H_5 \rightarrow C_7H_8$ reaction we extended the earlier AITSTME analysis of Klippenstein et al. (2007) to lower temperature and examined the role of radiative emission. This analysis includes a treatment of the decomposition to $C_7H_7 + H$. However, we find that radiative emission leads to C_7H_8 being the dominant product for the temperatures of relevance to Titan's atmospheric chemistry and so report rate data for only that channel.

Although we have not explicitly calculated the rate for the $C_2H_3 + C_4H_3$ reaction it is clear that this reaction is barrierless. Furthermore, prior explorations of the C_6H_6 PES and related master equation studies (Miller and Klippenstein, 2003; Kislov et al., 2004) indicate that there are low energy pathways, with barriers well below the reactants energy, that allow for isomerization to highly exothermic benzene products. Thus, this reaction is likely to occur at near the collision rate with strong radiative association.

For a number of radical-radical abstractions ($CH_3+C_3H_7 \rightarrow C_3H_6+CH_4$, $H+C_4H_3 \rightarrow C_4H_2 + H_2$, and $C_2H_5 + C_3H_7 \rightarrow$ products) we estimate a temperature independent rate constant of 1×10^{-10} cm^3 s^{-1} based on analogy with our prior analysis for $CH_3 + HCO$ (Harding et al., 2007). For the $C_2H_5 + C_3H_7$ reaction we assign half of this to each of the two separate abstraction channels: $C_3H_8 + C_2H_4$ and $C_3H_6 + C_2H_6$.

Appendix A.2.2. Nitrogen Chemistry

For the reaction of H with H_2CN we performed AITSTME calculations that consider addition to both the C and N atoms in addition to direct abstraction. However, preliminary calculations suggested that the addition to the N atom dominates over addition to the C atom, since the former is barrierless, while the latter has a positive barrier of ∼2 kcal/mol. From CH_2NH we considered H_2 losses to form $HCN + H_2$ and $HNC + H_2$, with the latter 11 kcal/mol lower, and thus dominant. The direct abstraction to yield $HCN + H_2$ is also barrierless. We treat the two barrierless channels ($H + CH_2N \rightarrow CH_2NH$ and $H + CH_2N \rightarrow HCN + H_2$) with direct CASPT2(4e,4o)/aug-cc-pVDZ VRC-TST. The (4e,4o) active space employed in these VRC-TST analyses consists of the π, π^* orbitals of CH_2N, the CH_2N radical orbital, and the H orbital. In both cases we also include a one-dimensional correction for extension to the CBS limit and to allow for geometry relaxation along the MEP.

Our predicted rate coefficients for $H + H_2CN \rightarrow HCN + H_2$ and $H + H_2CN \rightarrow HNC + H_2$ are about an factor of 4 larger than estimated by Loison et al. (2015) and Hébrard et al. (2012) (cf. Figure A.3f). The latter rate estimates are based on RRKM theory calculations employing similar levels of ab initio electronic structure theory. Thus, the differences in the rate estimates are likely an indication of the inadequacy of the modified strong collider assumptions inherent to RRKM theory, particularly when applied to multichannel reactions. After completion of the rate analysis for the present modeling work we performed higher level ANL0 evaluations of the TS for $CH_2NH \rightarrow HNC+H_2$, which yielded a slightly lower barrier of -1.69 kcal/mol relative to $H + H_2CN$. This modest reduction in the barrier height yields only a very modest (∼10%) increase in the predicted rate constant. Loison et al. also present the rate coefficient for formation of CH_2NH. For simplicity, we have neglected this channel as we find it to have an even lower rate coefficient at low altitudes, while at higher altitudes it approaches the radiative rate, which is only 1×10^{-16} cm^3 s^{-1}.

For the ^{3}NH + CH$_3$ $\rightarrow$ CH$_2$NH + H reaction we have performed direct CASPT2(3e,3o)/aug-cc-pVDZ VRC-TST calculations of the rate. This VRC-TST analysis includes a one-dimensional correction for geometry relaxation and for extrapolation to the CBS limit. The (3e,3o) active space consists of the radical orbital of CH$_3$ and the two radical orbitals of ^{3}NH. For simplicity we presume that the CH$_3$NH adduct leads directly to the CH$_2$NH + H products (i.e., without any stabilization), which is justified by the fact that those products are 47 kcal/mol (ANL0) exothermic from the reactants, and the reverse reaction is barrierless.

Appendix A.2.3. Oxygen chemistry

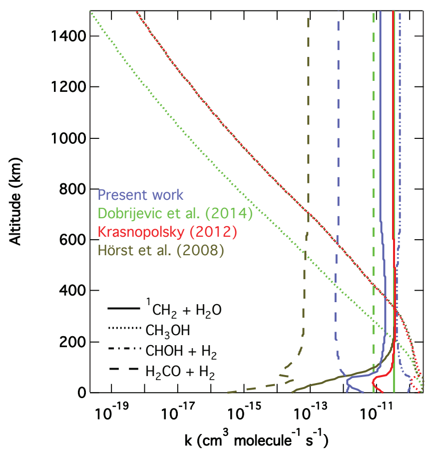

Figure A.4: Rate coefficient versus altitude of OH + CH$_3$ $\rightarrow$ ^{1}CH$_2$ + H$_2$O / CH$_3$OH / HCHO + H$_2$ (R$_n$526) according to Hörst et al. (2008), Krasnopolsky (2012), Dobrijevic et al. (2014) and this work.

For the OH + CH$_3$ and H$_2$O + ^{1}CH$_2$ reactions we have performed a new AITSTME analyses that extends the work of Jasper et al. (2007) to lower temperature and incorporates high level ANL0 calculations for the various decomposition channels from the CH$_3$OH adduct: OH + CH$_3$, H$_2$O + ^{1}CH$_2$, H$_2$ + H$_2$CO, H$_2$ + cis-HCOH, and H$_2$ + trans-HCOH. Figure A.4 provides a comparison of the present predictions for the OH + CH$_3$ rate coefficients with corresponding values from Dobrijevic et al. (2014), Krasnopolsky (2012), and Hörst et al. (2008). Notably, we predict CHOH + H$_2$ to be the dominant low temperature products, while this channel is neglected in the other estimates, apparently due to its insignificance at higher temperatures. Meanwhile, Dobrijevic et al., who base their value at least in part on the Jasper et al. work, estimate an order of magnitude larger rate coefficient for the formation of H$_2$CO + H$_2$, while Hörst et al. estimated an order of magnitude smaller rate coefficient. Our predicted decrease relative to Dobrijevic is likely related to a 0.3 kcal/mol increase in the barrier height for the present ANL0 calculations. This barrier height happens to be very close to the CH_3 + OH asymptotic energy and so a modest change dramatically affects its branching. The three predictions for the $^1CH_2$ + H_2O channel are fairly similar. At low altitudes Krasnopolsky and Dobrijevic predict significant CH_3OH formation, which for simplicity is neglected in the present work.

Appendix A.3. Barrierless Radical-Molecule Reactions

Table A.3 lists the exothermicity and electronic structure methodology employed in the analysis of the barrierless radical-molecule reactions studied here.

Table A.3: Barrierless radical-molecule reaction properties.

Reactants	Products	TS E$^{(a)}$	Product E^{a}	Rovib Method	Energy Method	ΔE_{down} A,n$^{(b)}$
$C_3N + C_4H_2$	CHCCCHCCCN	No Barr.	-70.6	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	
	$H + HC_7N$		-30.8	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	
$C_5N + C_2H_2$	$H + HC_7N$	No Barr.	-30.1			
CH + CO	HCCO		-72.2	B3LYP/6-311++G**	QCISD(T)/CBS(T,Q)	200, 1.0

$^{(a)}$Energies in kcal/mol.
$^{(b)}$Average downwards energy transfer parameter in exponential down model = $A(T/300)^n$ cm^{-1}.

Appendix A.3.1. Nitrogen chemistry

For the $C_3N + C_4H_2 \rightarrow H + HC_7N$ reaction the entrance channel is barrierless and we have employed direct CASPT2 VRC-TST to predict the capture rate. The presence of a highly exothermic exit channel ($H + HC_7N$) is presumed to imply that those products are produced at the capture rate. The VRC-TST analysis employs a CASPT2(5e,5o)/cc-pVDZ orientational sampling with the active space consisting of the sigma radical orbital of C_3N along with its (4e,4o) π, π^* space. A one-dimensional correction along the MEP is obtained from extrapolation of CASPT2(5e,5o)/cc-pVTZ calculations together with a CASPT2(5e,5o)/cc-pVDZ evaluation of geometry relaxation effects. Evaluations at the CASPT2(9e,9o)/cc-pVDZ level suggest only a modest dependence on active space.

The $C_5N + C_2H_2 \rightarrow H + HC_7N$ reaction is similar in many respects to the $C_3N + C_4H_2 \rightarrow H + HC_7N$ reaction. The reactants differ in energy by less than 1 kcal/mol. The formation of the adduct is also expected to be barrierless, and the same products are formed. The $C_5N + C_4H_2 \rightarrow H + HC_9N$ is simply the next member in this reaction series, with similar energetics expected. Thus, we estimate the rate constants for both of these reactions to be equivalent to that calculated for the $C_3N + C_4H_2 \rightarrow H + HC_7N$ reaction.

For the $N(^2D) + HNC$ reaction we performed direct CASPT2(7e,7o)/CBS(TZ,QZ) VRC-TST calculations. The calculations include a one-dimensional correction obtained from CI+QC(7e,7o)/CBS(TZ,QZ) calculations along the MEP. The active space consists of the 3 p orbitals of the N atom together with the 4e,4o π, π^* space of HNC. The CAS reference employs a 5 state average over the states that correlate with the quintuply degenerates states of $N(^2D)$. Consideration of the PES and kinetics for HNCN decomposition, as described in Harding et al. (2008), suggests that the primary products are H + NCN.

Appendix A.3.2. Oxygen chemistry

For the CH + CO reaction we have used AITSTME calculations to predict only the radiative association rates. For these calculations the entrance rate was represented with PST normalized to yield a rate of $\sim 3.5 \times 10^{-10}$ cm^3 s^{-1}. The pressure dependent stabilization rate parameters for this reaction are taken from the review of Baulch et al. (2005).

For the H + CHOH, CH_3 + CHOH, and $N(^2D)$ + CHOH reactions we estimate the radiative recombination rate as 1×10^{-10} cm^3 s^{-1} in analogy with other radical-radical recombination reactions. For the first two reactions, the OH bond is expected to be the weakest bond in the complexes (CH_2OH and CH_3CHOH), with OH bond fission highly exothermic relative to reactants. Thus, we predict the products to be $H_2CO + H$ and $CH_3CHO + H$ for the H + CHOH and CH_3 + CHOH reactions, respectively. For the $N(^2D)$ + CHOH reaction we expect the intial adduct, HCNOH, to be formed through insertion in the CO bond, with NO bond fission expected to yield HCN + OH as the dominant products.

Appendix A.4. Ion-Molecule Reactions

For the $CH_3 + HCNH^+$ reaction we performed AITSTME calculations that consider the CH_3CHNH^+ well (-30.13 kcal/mol at the ANL0 level) as well as the H loss channel, $H + CH_3CNH^+$. The entrance and exit saddle points lie at -4.72 and -4.37 kcal/mol. The entrance flux was evaluated with a two transition state model (Greenwald et al., 2005) employing direct MP2/cc-pVTZ VRC-TST for the long-range TS and an ANL0//CCSD(T)/cc-pVTZ variational TS model for the inner TS. The flux through the exit channel was evaluated with an ANL0//CCSD(T)/cc-pVTZ variational TS model. Near 140 K stabilization is negligible and so we report only the rate coefficient for formation of $H + CH_3CNH^+$.

For the $C_2H_4 + HCNH^+$ reaction we performed AITSTME calculations of the stabilization to the boat form of C_2H_4:$CHNH^+$ (Bera et al., 2011). We calculate a binding energy of -42.66 kcal/mol at the CCSD(T)/cc-pVTZ level. We treat the entrance flux with PST for an ion-induced dipole potential. The infrared intensities are evaluated with the M06-2X/6-31G* density functional.

Appendix B. Input Data

Appendix B.1. Molecular Diffusion

Table B.1: Molecular diffusion coefficients.

Species	Type	A	s	S	S′	ϕ/k	Ref.
CH_4	1	7.34×10^{16}	0.750	0	0	0	(Mason and Marrero, 1970)
^{40}Ar	1	6.73×10^{16}	0.749	0	0	0	(Mason and Marrero, 1970)
H_2	1	1.88×10^{17}	0.820	0	0	0	(Mason and Marrero, 1970)
$C_2H_2{}^{(a)}$	1	7.91×10^{16}	0.730	0	0	0	-
C_2H_4	1	7.77×10^{16}	0.730	0	0	0	(**?**)
C_2H_6	1	3.74×10^{16}	0.774	0	0	0	(**?**)
$C_4H_2{}^{(a)}$	1	6.54×10^{16}	0.668	0	0	0	4
N	1	9.69×10^{16}	0.774	0	0	0	-
HCN	4	1.17×10^{16}	1.012	0	0	0	-
HNC	4	1.17×10^{16}	1.012	0	0	0	2
H_2O	1	1.38×10^{16}	1.072	0	0	0	2
CO	3	3.24×10^{19}	0.576	-36.23	3.83×10^{3}	1.57×10^{8}	2?
CO_2	2	2.32×10^{17}	0.570	113.6	0	0	?
$H_2CO^{(b)}$	3	3.19×10^{19}	0.576	-36.23	3.83×10^{3}	1.57×10^{8}	2?

$^{(a)}$Estimated from the values for C_2H_4 and C_2H_6.
$^{(b)}$Estimated from the value for CO.

Type 1 is calculated from

$$b = AT^s \tag{B.1}$$

Type 2 is calculated from

$$b = AT^s \exp\left(-S/T\right) \tag{B.2}$$

Type 3 from

$$b = AT^s \left(\ln(\phi/kT)\right)^2 \exp\left(-S/T - S'/T^2\right) \tag{B.3}$$

Parameters for all these types are obtained from the references listed.

Type 4 is calculated from the kinetic theory formula based a on Lennard-Jones 6-12 potential

$$b_{i,j} = \frac{3}{16}\frac{\sqrt{2\pi k^3 T/\mu_{i,j}}}{\pi\sigma_{i,j}^2 \Omega^{(1,1)\star}(T_{i,j}^\star)} \tag{B.4}$$

where $\mu_{i,j}$ is the reduced collision mass , $\sigma_{i,j}$ is the collision diameter, and $\Omega^{(1,1)\star}(T_{i,j}^\star)$ is a Chapman-Cowling transport integral calculated at the reduced temperature

$$T_{i,j}\star = kT/\epsilon_{i,j} \tag{B.5}$$

The force parameter $\epsilon_{i,j}$ and collision diameter $\sigma_{i,j}$ are calculated from the Lennard-Jones parameters for the individual molecules by

$$\sigma_{i,j} = \frac{1}{2}\left(\sigma_i + \sigma_j\right) \tag{B.6}$$

$$\epsilon_{i,j} = \sqrt{\epsilon_i \epsilon_j} \tag{B.7}$$

Lennard-Jones parameters are obtained from (**?**).

For molecules not included in the table, the binary diffusion parameter is obtained from the kinetic theory expression for hard sphere collisions

$$b = \frac{3}{8}\frac{kT/\mu}{\sqrt{\pi}\sigma^2} \tag{B.8}$$

Appendix B.2. Saturation Vapor Pressure

Table B.2: Saturation vapor pressures.

Species	Expression (μbar)	T (K)	Ref.
C_2H_2	$10^6 \times e^{(13.4-2536/T)}$	< 192	Fray and Schmitt (2009)
C_2H_4	$10^6 \times e^{(1.540\times10^1-2.206\times10^3/T-1.216\times10^4/T^2+2.843\times10^5/T^3-2.203\times10^6/T^4)}$	20-104	Fray and Schmitt (2009)
C_2H_6	$10^6 \times e^{(1.511\times10^1-2.207\times10^3/T-2.411\times10^4/T^2+7.744\times10^5/T^3-1.161\times10^7/T^4+6.763\times10^7/T^5)}$	20-90	Fray and Schmitt (2009)
CH_3CCH	$1333 \times 10^{(7.7759-1240.32/T)}$	162-250	Moses et al. (1992)
CH_2CCH_2	$1333 \times 10^{(7.7759-1240.32/T)}$	-	assumed same as CH_3CCH
C_3H_6	$1333 \times 10^{(7.7759-1240.32/T)}$	-	assumed same as CH_3CCH
C_3H_8	$1333 \times 10^{(8.16173-1176/T)}$	105-238	based on Tickner and Lossing (1951) data
C_4H_2	$1333 \times 10^{(5.3817-3300.5/T+16.63415\times log_{10}(1000/T))}$	127-249	Moses et al. (1992)
C_4H_4	$1333 \times 10^{(5.3817-3300.5/T+16.63415\times log_{10}(1000/T))}$	-	assumed same as C_4H_2
C_4H_6	$1333 \times 10^{(8.032581-1441.42/T)}$	181-282	Moses et al. (1992)
C_4H_8	$1333 \times 10^{(8.032581-1441.42/T)}$	-	assumed same as C_4H_6
C_4H_{10}	$1333 \times 10^{(8.446-1461.2/T)}$	128-196	Moses et al. (1992)
C_6H_2	$1333 \times 10^{(5.3817-3300.5/T+16.63415\times log_{10}(1000/T))}$	-	assumed same as C_4H_2
C_6H_6	$10^6 \times e^{(1.735\times10^1-5.663\times10^3/T)}$	< 279	Fray and Schmitt (2009)
NH_3	$10^6 \times e^{(1.596\times10^1-3.537\times10^3/T-3.310\times10^4/T^2+1.742\times10^6/T^3-2.995\times10^7/T^4)}$	15-195	Fray and Schmitt (2009)
N_2H_4	$10^6 \times e^{(1.596\times10^1-3.537\times10^3/T-3.310\times10^4/T^2+1.742\times10^6/T^3-2.995\times10^7/T^4)}$	-	assumed same as NH_3
CH_2NH	$10^3 \times e^{(19.413-3333.325/T)}$	-	assumed same as CH_2NH
CH_3NH_2	$10^3 \times e^{(19.413-3333.325/T)}$	196-267	Loison et al. (2015)
HCN	$10^6 \times e^{(1.393\times10^1-3.624\times10^3/T-1.325\times10^5/T^2+6.314\times10^6/T^3-1.128\times10^8/T^4)}$	15-260	Fray and Schmitt (2009)
HNC	$10^6 \times e^{(1.393\times10^1-3.624\times10^3/T-1.325\times10^5/T^2+6.314\times10^6/T^3-1.128\times10^8/T^4)}$	-	assumed same as HCN
CH_3CN	$10^3 \times e^{(18.2432-4017.098/T)}$	295-354	Loison et al. (2015)
HC_3N	$10^6 \times e^{(1.301\times10^1-4.426\times10^3/T)}$	< 202	Fray and Schmitt (2009)
C_2H_3CN	$10 \times 10^{(21.058-2371.0/T-1.560\times log(T))}$	291-350	Loison et al. (2015)
C_2H_5CN	$10^3 \times e^{(18.7211-4352.66/T)}$	204-371	Loison et al. (2015)
HC_5N	$10^6 \times e^{(1.301\times10^1-4.426\times10^3/T)}$	-	assumed same as HC_3N
C_2N_2	$10^6 \times e^{(1.653\times10^1-4.109\times10^3/T)}$	< 245	Fray and Schmitt (2009)
C_4N_2	$10^6 \times e^{(1.909\times10^1-6.036\times10^3/T)}$	< 273	Fray and Schmitt (2009)
H_2O	$10^6 \times 6.11657 \times 10^{-3} \times e^{(1.5\times log(T/273.16)+(1-273.16/T)\times(20.9969665107897+3.72437478271362\times(T/273.16)-13.9205483215524\times(T/273.16)^2+29.6988765013566\times(T/273.16)^3-40.1972392635944\times(T/273.16)^4+29.7880481050215\times(T/273.16)^5-9.13050963547721\times(T/273.16)^6))}$	< 273	Fray and Schmitt (2009)
CO_2	$10^6 \times e^{(1.476\times10^1-2.571\times10^3/T-7.781\times10^4/T^2+4.325\times10^6/T^3-1.207\times10^8/T^4+1.350\times10^9/T^5)}$	40-195	Fray and Schmitt (2009)

Table B.3: Neutral species included in the model.

Closed-shell molecules
H_2, CH_4, C_2H_2, C_2H_4, C_2H_6, CH_3CCH, CH_2CCH_2, C_3H_6, C_3H_8
C_4H_2, C_4H_4, C_4H_6, C_4H_8, C_4H_{10}, C_6H_2, C_6H_6, C_7H_8
N_2, NH_3, N_2H_4, CH_2NH, CH_3NH_2, HCN, HNC, CH_3CN
HC_3N, C_2H_3CN, C_2H_5CN, HC_5N, C_2N_2, C_4N_2
H_2O, CO, H_2CO, CH_2CO, CH_3CHO, CO_2, HNO
Radicals
H, C, CH, $^3CH_2$, $^1CH_2$, CH_3, C_2, C_2H, C_2H_3, C_2H_5
C_3, C_3H, C_3H_2, C_3H_3, C_3H_5, C_3H_7
C_4H, C_4H_3, C_4H_5, C_4H_7, C_4H_9, C_6H, C_6H_3, C_6H_5, C_7H_7
$N(^4S)$, $N(^2D)$, NH, NH_2
CN, H_2CN, C_2N, HC_2N, CH_2CN, C_3N, C_2H_2CN, C_2H_4CN
$O(^3P)$, $O(^1D)$, $O(^1S)$, OH, HCO, CHOH, CH_2OH, HCCO, CH_3CO
NO, NCO

Table B.4: Ion species included in the model.

Positive ions
H^+, H_2^+, H_3^+, H_5^+, C^+, CH^+, CH_2^+, CH_3^+, CH_4^+, CH_5^+
C_2H^+, $C_2H_2^+$, $C_2H_3^+$, $C_2H_4^+$, $C_2H_5^+$, $C_2H_6^+$, $C_2H_7^+$
C_3^+, C_3H^+, $C_3H_2^+$, l-$C_3H_3^+$, c-$C_3H_3^+$, $C_3H_4^+$, $C_3H_5^+$, $C_3H_6^+$, $C_3H_7^+$, $C_3H_8^+$, $C_3H_9^+$
C_4H^+, $C_4H_2^+$, $C_4H_3^+$, $C_4H_4^+$, $C_4H_5^+$, $C_4H_6^+$, $C_4H_7^+$, $C_4H_8^+$, $C_4H_9^+$
C_5H^+, $C_5H_2^+$, $C_5H_3^+$, $C_5H_4^+$, $C_5H_5^+$, $C_5H_6^+$, $C_5H_7^+$, $C_5H_8^+$, $C_5H_9^+$, $C_5H_{10}^+$, $C_5H_{11}^+$
C_6H^+, $C_6H_2^+$, $C_6H_3^+$, $C_6H_4^+$, $C_6H_5^+$, $C_6H_6^+$, $C_6H_7^+$, $C_6H_9^+$, $C_6H_{11}^+$, $C_6H_{13}^+$
C_7H^+, $C_7H_2^+$, $C_7H_3^+$, $C_7H_4^+$, $C_7H_5^+$, $C_7H_6^+$, $C_7H_7^+$, $C_7H_8^+$, $C_7H_9^+$
C_8H^+, $C_8H_2^+$, $C_8H_3^+$, $C_8H_4^+$, $C_8H_5^+$, $C_8H_6^+$, $C_8H_7^+$, $C_8H_9^+$
C_9H^+, $C_9H_2^+$, $C_9H_3^+$, $C_9H_4^+$, $C_9H_7^+$, $C_9H_8^+$
N^+, NH^+, NH_2^+, NH_3^+, NH_4^+, N_2^+, N_3^+, N_4^+, N_2H^+, $N_2H_5^+$
CN^+, HCN^+, HNC^+, $HCNH^+$, CH_2NH^+, $CH_2NH_2^+$, $CH_3NH_2^+$, $CH_3NH_3^+$
CNC^+, C_2N^+, HC_2N^+, HC_2NH^+, $C_2H_3N^+$, $C_2H_3NH^+$, $C_2H_5N^+$
C_3N^+, HC_3N^+, HC_3NH^+, $C_3H_3N^+$, $C_3H_3NH^+$, $C_3H_5N^+$, $C_3H_5NH^+$, $C_3H_7NH^+$, $C_3H_9NH^+$
C_4N^+, HC_4N^+, HC_4NH^+, $C_4H_3N^+$, $C_4H_3NH^+$, $C_4H_5N^+$, $C_4H_5NH^+$, $C_4H_7NH^+$, $C_4H_9NH^+$
C_5N^+, HC_5N^+, HC_5NH^+, $C_5H_3N^+$, $C_5H_3NH^+$, $C_5H_5N^+$, $C_5H_5NH^+$, $C_5H_7NH^+$
C_6N^+, HC_6NH^+, $C_6H_3NH^+$, $C_6H_5NH^+$, $C_6H_7N^+$, $C_6H_7NH^+$, $C_6H_9N^+$, $C_6H_9NH^+$
C_7N^+, HC_7N^+, HC_7NH^+, $C_7H_3N^+$, $C_7H_3NH^+$, $C_7H_7N^+$, $C_7H_7NH^+$
$C_2N_2^+$, $C_2N_2H^+$, $C_4N_2^+$, $C_4N_2H^+$, $C_6N_2^+$, $C_6N_2H^+$, $C_xH_yN_z^+$
O^+, OH^+, H_2O^+, H_3O^+, CO^+, HCO^+, HOC^+, CH_2O^+, CH_2OH^+, $CH_3OH_2^+$
HC_2O^+, CH_2CO^+, CH_3CO^+, CH_3COH^+, CH_3CHOH^+, HC_3O^+, $C_2H_2CO^+$, $C_2H_3CO^+$
CO_2^+, $OCOH^+$, NO^+, HNO^+, NCO^+, $HNCO^+$
$CH_5^+ \cdot CH_4$, $C_2H_5^+ \cdot CH_4$, $C_2H_7^+ \cdot CH_4$, $C_3H_7^+ \cdot CH_4$, Adduct$^+$
$CH_2^+ \cdot N_2$, $CH_3^+ \cdot N_2$, $CH_5^+ \cdot N_2$, $C_2H_5^+ \cdot N_2$, $C_3H_7^+ \cdot N_2$
$CH_5^+ \cdot HNC$, $HCNH^+ \cdot CH_4$, $HCNH^+ \cdot N_2$, AdductN$^+$
$C_4H_3^+ \cdot CO$, $CO^+ \cdot N_2$, $HCO^+ \cdot H_2$, $HCO^+ \cdot CO$
Negative ions
H^-, CH_2^-, CH_3^-, C_2H^-, C_4H^-, C_6H^-, CN^-, C_3N^-, C_5N^-, O^-, OH^-, $C_xH_yN_z^-$

Appendix B.4. Primary Processes

Table B.5: Energy thresholds and references for N_2, CH_4 and CO dissociation and ionization by photons and electrons.

		Reaction Channels	ΔE (eV)	Photons: Branching Ratios	Photons: Cross-sections	Electrons
(J_d1a)	N_2	$\rightarrow N(^2D) + N(^4S)$	12.1	(Walter et al., 1993)	(Lavvas et al., 2011a) (100-83.5)	(Itikawa, 2006)
(J_d1b)		$\rightarrow N(^2D) + N(^2D)$	14.5	(Lewis et al., 2005)	(Fennelly and Torr, 1992) (83.5-79.5)	
(J_i1a)	N_2	$\rightarrow N_2^+ + e^-$	15.6	(Aoto et al., 2006)	(Shaw et al., 1992) (79.5-65.0)	(Shemansky and Liu, 2005)
(J_i1b)		$\rightarrow N^+ + N(^4S) + e^-$	24.3	(Kirby et al., 1979)	(Samson et al., 1987) as reported in (Fennelly and Torr, 1992) (65.0-11.5)	
(J_i1c)		$\rightarrow N^+ + N(^2D) + e^-$	26.7	(Krummacher et al., 1980)	(Stolte et al., 1998) (11.5-1.50)	
(J_d2a)	CH_4	$\rightarrow CH_3 + H$	4.48	(Gans et al., 2011)	(Mount et al., 1977) (160-140)	(Erwin and Kunc, 2005, 2008)
(J_d2b)		$\rightarrow {}^1CH_2 + H_2$	5.14		(Lee and Chiang, 1983) (140-100)	
(J_d2c)		$\rightarrow CH + H_2 + H$	9.05			
(J_d2d)		$\rightarrow {}^3CH_2 + 2\ H$	9.18			
(J_i2a)	CH_4	$\rightarrow CH_4^+ + e^-$	12.6		(Samson et al., 1989) (95-11)	(Liu and Shemansky, 2006)
(J_i2b)		$\rightarrow CH_3^+ + H + e^-$	14.3			(Erwin and Kunc, 2005, 2008)
(J_i2c)		$\rightarrow CH_2^+ + H_2 + e^-$	15.2			
(J_i2d)		$\rightarrow H^+ + CH_3 + e^-$	18.0			
(J_i2e)		$\rightarrow C^+ + H_2 + H_2 + e^-$	19.4			
(J_i2f)		$\rightarrow CH_2^+ + H + H + e^-$	19.7			
(J_i2g)		$\rightarrow CH^+ + H_2 + H + e^-$	19.8			
(J_i2h)		$\rightarrow H_2^+ + {}^3CH_2 + e^-$	20.2			
(J_d3a)	CO	$\rightarrow O(^3P) + C(^3P)$	11.1	(?)	(Cook et al., 1965) (100-60)	
(J_d3b)		$\rightarrow O(^1D) + C(^1D)$	13.1	(?)	(Chan et al., 1993a) (60-1.50)	
(J_i3a)		$\rightarrow CO^+ + e^-$	14.0	(??)		
(J_i3b)		$\rightarrow C^+ + O(^3P) + e^-$	22.6	(??)		
(J_i3c)		$\rightarrow O^+ + C(^3P) + e^-$	24.6	(??)		

Notes. ΔE is the adiabatic energy threshold for the given reaction channel.
The values in parenthesis represent the energy range in nm.

Table B.6: Photodissociation reactions

Reaction Channels			ΔE (nm)	λ (nm)	Branching Ratios Values (%)	Ref.	Cross-sections λ (nm)	T (K)	Ref.
(J_d4)	H_2	→		**Not included.**					
(J_d5)	C_2H_2	→ $C_2H + H$	217	>110	1.0	Läuter et al. (2002)	100-110	295	Cooper et al. (1995)
						Kovács et al. (2010)	110-147	298	Nakayama and Watanabe (1964)
							147-153	195	Smith et al. (1991)
							153-189	155	Wu et al. (1989)
							189-225	200	Bénilan et al. (2000)
(J_d6a)	C_2H_4	→ $C_2H_2 + H_2$	713	>118	0.5	Balko et al. (1992)	100-185	295	Holland et al. (1997)
(J_d6b)		→ $C_2H_2 + 2\,H$	200	>118	0.5	Lee et al. (2004)	185-197	295	Orkin et al. (1997)
(J_d7a)	C_2H_6	→ $C_2H_4 + H_2$	925	108-140 / >140	0.14 / 0.56	Akimoto et al. (1965)	110-125	295	Kameta et al. (1996)
(J_d7b)		→ $C_2H_2 + H_2 + H_2$	403	108-140 / >140	0.27 / 0.29	Hampson and McNesby (1965)	125-150	150	Chen and Wu (2004)
(J_d7c)		→ $CH_3 + CH_3$	325	108-140 / >140	0.06 / 0.00	Lias et al. (1970)	150-161	295	Lee et al. (2001)
(J_d7d)		→ $CH_4 + {}^1CH_2$	278	108-140 / >140	0.22 / 0.02				
(J_d7e)		→ $C_2H_4 + 2\,H$	213	108-140 / >140	0.31 / 0.13				
(J_d8a)	CH_3CCH	→ $C_3H_2 + H_2$	394	>119	0.01	Seki and Okabe (1992)	120-160	295	Ho et al. (1998)
(J_d8b)		→ $C_3H_3 + H$	318	>119	0.89	Ni et al. (1999)	160-195	233	Fahr and Nayak (1996)
(J_d8c)		→ $C_2H_2 + {}^1CH_2$	230	>119	0.10	DeSain and Taatjes (2003)	195-219	183	Bénilan et al. (1999)
(J_d9a)	CH_2CCH_2	→ $C_3H_2 + H_2$	400	128-157 / >157	0.11 / 0.10	Jackson et al. (1991)	100-185	200	Chen et al. (2000)
(J_d9b)		→ $C_3H_3 + H$	322	128-157 / 157-218 / >218	0.70 / 0.89 / 0.90	Ni et al. (1999)	185-229	183	Bénilan et al. (1999)
(J_d9c)		→ $C_2H_2 + {}^1CH_2$	260	128-157 / 157-218 / >218	0.19 / 0.01 / 0.00	Harich et al. (2000)			
(J_d9d)						Robinson et al. (2005)			
(J_d10a)	C_3H_6	→ $C_2H_2 + CH_4$	942	>127	0.05	Borrell et al. (1971)	100-110	295	Koizumi et al. (1985)
(J_d10b)		→ $C_3H_5 + H$	330	127-140 / >140	0.30 / 0.40	Collin et al. (1979)	110-155	295	Samson et al. (1962)
(J_d10c)		→ $C_2H_3 + CH_3$	288	127-140 / >140	0.25 / 0.35	Niedzielski et al. (1982)	155-200	223	Fahr and Nayak (1996)
(J_d10d)		→ $C_2H_4 + {}^3CH_2$	287	127-140 / >140	0.05 / 0.03	Naroznik and Niedzielski (1986)			
(J_d10e)		→ $CH_3CCH + H + H$	203	127-140 / >140	0.14 / 0.07	Collin (1988)			
(J_d10f)		→ $CH_2CCH_2 + H + H$	201	127-140 / >140	0.21 / 0.10	Gierczak et al. (1988)			
(J_d11a)	C_3H_8	→ $C_2H_4 + CH_4$	1577	114-140 / >140	0.20 / 0.06	Okabe and McNesby (1962)	100-115	295	Kameta et al. (1996)
(J_d11b)		→ $C_3H_6 + H_2$	1024	114-140 / >140	0.33 / 0.94	Laufer and McNesby (1966)	115-120	298	Au et al. (1993)
(J_d11c)		→ $C_2H_5 + CH_3$	329	114-140 / >140	0.38 / 0.00		120-160	295	Okabe and Becker (1963)
(J_d11d)		→ $C_2H_6 + {}^1CH_2$	271	114-140 / >140	0.09 / 0.00				
(J_d12a)	C_4H_2	→ $C_4H + H$	215	122-150 / 150-180 / 180-205 / >205	0.75 / 0.80 / 0.88 / 1.0	Silva et al. (2008)	120-160	296	Okabe (1981)
(J_d12b)		→ $C_2H_2 + C_2$	203	122-150 / 150-180 / 180-205 / >205	0.06 / 0.16 / 0.12 / 0.0		160-195	223	Fahr and Nayak (1994)
(J_d12c)		→ $C_4 + H_2$	192	122-150 / 150-180 / 180-205 / >205	0.05 / 0.01 / 0.0 / 0.0		195-250	193	Smith et al. (1998)
(J_d12d)		→ $C_2H + C_2H$	179	122-150 / 150-180 / 180-205 / >205	0.14 / 0.03 / 0.0 / 0.0				
(J_d13a)	C_4H_4	→ $C_2H_2 + C_2H_2$	745	>129	0.66	Stearns et al. (2006)	160-240	220	Fahr and Nayak (1996)
(J_d13b)		→ $C_4H_2 + H_2$	744	>129	0.07				
(J_d13c)		→ $C_4H_3 + H$	287	>129	0.27				
(J_d14a)	C_4H_6	→ $C_2H_4 + C_2H_2$	733	>137	0.20	Robinson et al. (2002)	160-240	218	Fahr and Nayak (1994)
(J_d14b)		→ $C_4H_4 + H_2$	701	>137	0.02				
(J_d14c)		→ $C_3H_3 + CH_3$	317	>137	0.50				
(J_d14d)		→ $C_4H_5 + H$	291	>137	0.20				
(J_d14e)		→ $C_2H_3 + C_2H_3$	251	>137	0.08				

Table B.6 – Continued from previous page

Reaction Channels			ΔE (nm)	Branching Ratios λ (nm)	Values (%)	Ref.	Cross-sections λ (nm)	T (K)	Ref.
(J_d15a)	C_4H_8	$\rightarrow C_4H_6 + H_2$	893	130-150 / >150	0.37 / 0.07	Collin and Perrin (1972)	100-105	298	Koizumi et al. (1985)
(J_d15b)		$\rightarrow CH_3CCH + CH_4$	872	130-150 / >150	0.20 / 0.01	Deslauriers et al. (1987)	105-115	298	Samson et al. (1962)
(J_d15c)		$\rightarrow C_4H_7 + H$	337	130-150 / >150	0.00 / 0.46		115-205	296	Es-sebbar et al. (2013)
(J_d15d)		$\rightarrow C_3H_6 + {}^3CH2$	276	130-150 / >150	0.04 / 0.00				
(J_d15e)		$\rightarrow C_3H_5 + CH_3$	274	130-150 / >150	0.00 / 0.44				
(J_d15f)		$\rightarrow C_2H_2 + CH_3 + CH_3$	223	130-150 / >150	0.27 / 0.00				
(J_d15g)		$\rightarrow C_2H_5 + C_2H_2 + H$	205	130-150 / >150	0.08 / 0.01				
(J_d15h)		$\rightarrow C_2H_4 + C_2H_3 + H$	204	130-150 / >150	0.04 / 0.01				
(J_d16a)	C_4H_{10}	$\rightarrow C_3H_6 + CH_4$	1162	116-140 / 140-160	0.05 / 0.01	Okabe and Becker (1963)	120-160	298	Au et al. (1993)
(J_d16b)		$\rightarrow C_2H_6 + C_2H_4$	946	116-140 / 140-160	0.20 / 0.12	Obi et al. (1971)			
(J_d16c)		$\rightarrow C_4H_8 + H_2$	896	116-140 / 140-160	0.40 / 0.70	Jackson and Lias (1974)			
(J_d16d)		$\rightarrow C_2H_5 + C_2H_5$	301	116-140 / 140-160	0.15 / 0.10				
(J_d16e)		$\rightarrow C_2H_4 + CH_3 + CH_3$	327	116-140 / 140-160	0.10 / 0.03				
(J_d16f)		$\rightarrow C_3H_6 + CH_3 + H$	223	116-140 / 140-160	0.10 / 0.04				
(J_d17a)	C_6H_2	$\rightarrow C_6H + H$	215	131-150 / 150-180 / 180-205 / >205	0.75 / 0.80 / 0.88 / 1.0	Estimate after C_4H_2	120-185	300	Kloster-Jensen et al. (1974)
(J_d17b)		$\rightarrow C_4H_2 + C_2$	203	131-150 / 150-180 / 180-205 / >205	0.06 / 0.16 / 0.12 / 0.0		185-300	233	Shindo et al. (2003)
(J_d17c)		$\rightarrow C_6 + H_2$	192	131-150 / 150-180 / 180-205 / >205	0.05 / 0.01 / 0.0 / 0.0				
(J_d17d)		$\rightarrow C_4H + C_2H$	179	131-150 / 150-180 / 180-205 / >205	0.14 / 0.03 / 0.0 / 0.0				
(J_d18)	C_6H_6	$\rightarrow C_6H_5 + H$	254	>134	1.0	Tsai et al. (2000)	100-115	295	Koch and Otto (1972)
							115-210	250	Capalbo et al. (2016)
							210-270	295	Pantos et al. (1978)
(J_d19a)	C_7H_8	$\rightarrow C_7H_7 + H$	653	>140	0.75	Luther et al. (1990)	185-240	300	Hippler et al. (1983)
(J_d19b)		$\rightarrow C_6H_5 + CH_3$	295	>140	0.25	Fröchtenicht (1995)	240-270	296	Burton and Noyes (1968)
(J_d20)	NH_3	$\rightarrow NH_2 + H$	270	>123	1.0	Ashfold et al. (1997)	140-175	298	Cheng et al. (2006)
							175-225	175	Chen et al. (1999)
(J_d21)	N_2H_4	$\rightarrow N_2H_3 + H$	354	>153	1.0	Vaghjiani (1995)	191-291	296	Vaghjiani (1993)
(J_d22)	HCN	$\rightarrow CN + H$	229	>100	1.0	Lee (1980)	100-105	295	Nuth and Glicker (1982)
							105-190	295	Lee (1980)
(J_d23)	HNC	$\rightarrow$	**No photodissociation (cf. section 2.6.3)**						
(J_d24)	CH_2NH	$\rightarrow HCN + H + H$	258	>124	1.0	Nguyen et al. (1996)	234-260	298	Teslja et al. (2004)
(J_d25a)	CH_3NH_2	$\rightarrow CH_2NH + H + H$	224	139-165 / >165	1.0 / 0.55	Gardner and McNesby (1982)	100-249	298	Hubin-Franskin et al. (2002)
(J_d25b)		$\rightarrow HCN + H_2 + H + H$	211	139-165 / >165	0.0 / 0.20				
(J_d26)	CH_3CN	$\rightarrow CN + CH_3$	237	>102	1.0	Halpern and Tang (1985)	100-106	295	Nuth and Glicker (1982)
							106-184	298	Suto and Lee (1985)
(J_d27a)	HC_3N	$\rightarrow C_3N + H$	213	107-191 / >191	0.57 / 1.0	Silva et al. (2009)	100-165	295	Connors et al. (1974)
(J_d27b)		$\rightarrow CN + C_2H$	191	107-191 / >191	0.43 / 0.0		185-230	213	Bénilan et al. (1994)
(J_d28a)	C_2H_3CN	$\rightarrow HC_3N + H_2$	668	>114	0.59	Derecskei-Kovacs and North (1999)	100-230	298	Eden et al. (2003)
(J_d28b)		$\rightarrow HNC + C_2H_2$	528	>114	0.04	Wilhelm et al. (2009)			
(J_d28c)		$\rightarrow HCN + C_2H_2$	345	>114	0.12				
(J_d28d)		$\rightarrow CH_2CCN + H$	273	>114	0.24				
(J_d28e)		$\rightarrow CN + C_2H_3$	221	>114	0.01				
(J_d29a)	C_2H_5CN	$\rightarrow HCN + C_2H_4$	864	>104	0.16	Estimate after C_2H_3CN	100-152	298	Kanda et al. (1999)
(J_d29b)		$\rightarrow C_2H_3CN + H_2$	840	>104	0.59		152-217	-	Same as C_2H_2
(J_d29c)		$\rightarrow CN + C_2H_5$	232	>104	0.01				
(J_d29d)		$\rightarrow CH_3CHCN + H$		>104	0.24				

Table B.6 – Continued from previous page

Reaction Channels			ΔE (nm)	λ (nm)	Branching Ratios Values (%)	Ref.	Cross-sections λ (nm)	T (K)	Ref.
(J_d30a)	HC_5N	→ $C_5N + H$	209	<174 / >174	0.50 / 1.0	Estimate after HC_3N	115-298	233	Fray et al. (2010)
(J_d30b)		→ $CN + C_4H$	189	<174 / >174	0.25 / 0.0				
(J_d30c)		→ $C_3N + C_2H$	176	<174 / >174	0.25 / 0.0				
(J_d31a)	C_2N_2	→ $CN + CN$	213	>100	1.0	Halpern and Huang (1997)	100-114	295	Nuth and Glicker (1982)
(J_d31b)							114-170	295	Connors et al. (1974)
(J_d31c)							185-214	293	LISA[a]
(J_d31d)							214-225	183	LISA[a]
(J_d32)	C_4N_2	→ $C_3N + CN$	193	>105	1.0	Halpern et al. (1990)	100-176	295	Connors et al. (1974)
							195-275	233	LISA[a]
(J_d33a)	H_2O	→ $OH + H$	243	<124 / 124-140 / >140	0.78 / 0.89 / 1.0	Mordaunt et al. (1994)	100-115	298	Chan et al. (1993c)
(J_d33b)		→ $O(^1D) + H_2$	179	<140 / >140	0.11 / 0.0	Stief et al. (1975)	115-194	298	Mota et al. (2005)
(J_d33c)		→ $O(^3P) + H + H$	129	<124 / >124	0.11 / 0.0	Sander et al. (2006)			
(J_d34a)	H_2CO	→ $CO + H_2$	361	114-250 / > 250	0.5 / Table B.7	Glicker and Stief (1971)	100-225	298	Cooper et al. (1996)
(J_d34b)		→ $HCO + H$	330	114-250 / >250	0.5 / Table B.7	Sander et al. (2011)	225-375	223	Meller and Moortgat (2000)
(J_d35a)	CH_2CO	→ $CO + {}^3CH_2$	371	129-332 / > 332	0.0 / 1.0	Hayden et al. (1982)	290-354	298	Laufer and Keller (1971)
(J_d35b)		→ $CO + {}^1CH_2$	332	129-332 / > 332	1.0 / 0.0	Morgan et al. (1996)			
(J_d36)	CH_3CHO	→ $CO + CH_4$	-[b]	>113	1.0	Sander et al. (2011)	113-184	298	Limão-Vieira et al. (2003)
							202-300	298	Sander et al. (2011)
(J_d37a)	CO_2	→ $CO + O(^3P)$	228	>100	Table B.8	Lawrence (1972)	100-117	298	Chan et al. (1993b)
(J_d37b)		→ $CO + O(^1D)$	167	>100	Table B.8	Okabe (1978)	117-163	195	Yoshino et al. (1996)
(J_d37c)		→ $CO + O(^1S)$	129	>100	Table B.8		163-192	195	Parkinson et al. (2003)
							192-300	298	Shemansky (1972)

Notes. [a] LISA cross-sections are taken from http://www.lisa.univ-paris12.fr/GPCOS/SCOOPweb/index.html.
[b] Exothermic reaction.

Table B.7: Photodissociation of H_2CO: Branching ratios.

Wavelength (nm)	Products	
	$CO + H_2$	$HCO + H$
250	0.490	0.310
251	0.492	0.308
252	0.493	0.307
253	0.494	0.306
254	0.495	0.305
255	0.496	0.304
256	0.496	0.304
257	0.497	0.303
258	0.497	0.303
259	0.496	0.304
260	0.493	0.307
261	0.490	0.312
262	0.487	0.318
263	0.485	0.325
264	0.482	0.333
265	0.477	0.343
266	0.471	0.354
267	0.465	0.365
268	0.458	0.377
269	0.450	0.390
270	0.441	0.404
271	0.432	0.418
272	0.422	0.433
273	0.412	0.448
274	0.401	0.464
275	0.391	0.479
276	0.380	0.495
277	0.371	0.512
278	0.362	0.528
279	0.356	0.544
280	0.347	0.560
281	0.337	0.576
282	0.329	0.591
283	0.321	0.606
284	0.313	0.620
285	0.307	0.633
286	0.302	0.645
287	0.296	0.657
288	0.291	0.669
289	0.284	0.680
290	0.278	0.690
291	0.272	0.700
292	0.266	0.710
293	0.262	0.718
294	0.259	0.726
295	0.256	0.734
296	0.254	0.740
297	0.252	0.746
298	0.249	0.751
299	0.245	0.755
300	0.242	0.758

Table B.8: Photodissociation of CO_2: Branching ratios.

Wavelength (nm)	Products		
	CO + O(^{3}P)	CO + O(^{1}D)	CO + O(^{1}S)
100	0.35	0	0.65
101	0.30	0	0.70
102	0.25	0	0.75
103	0.21	0	0.79
104	0.17	0	0.83
105	0.13	0	0.87
106	0.095	0	0.91
107	0.045	0	0.96
108	0	0	1
109	0	0	1
110	0	0	1
111	0	0	1
112	0	0	1
113	0	0.010	0.99
114	0	0.025	0.975
115	0	0.08	0.92
116	0	0.19	0.81
117	0	0.33	0.67
118	0	0.54	0.46
119	0	0.70	0.30
120	0	0.80	0.20
121	0	0.86	0.14
122	0	0.91	0.09
123	0	0.954	0.046
124	0	0.974	0.026
125	0	0.98	0.020
126	0	0.99	0.010
127	0	0.99	0.010
$\geq$128	0	1	0

Table B.9: Photodissociation reactions for radicals.

Reaction			Wavelength (nm)	Branching Ratio	Ref. Cross-section	Ref. Branching Ratio
(J_d38)	$CH_3 + h\nu$	$\rightarrow {}^1CH_2 + H$	200-240	1.0	Cameron et al. (2002)	Wilson et al. (1994b,c)
						Wu et al. (2004)
(J_d39)	$C_2H_3 + h\nu$	$\rightarrow C_2H_2 + H$	160-170	1.0	Fahr and Laufer (1988)	
			225-238	1.0	Fahr et al. (1998)	Ahmed et al. (1999)
			360-505	1.0	Hunziker et al. (1983)	Xu et al. (1999)
(J_d40)	$C_2H_5 + h\nu$	$\rightarrow C_2H_4 + H$	200-260	1.0	Fagerström et al. (1993)	Steinbauer et al. (2012)
(J_d41a)	$C_3H_3 + h\nu$	$\rightarrow C_3H_2 + H$	230-300	0.97	Fahr et al. (1997)	
(J_d41b)		$\rightarrow C_3H + H_2$		0.03		Nguyen et al. (2001)
(J_d41a)	$C_3H_3 + h\nu$	$\rightarrow C_3H_2 + H$	305-340	0.97		Goncher et al. (2008)
(J_d41b)		$\rightarrow C_3H + H_2$		0.03	Atkinson and Hudgens (1999)	
(J_d41a)	$C_3H_3 + h\nu$	$\rightarrow C_3H_2 + H$	340-347	1.0		
(J_d42a)	$C_3H_5 + h\nu$	$\rightarrow CH_3CCH + H$	210-233	0.30		
(J_d42b)		$\rightarrow CH_2CCH_2 + H$		0.40	Jenkin et al. (1993)	Deyerl et al. (1997)
(J_d42c)		$\rightarrow C_2H_2 + CH_3$		0.30		Stranges et al. (1998)
(J_d42a)	$C_3H_5 + h\nu$	$\rightarrow CH_3CCH + H$	370-420	0.40		Deyerl et al. (1999)
(J_d42b)		$\rightarrow CH_2CCH_2 + H$		0.30	Tonokura and Koshi (2000)	
(J_d42c)		$\rightarrow C_2H_2 + CH_3$		0.30		
(J_d43)	$C_3H_7 + h\nu$	$\rightarrow C_3H_6 + H$	200-350	1.0	Wendt and Hunziker (1984)	Noller and Fischer (2007)
(J_d44)	$C_6H_5 + h\nu$	$\rightarrow C_6H_4 + H$	225-360	1.0	Wallington et al. (1998)	Song et al. (2012)
(J_d45)	$C_7H_7 + h\nu$	$\rightarrow C_7H_6 + H$	220-340	1.0	Ikeda et al. (1984)	Song et al. (2011)
(J_d46)	$H_2CN + h\nu$	$\rightarrow HCN + H$	278-287	1.0	Nizamov and Dagdigian (2003)	Bernard et al. (1999)
					Teslja et al. (2006)	
(J_d47)	$HCO + h\nu$	$\rightarrow CO + H$	613-616	1.0	Flad et al. (2006)	

Table B.10: Photoionization reactions leading to ion-pair formation.

Reaction			Resonance Position (eV)	Cross-section (cm^2)	Ref.
(J_{ip}2)	$CH_4 + h\nu$	$\rightarrow H^- + CH_3^+$	21.5	1.0×10^{-20}	Mitsuke et al. (1991)
(J_{ip}3)	$H_2 + h\nu$	$\rightarrow H^- + H^+$	17.3	2.5×10^{-23}	Chupka et al. (1975)
(J_{ip}4)	$C_2H_2 + h\nu$	$\rightarrow C_2H^- + H^+$	18.8	6.0×10^{-21}	Ruscic and Berkowitz (1990)
(J_{ip}20)	$HCN + h\nu$	$\rightarrow CN^- + H^+$	15.2	4.4×10^{-20}	Berkowitz et al. (1969)
(J_{ip}31)	$H_2O + h\nu$	$\rightarrow OH^- + H^+$	16.9	1.1×10^{-20}	Berkowitz (1996)
(J_{ip}32)	$CO + h\nu$	$\rightarrow O^- + C^+$	20.9	1.1×10^{-19}	Oertel et al. (1980)

Table B.11: Dissociative electron attachment reactions.

Reaction			Resonance Position (eV)	Cross-section (cm^2)	Ref.
(J_{dea}2)	$CH_4 + e^-$	$\rightarrow CH_2^- + H_2$	10.4	1.4×10^{-19}	Rawat et al. (2008)
		$\rightarrow H^- + CH_3$	9.8	1.6×10^{-18}	
(J_{dea}3)	$H_2 + e^-$	$\rightarrow H^- + H$	3.7	1.5×10^{-21}	Krishnakumar et al. (2011)
			10.5	1.2×10^{-20}	
			14.0	1.7×10^{-20}	
(J_{dea}4)	$C_2H_2 + e^-$	$\rightarrow C_2H^- + H$	3.0	3.5×10^{-20}	May et al. (2009)
		$\rightarrow H^- + C_2H$	7.9	3.9×10^{-20}	
(J_{dea}7)	$CH_3CCH + e^-$	$\rightarrow H^- + C_3H_3$	3.6	6.0×10^{-22}	Janečková et al. (2012)
			6.9	1.2×10^{-20}	
			11.6	1.4×10^{-20}	
(J_{dea}11)	$C_4H_2 + e^-$	$\rightarrow C_4H^- + H$	2.5	3.0×10^{-20}	May et al. (2008)
			5.3	7.3×10^{-19}	
		$\rightarrow C_2H^- + C_2H$	6.0	2.1×10^{-20}	
			8.7	4.5×10^{-21}	
(J_{dea}18)	$NH_3 + e^-$	$\rightarrow H^- + NH_2$	5.7	2.3×10^{-18}	Rawat et al. (2008)
			10.5	5.0×10^{-19}	
(J_{dea}20)	$HCN + e^-$	$\rightarrow CN^- + H$	1.9	9.4×10^{-18}	May et al. (2010)
(J_{dea}21)	$HNC + e^-$	$\rightarrow CN^- + H$	3.0	1.0×10^{-17}	Chourou and Orel (2009)
(J_{dea}24)	$CH_3CN + e^-$	$\rightarrow CN^- + CH_3$	2.0	4.2×10^{-25}	Sailer et al. (2003)
			8.0	1.1×10^{-24}	
(J_{dea}25)	$HC_3N + e^-$	$\rightarrow C_3N^- + H$	2.6	3.8×10^{-18}	Dibeler et al. (1961)
		$\rightarrow CN^- + C_2H$	4.9	4.0×10^{-18}	
(J_{dea}26)	$C_2H_3CN + e^-$	$\rightarrow CN^- + C_2H_3$	4.9	3.7×10^{-18}	Tsuda et al. (1973)
			7.6	4.9×10^{-18}	
(J_{dea}29)	$C_2N_2 + e^-$	$\rightarrow CN^- + CN$	5.5	1.9×10^{-17}	Inoue (1966)
(J_{dea}30)	$C_4N_2 + e^-$	$\rightarrow C_3N^- + CN$	2.9	1.7×10^{-17}	Graupner et al. (2008)
			6.0	1.4×10^{-18}	
		$\rightarrow CN^- + C_3N$	3.3	2.6×10^{-18}	
			6.0	1.9×10^{-18}	
(J_{dea}31)	$H_2O + e^-$	$\rightarrow OH^- + H$	6.9	4.9×10^{-20}	Fedor et al. (2006)
			8.5	2.4×10^{-20}	Haxton et al. (2007)
			11.3	2.8×10^{-20}	
		$\rightarrow O^- + H_2$	7.1	2.1×10^{-19}	
			9.2	6.4×10^{-19}	
			11.9	9.1×10^{-19}	
		$\rightarrow H^- + OH$	6.4	6.4×10^{-18}	
			8.5	1.1×10^{-18}	
(J_{dea}32)	$CO + e^-$	$\rightarrow O^- + C$	9.8	2.0×10^{-19}	Rapp and Briglia (1965) Stamatovic and Schulz (1970)

Table B.12: Mass-to-charge (m/z), electron affinities (EA) and asymptotic cross-sections σ_0 used in the calculation of the photodetachment cross-sections.

Ion species	m/z (u)	EA (eV)	σ_0 (cm^2)	Ref.
H^-	1	0.75	1.0×10^{-17}	Hotop and Lineberger (1985); Millar et al. (2007)
CH_2^-	14	0.65	1.0×10^{-17}	Leopold et al. (1985); Millar et al. (2007)
CH_3^-	15	0.08	1.0×10^{-17}	Ellison et al. (1978); Millar et al. (2007)
C_2H^-	25	3.0	8.8×10^{-18}	Best et al. (2011)
C_4H^-	49	3.6	7.7×10^{-18}	Pino et al. (2002); Best et al. (2011)

C_6H^-	73	3.8	4.8×10^{-18}	Pino et al. (2002); Best et al. (2011)
CN^-	26	3.9	2.8×10^{-17}	Bradforth et al. (1993); Kumar et al. (2013)
C_3N^-	50	4.3	5.2×10^{-17}	Yen et al. (2010); Kumar et al. (2013)
C_5N^-	74	4.5	1.0×10^{-17}	Yen et al. (2010); Millar et al. (2007)
O^-	16	1.5	1.2×10^{-17}	Hotop and Lineberger (1985); Hlavenka et al. (2009)
OH^-	17	1.8	3.3×10^{-17}	Goldfarb et al. (2005); Hlavenka et al. (2009)

Notes. The asymptotic cross-sections for O^- and OH^- are derived from fits to Equation (E24) using the literature electron affinities shown in column 2, and measured cross-sections at 1.87 and 2.33 eV for O^- and 1.87 and 1.96 eV for OH^- (cf. Hlavenka et al. (2009)).

Table B.13: Column production rate (cm^{-2}) for the fragments of the ionization and dissociation of CH_4 and N_2 from GCR.

Reaction			Total rate
(J_{gcr}1a)	$N_2 + GCR$	$\rightarrow N_2^+ + e^-$	9.1×10^7
(J_{gcr}1b)		$\rightarrow N(^4S) + N(^2D)$	6.9×10^7
(J_{gcr}1c)		$\rightarrow N^+ + N(^4S) + e^-$	2.3×10^7
(J_{gcr}2a)	$CH_4 + GCR$	$\rightarrow {}^3CH_2 + H_2$	2.4×10^6
(J_{gcr}2b)		$\rightarrow CH_3 + H$	2.0×10^6
(J_{gcr}2c)		$\rightarrow CH_4^+ + e^-$	1.8×10^6
(J_{gcr}2d)		$\rightarrow CH_3^+ + H + e^-$	1.4×10^6
(J_{gcr}2e)		$\rightarrow CH_2^+ + H_2 + e^-$	2.4×10^5

Table B.14: Radiative association reactions.

	Type	Reaction					k	Ref.
$R_{ra}1$	2	H	+	e	$\rightarrow$	H^-	$3.37\times10^{-16}T^{-0.64}e^{-9.2/T}$	Stancil and Dalgarno (1998)
$R_{ra}2$	2	$^3CH_2$	+	e	$\rightarrow$	CH_2^-	1.00×10^{-14}	est.(CN+e)
$R_{ra}3$	2	CH_3	+	e	$\rightarrow$	CH_3^-	1.00×10^{-14}	est.(CN+e)
$R_{ra}4$	2	C_2H	+	e	$\rightarrow$	C_2H^-	$2.00\times10^{-15}T^{0.50}$	Herbst and Osamura (2008)
$R_{ra}5$	2	C_4H	+	e	$\rightarrow$	C_4H^-	$6.60\times10^{-09}T^{0.41}e^{-0.6/T}$	Carelli et al. (2013)
$R_{ra}6$	2	C_6H	+	e	$\rightarrow$	C_6H^-	$8.62\times10^{-08}T^{0.23}e^{-0.5/T}$	Carelli et al. (2013)
$R_{ra}7$	2	CN	+	e	$\rightarrow$	CN^-	1.00×10^{-14}	Petrie (1996)
$R_{ra}8$	2	C_3N	+	e	$\rightarrow$	C_3N^-	$2.60\times10^{-10}T^{0.50}$	Herbst and Osamura (2008)
$R_{ra}9$	2	C_5N	+	e	$\rightarrow$	C_5N^-	$1.25\times10^{-07}T^{0.50}$	Herbst and Osamura (2008),Walsh et al. (2009)
$R_{ra}10$	2	$O(^3P)$	+	e	$\rightarrow$	O^-	1.50×10^{-15}	Prasad and Huntress Jr. (1980)
$R_{ra}11$	2	OH	+	e	$\rightarrow$	OH^-	1.00×10^{-14}	est.(CN+e)

Appendix B.5. Representation of Rate Coefficients

Appendix B.5.1. Neutral Reactions

Rate coefficients are temperature dependent and are expressed in the standard form:

$$k = AT^n exp(-E_a/T), \tag{E27}$$

where T is the temperature of the neutrals and/or ions considered at the exception of radiative attachment and dissociative/radiative electron recombination where T is the electron temperature (cf. Figure 3).

Our most general rate representations employ Eq. (E18) with 10 parameters: A, B, and C for $k_\circ$, for k_∞, and for k_R and a temperature independent parameter F_c. However, in some cases we employ various limiting and alternative representations. The entries in Table B.15 correspond in order to the modified Arrhenius representations for k_1, k_2, and k_3 as outlined below.

- Type 1: Pressure independent unimolecular reactions:

  $k = k_1$, with k_1 in s^{-1}.

- Type 2: Pressure independent bimolecular reactions:

  $k = k_1$, with k_1 in cm^3 s^{-1}.

- Type 3: Pressure dependent bimolecular reactions:

  The Troe form of Eq. (E11) with $k_\infty = k_1$ in s^{-1} and $k_\circ = k_2$ in cm^3 s^{-1}.

- Type 4: Pressure dependent association reactions:

  Our modified Troe form of Eq. (E18) with $k_\infty = k_1$ in cm^3 s^{-1}, $k_\circ = k_2$ in cm^6 s^{-1}, and $k_R = k_3$ in cm^3 s^{-1}. Note, however, that the denominator in Eq. (E18) is singular for $k_R = k_\infty$. Thus, for $k_R > 0.99k_\infty$ we replace this expression with k_∞.

- Types 5 and 6: Special case for OH + CO pressure dependent bimolecular reactions (Sander et al. (2011), section 2.1):

  $OH + CO \rightarrow H + CO_2$

$$k([M]) = \left(\frac{k_\circ}{1 + \frac{k_\circ[M]}{k_\infty}}\right) 0.6^{\left[1+\left(log_{10}\left(\frac{k_\circ[M]}{k_\infty}\right)\right)^2\right]^{-1}} \tag{B.9}$$

  $k_\infty = k_1$ in s^{-1} and $k_\circ = k_2$ in cm^3 s^{-1}.

  $OH + CO \rightarrow HOCO$

$$k([M]) = \left(\frac{k_\circ[M]}{1 + \frac{k_\circ[M]}{k_\infty}}\right) 0.6^{\left[1+\left(log_{10}\left(\frac{k_\circ[M]}{k_\infty}\right)\right)^2\right]^{-1}} \tag{B.10}$$

  $k_\infty = k_1$ in cm^3 s^{-1} and $k_\circ = k_2$ in cm^6 s^{-1}.

- Type 7: Special case for $H + C_2H_3$: The Troe form does not accurately reproduce the master equation results and so we instead interpolate the data from a table.

Appendix B.5.2. Positive and Negative Ion Reactions

$$k = A(300/T)^B exp(-C/T) \tag{B.11}$$

- Type 1: Unimolecular reactions.

$$k = k_\infty \tag{B.12}$$

with $T=T_n=T_i$.

k_∞ in s^{-1}.

- Type 2: Bimolecular ion-neutral reactions.

$$k = k_\infty \tag{B.13}$$

with $T=T_n=T_i$.

k_∞ in $cm^3\ s^{-1}$.

- Type 3: Termolecular ion-neutral reactions.

$$k([M]) = \frac{k_\infty k_\circ [M]}{k_\infty + k_\circ [M]} \tag{B.14}$$

with $T=T_n=T_i$.

k_∞ in $cm^3\ s^{-1}$ and k_0 in $cm^6\ s^{-1}$.

- Type 4: Electron recombination reactions.

$$k = k_\infty \tag{B.15}$$

with $T=T_e$.

k_∞ in $cm^3\ s^{-1}$.

- Type 5: Ion-neutral association reactions.

if $(k_\infty - k_R)/k_\infty > 1 \times 10^{-2}$

$$k([M]) = F \times \frac{(k'_R + k_\circ [M]) k_\infty}{k_\circ [M] + k'_R + k_\infty} \tag{B.16}$$

where

$$k'_R = \frac{k_R k_\infty}{k_\infty - k_R} \tag{B.17}$$

and

$$F = 10^{\left(\frac{log_{10}(F_c)}{1+\left(\frac{(log_{10}[P_r]+C)}{N-0.14(log_{10}[P_r]+C)}\right)^2}\right)}, \tag{B.18}$$

where $P_r = k_\circ[M]/k_\infty$, $N = 0.75 - 1.27log_{10}(F_c)$ and $C = -0.4 - 0.67log_{10}(F_c)$.

else (type -2)

$$k([M]) = k_\infty \tag{B.19}$$

with T=T_n=T_i.

k_∞ and k_R in cm^3 s^{-1}, k_0 in cm^6 s^{-1}.

Appendix B.6. Reaction Lists

Table B.15: Neutral reaction list

	Type	Reaction							k	F_c	T range	Ref.
R_n1	4	H	+	H	→	H_2			1.00×10^{-10}		200-2500	Baulch et al. (2005)
									$1.80\times10^{-30}T^{-1.00}$	0.40		
R_n2	2	H	+	CH	→	C	+	H_2	$2.81\times10^{-12}T^{0.26}$		50-500	van Harrevelt et al. (2002)
R_n3	2	H	+	$^3CH_2$	→	CH	+	H_2	$3.54\times10^{-11}T^{0.32}$		185-800	Fulle and Hippler (1997)
R_n4	2	H	+	$^1CH_2$	→	CH	+	H_2	1.00×10^{-10}		290	Peeters et al. (1994)
R_n5a	4	H	+	CH_3	→	CH_4			$1.40\times10^{-10}T^{0.15}e^{-1./T}$		50-300	Vuitton et al. (2012)
									$7.68\times10^{-25}T^{-1.66}e^{-22./T}$	0.56		
									$4.56\times10^{-14}T^{-1.09}e^{-11./T}$			
R_n5b	2	H	+	CH_3	→	$^1CH_2$	+	H_2	$2.10\times10^{-08}T^{-0.56}e^{-8000./T}$		300-2500	Baulch et al. (2005)
R_n6	4	H	+	C_2H	→	C_2H_2			$3.73\times10^{-11}T^{0.32}$		200-2000	Harding et al. (2005),est.(AtomNumber)
									9.00×10^{-26}	0.40		
									1.00×10^{-13}			
R_n7a	4	H	+	C_2H_2	→	C_2H_3			$1.72\times10^{-34}T^{8.41}e^{358./T}$		50-300	Vuitton et al. (2012)
									$2.18\times10^{-27}T^{-1.07}e^{-83./T}$	0.18		
									$1.05\times10^{-17}T^{-0.27}e^{-34./T}$			
R_n7b	2	H	+	C_2H_2	→	C_2H	+	H_2	$1.67\times10^{-14}T^{1.64}e^{-15250./T}$		200-3000	Baulch et al. (2005)
R_n9a	4	H	+	C_2H_4	→	C_2H_5			$4.26\times10^{-26}T^{5.31}e^{173./T}$		50-300	Vuitton et al. (2012)
									$5.08\times10^{-25}T^{-1.51}e^{-72./T}$	0.20		
									$9.02\times10^{-16}T^{-0.53}e^{-18./T}$			
R_n9b	2	H	+	C_2H_4	→	C_2H_3	+	H_2	$3.90\times10^{-22}T^{3.62}e^{-5670./T}$		400-2000	Baulch et al. (2005)
R_n10a	4	H	+	C_2H_5	→	CH_3	+	CH_3	$9.04\times10^{-11}T^{0.16}$		200-2000	Harding et al. (2005),est.(AtomNumber)
									9.00×10^{-26}	0.40		
									1.00×10^{-13}			
R_n10b	2	H	+	C_2H_5	→	C_2H_4	+	H_2	7.00×10^{-11}		298-2000	Baulch et al. (2005)
R_n11	4	H	+	C_3	→	C_3H			2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-23}	0.40		
									2.00×10^{-12}			
R_n12	4	H	+	C_3H	→	C_3H_2			2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-23}	0.40		
									2.00×10^{-12}			
R_n13	4	H	+	C_3H_2	→	C_3H_3			$1.26\times10^{-10}T^{0.22}e^{43./T}$		200-2000	Harding et al. (2007),est.(AtomNumber)
									1.00×10^{-23}	0.40		
									2.00×10^{-12}			
R_n14a	4	H	+	C_3H_3	→	CH_3CCH			$1.06\times10^{-10}T^{0.10}e^{15./T}$		200-2000	Harding et al. (2007),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n14b	4	$H + C_3H_3 \rightarrow CH_2CCH_2$	$3.40\times10^{-11}T^{0.21}e^{87./T}$		200-2000	Harding et al. (2007),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n15a	4	$H + CH_3CCH \rightarrow C_3H_5$	$5.01\times10^{-30}T^{6.79}e^{214./T}$		50-300	ThisWork
			$2.32\times10^{-20}T^{-2.67}e^{-265./T}$	0.11		
			$2.93\times10^{-12}T^{-1.30}e^{-256./T}$			
R_n15b	4	$H + CH_3CCH \rightarrow C_3H_5$	$5.01\times10^{-30}T^{6.79}e^{214./T}$		50-300	ThisWork
			$4.78\times10^{-28}T^{-1.69}e^{-133./T}$	0.50		
			$6.50\times10^{-16}T^{-1.38}e^{-163./T}$			
R_n15c	3	$H + CH_3CCH \rightarrow CH_2CCH_2 + H$	$2.46\times10^{-16}T^{8.57}e^{-803./T}$		50-300	ThisWork
R_n15d	3	$H + CH_3CCH \rightarrow C_2H_2 + CH_3$	$1.03\times10^{-17}T^{9.30}e^{-776./T}$		50-300	ThisWork
R_n16a	4	$H + CH_2CCH_2 \rightarrow C_3H_5$	$2.18\times10^{-38}T^{9.58}e^{418./T}$		50-300	ThisWork
			$5.84\times10^{-20}T^{-2.23}e^{-261./T}$	0.06		
			$6.73\times10^{-25}T^{3.74}e^{0./T}$			
R_n16b	4	$H + CH_2CCH_2 \rightarrow C_3H_5$	$7.57\times10^{-29}T^{6.30}e^{186./T}$		50-300	ThisWork
			$2.64\times10^{-25}T^{-1.81}e^{-164./T}$	0.60		
			$2.99\times10^{-13}T^{-1.62}e^{-171./T}$			
R_n16c	3	$H + CH_2CCH_2 \rightarrow CH_3CCH + H$	$7.20\times10^{-21}T^{10.40}e^{13./T}$		50-300	ThisWork
R_n17a	4	$H + C_3H_5 \rightarrow C_3H_6$	$9.69\times10^{-11}T^{0.18}e^{63./T}$		200-2000	Harding et al. (2007),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n17b	2	$H + C_3H_5 \rightarrow CH_2CCH_2 + H_2$	3.00×10^{-11}		300-1000	Baulch et al. (2005)
R_n18a	4	$H + C_3H_6 \rightarrow C_3H_7$	$5.02\times10^{-32}T^{7.22}e^{298./T}$		50-300	ThisWork
			$3.93\times10^{-30}T^{0.40}e^{-89./T}$	0.80		
R_n18b	4	$H + C_3H_6 \rightarrow C_3H_7$	$1.27\times10^{-27}T^{6.03}e^{157./T}$		50-300	ThisWork
			$4.38\times10^{-17}T^{-2.36}e^{-273./T}$	0.20		
			$1.29\times10^{-13}T^{-0.79}e^{-140./T}$			
R_n18c	3	$H + C_3H_6 \rightarrow CH_3 + C_2H_4$	$1.01\times10^{-26}T^{10.82}e^{438./T}$		50-300	ThisWork
R_n18d	2	$H + C_3H_6 \rightarrow C_3H_5 + H_2$	$1.14\times10^{-29}T^{5.25}e^{312./T}$		50-300	ThisWork
R_n19a	4	$H + C_3H_7 \rightarrow C_3H_8$	$2.76\times10^{-11}T^{0.22}$		200-2000	Harding et al. (2007),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n19b	2	$H + C_3H_7 \rightarrow C_3H_6 + H_2$	1.00×10^{-10}		-	ThisWork

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	Type	Reaction	k	F_c	T range	Ref.
R_n20	4	H + C_4H → C_4H_2	$9.69\times10^{-11}T^{0.24}e^{12./T}$ $2.39\times10^{-16}T^{-2.85}e^{-125./T}$ $5.51\times10^{-06}T^{-2.25}e^{-106./T}$	0.48	50-300	ThisWork
R_n21	4	H + C_4H_2 → C_4H_3	$1.28\times10^{-26}T^{5.70}e^{164./T}$ $5.69\times10^{-18}T^{-2.77}e^{-179./T}$ $3.98\times10^{-20}T^{2.89}e^{-39./T}$	0.30	50-300	ThisWork
R_n22a	4	H + C_4H_3 → C_4H_4	$1.03\times10^{-10}T^{0.05}e^{9./T}$ $2.87\times10^{-14}T^{-3.73}e^{-208./T}$ $6.79\times10^{-05}T^{-2.85}e^{-145./T}$	0.72	50-300	Vuitton et al. (2012)
R_n22b	2	H + C_4H_3 → C_4H_2 + H_2	1.00×10^{-10}		-	ThisWork
R_n23	4	H + C_4H_4 → C_4H_5	$6.69\times10^{-21}T^{3.40}e^{-6./T}$ $2.38\times10^{-15}T^{-3.60}e^{-134./T}$ $7.03\times10^{-12}T^{-0.63}e^{-260./T}$	0.39	50-300	ThisWork
R_n24	4	H + C_4H_5 → C_4H_6	$3.28\times10^{-11}T^{0.29}e^{80./T}$ 1.00×10^{-21} 2.00×10^{-11}	0.40	200-2000	Harding et al. (2007),est.(AtomNumber)
R_n25	4	H + C_4H_7 → C_4H_8	2.00×10^{-10} 1.00×10^{-21} 2.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n26	4	H + C_4H_9 → C_4H_{10}	$8.60\times10^{-12}T^{0.28}$ 1.00×10^{-21} 2.00×10^{-11}	0.40	200-2000	Harding et al. (2005),est.(AtomNumber)
R_n27	2	H + C_6H → C_6H_2	3.00×10^{-10}		50-300	ThisWork
R_n28	4	H + C_6H_2 → C_6H_3	$2.86\times10^{-26}T^{5.55}e^{153./T}$ $5.64\times10^{-20}T^{-2.24}e^{-1074./T}$ $8.70\times10^{-20}T^{2.75}e^{-50./T}$	0.30	-	est.(H+C4H2)
R_n29	4	H + C_6H_3 → C_6H_4	2.00×10^{-10} 1.00×10^{-17} 2.00×10^{-10}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n30	4	H + C_6H_5 → C_6H_6	$1.41\times10^{-10}T^{0.01}e^{14./T}$ $9.86\times10^{-12}T^{-2.54}e^{-122./T}$ $1.41\times10^{-10}T^{0.01}e^{14./T}$	0.51	50-300	Vuitton et al. (2012)
R_n31	4	H + C_6H_6 → C_6H_7	$1.41\times10^{-10}T^{0.01}e^{14./T}$ $4.52\times10^{-21}T^{-2.16}e^{-270./T}$ $1.42\times10^{-24}T^{3.27}e^{-71./T}$	0.07	50-300	ThisWork
R_n32	4	H + C_7H_7 → C_7H_8	4.30×10^{-10}		300-2000	Baulch et al. (2005),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-15}	0.40		
			4.30×10^{-10}			
R_n33	4	$H + C_8H_9 \rightarrow C_8H_{10}$	2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			2.00×10^{-10}			
R_n34	4	$C + H_2 \rightarrow {}^3CH_2$	$2.06\times10^{-11}e^{-57./T}$		300-2000	Harding et al. (1993)
			2.50×10^{-28}	0.40		
			6.00×10^{-16}			
R_n35	2	$C + CH_3 \rightarrow C_2H_2 + H$	1.00×10^{-10}		10-300	Smith et al. (2004)
R_n36a	2	$C + C_2H_2 \rightarrow C_3H + H$	$8.62\times10^{-11}T^{-0.12}$		15-295	Chastaing et al. (1999),Chastaing et al. (2001),
R_n36b	2	$C + C_2H_2 \rightarrow C_3 + H_2$	$4.88\times10^{-10}T^{-0.12}$		15-295	Chastaing et al. (1999),Chastaing et al. (2001),
R_n37	2	$C + C_2H_4 \rightarrow C_3H_3 + H$	$5.61\times10^{-10}T^{-0.11}$		15-295	Chastaing et al. (1999),Chastaing et al. (2001),
R_n38	2	$C + CH_3CCH \rightarrow C_4H_3 + H$	$5.06\times10^{-10}T^{-0.11}$		15-295	Chastaing et al. (2001),Loison and Bergeat (20
R_n39	2	$C + CH_2CCH_2 \rightarrow C_4H_3 + H$	$3.71\times10^{-10}T^{-0.01}$		15-295	Chastaing et al. (2001),Naulin et al. (2009)
R_n40a	2	$C + C_3H_6 \rightarrow C_4H_5 + H$	$2.29\times10^{-10}T^{-0.08}$		15-295	Chastaing et al. (1999),Loison and Bergeat (20
R_n40b	2	$C + C_3H_6 \rightarrow C_3H_3 + CH_3$	$2.29\times10^{-10}T^{-0.08}$		15-295	Chastaing et al. (1999),Loison and Bergeat (20
R_n41	2	$C + C_4H_2 \rightarrow C_5H + H$	$5.75\times10^{-10}T^{-0.12}$		-	est.(C+C2H2)
R_n42	2	$C + C_4H_4 \rightarrow C_5H_3 + H$	$5.75\times10^{-10}T^{-0.12}$		-	est.(C+C2H2),Parker et al. (2011)
R_n43	2	$C + C_4H_6 \rightarrow C_5H_5 + H$	1.10×10^{-09}		300	Husain and Ioannou (1997),Hahndorf et al. (20
R_n44a	2	$C + C_4H_8 \rightarrow C_5H_7 + H$	2.15×10^{-10}		300	Haider and Husain (1993)
R_n44b	2	$C + C_4H_8 \rightarrow C_4H_5 + CH_3$	2.15×10^{-10}		300	Haider and Husain (1993)
R_n45	2	$C + C_6H_2 \rightarrow C_7H + H$	$5.75\times10^{-10}T^{-0.12}$		-	est.(C+C2H2)
R_n46	4	$CH + H_2 \rightarrow CH_3$	$4.16\times10^{-11}T^{0.20}$		53-744	Brownsword et al. (1997b),Brownsword et al. (
			$5.72\times10^{-34}T^{1.60}$	0.63		
			6.00×10^{-16}			
R_n47	2	$CH + CH_4 \rightarrow C_2H_4 + H$	$4.00\times10^{-08}T^{-1.04}e^{-36./T}$		23-295	Canosa et al. (1997)
R_n48	2	$CH + C_2H_2 \rightarrow C_3H_2 + H$	$1.59\times10^{-09}T^{-0.23}e^{-16./T}$		23-295	Canosa et al. (1997),Vereecken and Peeters (19
R_n49a	2	$CH + C_2H_4 \rightarrow CH_3CCH + H$	$2.32\times10^{-09}T^{-0.55}e^{-29./T}$		23-295	Canosa et al. (1997),McKee et al. (2003),Goula
R_n49b	2	$CH + C_2H_4 \rightarrow CH_2CCH_2 + H$	$5.42\times10^{-09}T^{-0.55}e^{-29./T}$		23-295	Canosa et al. (1997),McKee et al. (2003),Goula
R_n50a	2	$CH + C_2H_6 \rightarrow C_2H_4 + CH_3$	$3.27\times10^{-08}T^{-0.86}e^{-53./T}$		23-295	Canosa et al. (1997),McKee et al. (2003)
R_n50b	2	$CH + C_2H_6 \rightarrow C_3H_6 + H$	$5.32\times10^{-09}T^{-0.86}e^{-53./T}$		23-295	Canosa et al. (1997),McKee et al. (2003)
R_n51	2	$CH + CH_3CCH \rightarrow C_4H_4 + H$	$1.83\times10^{-08}T^{-0.67}e^{-59./T}$		77-170	Daugey et al. (2005),Goulay et al. (2009),Loiso
R_n52	2	$CH + CH_2CCH_2 \rightarrow C_4H_4 + H$	$2.12\times10^{-08}T^{-0.69}e^{-67./T}$		77-170	Daugey et al. (2005),Goulay et al. (2009),Loiso
R_n53a	2	$CH + C_3H_6 \rightarrow C_4H_6 + H$	$2.84\times10^{-09}T^{-0.39}e^{-19./T}$		77-300	Daugey et al. (2005),Loison and Bergeat (2009)
R_n53b	2	$CH + C_3H_6 \rightarrow CH_3CCH + CH_3$	$3.15\times10^{-10}T^{-0.39}e^{-19./T}$		77-300	Daugey et al. (2005),Loison and Bergeat (2009)
R_n54a	2	$CH + C_3H_8 \rightarrow C_2H_4 + C_2H_5$	$1.20\times10^{-09}T^{-0.40}e^{-4./T}$		10-300	Loison et al. (2006),Faure(PersComm),Ribeiro

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	Type	Reaction							k	F_c	T range	Ref.
R_n54b	2	CH	+	C_3H_8	→	C_3H_6	+	CH_3	$7.02\times10^{-10}T^{-0.40}e^{-4./T}$		10-300	Loison et al. (2006),Faure(PersComm),Ribeiro
R_n54c	2	CH	+	C_3H_8	→	C_4H_8	+	H	$2.97\times10^{-10}T^{-0.40}e^{-4./T}$		10-300	Loison et al. (2006),Faure(PersComm),Ribeiro
R_n55	2	CH	+	C_4H_2	→	C_5H_2	+	H	$1.59\times10^{-09}T^{-0.23}e^{-16./T}$		-	est.(CH+C2H2)
R_n56	2	CH	+	C_4H_4	→	C_5H_4	+	H	$1.59\times10^{-09}T^{-0.23}e^{-16./T}$		-	est.(CH+C2H2)
R_n57	2	CH	+	C_4H_6	→	C_5H_6	+	H	$2.12\times10^{-08}T^{-0.69}e^{-67./T}$		-	est.(CH+CH2CCH2)
R_n58a	2	CH	+	C_4H_8	→	C_5H_8	+	H	$6.06\times10^{-09}T^{-0.53}e^{-33./T}$		23-295	Canosa et al. (1997),Loison and Bergeat (2009)
R_n58b	2	CH	+	C_4H_8	→	C_4H_6	+	CH_3	$2.72\times10^{-09}T^{-0.53}e^{-33./T}$		23-295	Canosa et al. (1997),Loison and Bergeat (2009)
R_n59a	2	CH	+	C_4H_{10}	→	C_5H_{10}	+	H	$2.52\times10^{-10}T^{-0.33}e^{-4./T}$		10-300	Faure(PersComm),Loison et al. (2006)
R_n59b	2	CH	+	C_4H_{10}	→	C_4H_8	+	CH_3	$1.55\times10^{-09}T^{-0.33}e^{-4./T}$		10-300	Faure(PersComm),Loison et al. (2006)
R_n60	2	CH	+	C_6H_2	→	C_7H_2	+	H	$1.59\times10^{-09}T^{-0.23}e^{-16./T}$		-	est.(CH+C2H2)
R_n61	1	$^1CH_2$			→	$^3CH_2$	+	hν	5.56×10^{-02}		-	Jacox (2003)
R_n62	2	$^1CH_2$	+	N_2	→	$^3CH_2$	+	N_2	$2.00\times10^{-11}e^{-237./T}$		200-1000	Baulch et al. (2005)
R_n63	2	$^1CH_2$	+	N_2I	→	$^3CH_2$	+	N_2I	$2.00\times10^{-11}e^{-237./T}$		-	est.(1CH2+N2)
R_n64a	2	$^1CH_2$	+	H_2	→	$^3CH_2$	+	H_2	3.05×10^{-11}		195-798	Gannon et al. (2008)
R_n64b	2	$^1CH_2$	+	H_2	→	CH_3	+	H	7.46×10^{-11}		195-798	Gannon et al. (2008)
R_n65	2	$^1CH_2$	+	CH_3	→	C_2H_4	+	H	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n66a	2	$^1CH_2$	+	CH_4	→	$^3CH_2$	+	CH_4	$3.10\times10^{-12}e^{250./T}$		200-1000	Baulch et al. (2005)
R_n66b	2	$^1CH_2$	+	CH_4	→	CH_3	+	CH_3	$1.40\times10^{-11}e^{250./T}$		200-1000	Baulch et al. (2005)
R_n66c	2	$^1CH_2$	+	CH_4	→	C_2H_5	+	H	$1.40\times10^{-11}e^{250./T}$		200-1000	Baulch et al. (2005)
R_n67a	2	$^1CH_2$	+	C_2H_2	→	$^3CH_2$	+	C_2H_2	$2.03\times10^{-09}T^{-0.39}$		195-798	Gannon et al. (2010b),Gannon et al. (2010a)
R_n67b	2	$^1CH_2$	+	C_2H_2	→	C_3H_3	+	H	$7.90\times10^{-10}T^{-0.39}$		195-798	Gannon et al. (2010b),Gannon et al. (2010a)
R_n68a	2	$^1CH_2$	+	C_2H_4	→	$^3CH_2$	+	C_2H_4	$1.63\times10^{-08}T^{-0.84}$		195-798	Gannon et al. (2010b),Gannon et al. (2010a)
R_n68b	2	$^1CH_2$	+	C_2H_4	→	C_3H_5	+	H	$8.80\times10^{-09}T^{-0.84}$		195-798	Gannon et al. (2010b),Gannon et al. (2010a)
R_n69a	2	$^1CH_2$	+	C_2H_6	→	$^3CH_2$	+	C_2H_6	3.60×10^{-11}		300-2000	Baulch et al. (1992)
R_n69b	2	$^1CH_2$	+	C_2H_6	→	C_2H_5	+	CH_3	$2.24\times10^{-08}T^{-0.90}$		210-475	Wagener (1990)
R_n70a	2	$^1CH_2$	+	CH_3CCH	→	$^3CH_2$	+	CH_3CCH	1.68×10^{-10}		298	Hayes et al. (1995)
R_n70b	2	$^1CH_2$	+	CH_3CCH	→	C_4H_5	+	H	$4.25\times10^{-09}T^{-0.52}e^{92./T}$		200-2000	Polino et al. (2013)
R_n71a	2	$^1CH_2$	+	CH_2CCH_2	→	$^3CH_2$	+	CH_2CCH_2	1.68×10^{-10}		298	Hayes et al. (1995)
R_n71b	2	$^1CH_2$	+	CH_2CCH_2	→	C_4H_5	+	H	$1.12\times10^{-09}T^{-0.35}e^{232./T}$		200-2000	Polino et al. (2013)
R_n72a	2	$^1CH_2$	+	C_3H_6	→	$^3CH_2$	+	C_3H_6	$6.13\times10^{-10}T^{-0.13}$		195-798	Gannon et al. (2010a)
R_n72b	2	$^1CH_2$	+	C_3H_6	→	C_4H_7	+	H	$6.06\times10^{-11}T^{-0.13}$		195-798	Gannon et al. (2010a)
R_n73a	2	$^1CH_2$	+	C_3H_8	→	$^3CH_2$	+	C_3H_8	1.12×10^{-10}		298	Hayes et al. (1995)
R_n73b	2	$^1CH_2$	+	C_3H_8	→	C_4H_9	+	H	1.12×10^{-10}		298	Hayes et al. (1995)
R_n74a	2	$^1CH_2$	+	C_4H_2	→	$^3CH_2$	+	C_4H_2	$2.03\times10^{-09}T^{-0.39}$		-	est.(1CH2+C2H2)
R_n74b	2	$^1CH_2$	+	C_4H_2	→	C_5H_3	+	H	$7.90\times10^{-10}T^{-0.39}$		-	est.(1CH2+C2H2)
R_n75a	2	$^1CH_2$	+	C_4H_4	→	$^3CH_2$	+	C_4H_4	$2.03\times10^{-09}T^{-0.39}$		-	est.(1CH2+C2H2)

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	Type	Reaction	k	F_c	T range	Ref.
R_n75b	2	$^1CH_2$ + C_4H_4 → C_5H_5 + H	$7.90\times10^{-10}T^{-0.39}$		-	est.(1CH2+C2H2)
R_n76a	2	$^1CH_2$ + C_4H_6 → $^3CH_2$ + C_4H_6	1.68×10^{-10}		-	est.(1CH2+CH2CCH2)
R_n76b	2	$^1CH_2$ + C_4H_6 → C_5H_7 + H	$2.92\times10^{-09}T^{-0.48}e^{220./T}$		200-2000	Polino et al. (2013)
R_n77a	2	$^1CH_2$ + C_4H_8 → $^3CH_2$ + C_4H_8	1.13×10^{-10}		295	Langford et al. (1983)
R_n77b	2	$^1CH_2$ + C_4H_8 → C_5H_9 + H	1.13×10^{-10}		295	Langford et al. (1983)
R_n78a	2	$^1CH_2$ + C_4H_{10} → $^3CH_2$ + C_4H_{10}	1.27×10^{-10}		298	Hayes et al. (1995)
R_n78b	2	$^1CH_2$ + C_4H_{10} → C_5H_{11} + H	1.27×10^{-10}		298	Hayes et al. (1995)
R_n79a	2	$^1CH_2$ + C_6H_2 → $^3CH_2$ + C_6H_2	$2.03\times10^{-09}T^{-0.39}$		-	est.(1CH2+C2H2)
R_n79b	2	$^1CH_2$ + C_6H_2 → C_7H_3 + H	$7.90\times10^{-10}T^{-0.39}$		-	est.(1CH2+C2H2)
R_n80a	4	$^3CH_2$ + $^3CH_2$ → C_2H_2 + H_2	$2.94\times10^{-11}e^{-4./T}$		300-2500	Jasper et al. (2007),est.(AtomNumber)
			1.00×10^{-25}	0.40		
			1.00×10^{-13}			
R_n80b	4	$^3CH_2$ + $^3CH_2$ → C_2H_2 + H + H	$1.18\times10^{-10}e^{-4./T}$		300-2500	Jasper et al. (2007),est.(AtomNumber)
			1.00×10^{-25}	0.40		
			1.00×10^{-13}			
R_n81	4	$^3CH_2$ + CH_3 → C_2H_4 + H	$1.99\times10^{-09}T^{-0.34}e^{-77./T}$		300	Jasper et al. (2007),est.(AtomNumber)
			1.00×10^{-25}	0.40		
			1.00×10^{-13}			
R_n82	4	$^3CH_2$ + C_2H → C_3H_2 + H	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n83a	4	$^3CH_2$ + C_2H_3 → C_3H_5	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n83b	2	$^3CH_2$ + C_2H_3 → C_2H_2 + CH_3	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n84a	4	$^3CH_2$ + C_2H_5 → C_3H_7	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n84b	2	$^3CH_2$ + C_2H_5 → C_2H_4 + CH_3	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n85	4	$^3CH_2$ + C_3 → C_4H_2	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n86	4	$^3CH_2$ + C_3H → C_4H_3	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n87	4	$^3CH_2$ + C_3H_2 → C_4H_4	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n88	4	$^3CH_2$ + C_3H_3 → C_4H_5	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n89	2	$^3CH_2$ + C_3H_5 → C_4H_6 + H	5.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n90	4	CH_3 + CH_3 → C_2H_6	$3.84\times10^{-10}T^{-0.29}e^{-28./T}$		50-300	ThisWork
			$5.53\times10^{-17}T^{-3.79}e^{-64./T}$	0.37		
			$3.20\times10^{-06}T^{-3.25}e^{-74./T}$			
R_n91	2	CH_3 + C_2H → C_3H_3 + H	4.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n92a	4	CH_3 + C_2H_3 → C_3H_6	$8.87\times10^{-10}T^{-0.38}e^{39./T}$		50-300	ThisWork
			$1.66\times10^{-24}T^{-2.11}e^{-167./T}$	0.80		
			$3.63\times10^{-12}T^{-2.18}e^{-122./T}$			
R_n92b	3	CH_3 + C_2H_3 → C_3H_5 + H	$1.24\times10^{+05}T^{0.61}e^{54./T}$		50-300	ThisWork
R_n92c	2	CH_3 + C_2H_3 → C_2H_2 + CH_4	$1.50\times10^{-11}e^{385./T}$		308-900	Stoliarov et al. (2000)
R_n93a	4	CH_3 + C_2H_5 → C_3H_8	$2.86\times10^{-09}T^{-0.61}e^{-44./T}$		50-300	ThisWork
			$4.31\times10^{-12}T^{-4.75}e^{-96./T}$	0.95		
			$3.62\times10^{-02}T^{-4.25}e^{-189./T}$			
R_n93b	3	CH_3 + C_2H_5 → C_2H_4 + CH_4	$4.88\times10^{-09}T^{4.59}e^{464./T}$		50-300	ThisWork
R_n94	4	CH_3 + C_3 → C_4H_3	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n95	4	CH_3 + C_3H → C_4H_4	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n96	4	CH_3 + C_3H_2 → C_4H_5	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n97a	4	CH_3 + C_3H_3 → C_4H_6	$6.80\times10^{-11}e^{130./T}$		301-800	Knyazev and Slagle (2001),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n97b	2	CH_3 + C_3H_3 → C_3H_2 + CH_4	$1.50\times10^{-11}e^{385./T}$		50-300	ThisWork
R_n98a	4	CH_3 + C_3H_5 → C_4H_8	$1.55\times10^{-09}T^{-0.54}e^{117./T}$		301-800	Knyazev and Slagle (2001),Baulch et al. (2005)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n98b	2	CH_3 + C_3H_5 → CH_2CCH_2 + CH_4	6.00×10^{-13}		500-800	Baulch et al. (2005)

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	Type	Reaction	k	F_c	T range	Ref.
R_n99a	4	$CH_3 + C_3H_7 \rightarrow C_4H_{10}$	$5.33\times10^{-10}T^{-0.47}e^{97./T}$ 1.00×10^{-21} 2.00×10^{-11}	0.40	200-2000	Klippenstein et al. (2006),est.(AtomNumber)
R_n99b	2	$CH_3 + C_3H_7 \rightarrow C_3H_6 + CH_4$	1.00×10^{-10}		-	ThisWork
R_n100a	4	$CH_3 + C_4H_3 \rightarrow C_5H_6$	8.00×10^{-11} 1.00×10^{-19} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n100b	2	$CH_3 + C_4H_3 \rightarrow C_4H_2 + CH_4$	$1.50\times10^{-11}e^{385./T}$		-	est.(CH3+C2H3)
R_n101	4	$CH_3 + C_4H_5 \rightarrow C_5H_8$	8.00×10^{-11} 1.00×10^{-19} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n102	4	$CH_3 + C_4H_7 \rightarrow C_5H_{10}$	8.00×10^{-11} 1.00×10^{-19} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n103	4	$CH_3 + C_4H_9 \rightarrow C_5H_{12}$	$1.16\times10^{-09}T^{-0.67}e^{73./T}$ 1.00×10^{-19} $1.16\times10^{-09}T^{-0.67}e^{73./T}$	0.40	-	Klippenstein et al. (2006),est.(AtomNumber)
R_n104a	4	$CH_3 + C_6H_3 \rightarrow C_7H_6$	8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n104b	2	$CH_3 + C_6H_3 \rightarrow C_6H_2 + CH_4$	$1.50\times10^{-11}e^{385./T}$		-	est.(CH3+C2H3)
R_n105	4	$CH_3 + C_6H_5 \rightarrow C_7H_8$	$3.62\times10^{-09}T^{-0.62}e^{-29./T}$ 1.00×10^{-15} $3.62\times10^{-09}T^{-0.62}e^{-29./T}$	0.40	50-300	Vuitton et al. (2012)
R_n106	4	$CH_3 + C_7H_7 \rightarrow C_8H_{10}$	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n107	4	$CH_3 + C_8H_9 \rightarrow C_9H_{12}$	8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n108	2	$C_2 + H_2 \rightarrow C_2H + H$	$5.60\times10^{-11}e^{-1095./T}$		293-395	Nakajima et al. (2009)
R_n109	2	$C_2 + CH_4 \rightarrow C_2H + CH_3$	$9.83\times10^{-11}T^{-0.42}e^{-13./T}$		24-300	Páramo et al. (2008)
R_n110	2	$C_2 + C_2H_2 \rightarrow C_4H + H$	$1.92\times10^{-07}T^{-1.14}e^{-77./T}$		49-300	Páramo et al. (2008),Gu et al. (2006),Leonori e
R_n111a	2	$C_2 + C_2H_4 \rightarrow C_2H_2 + C_2H_2$	$2.57\times10^{-08}T^{-0.93}e^{-58./T}$		49-300	Páramo et al. (2008),Mebel et al. (2006a)
R_n111b	2	$C_2 + C_2H_4 \rightarrow C_4H_3 + H$	$2.13\times10^{-08}T^{-0.93}e^{-58./T}$		49-300	Páramo et al. (2008),Mebel et al. (2006a),Gu e
R_n111c	2	$C_2 + C_2H_4 \rightarrow C_4H_2 + H_2$	$4.03\times10^{-09}T^{-0.93}e^{-58./T}$		49-300	Páramo et al. (2008),Mebel et al. (2006a)

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	Type	Reaction							k	F_c	T range	Ref.
R_n112	2	C_2	+	C_2H_6	→	C_2H_5	+	C_2H	$2.77\times10^{-08}T^{-0.94}e^{-44./T}$		24-300	Páramo et al. (2008)
R_n113a	2	C_2	+	CH_3CCH	→	C_5H_3	+	H	4.41×10^{-10}		77-296	Daugey et al. (2008),Guo et al. (2006a),Mebel
R_n113b	2	C_2	+	CH_3CCH	→	C_5H_2	+	H_2	9.00×10^{-12}		77-296	Daugey et al. (2008),Mebel et al. (2006b)
R_n114	2	C_2	+	CH_2CCH_2	→	C_5H_3	+	H	5.00×10^{-10}		77-296	Daugey et al. (2008),Guo et al. (2006b)
R_n115a	2	C_2	+	C_3H_6	→	C_5H_5	+	H	2.86×10^{-10}		77-296	Daugey et al. (2008),Dangi et al. (2013)
R_n115b	2	C_2	+	C_3H_6	→	C_4H_3	+	CH_3	1.18×10^{-10}		77-296	Daugey et al. (2008),Dangi et al. (2013)
R_n115c	2	C_2	+	C_3H_6	→	CH_3CCH	+	C_2H_2	1.52×10^{-11}		77-296	Daugey et al. (2008),Dangi et al. (2013)
R_n116	2	C_2	+	C_3H_8	→	C_3H_7	+	C_2H	$3.89\times10^{-07}T^{-1.31}e^{-94./T}$		24-300	Páramo et al. (2008)
R_n117	2	C_2H	+	H_2	→	C_2H_2	+	H	$3.50\times10^{-18}T^{2.32}e^{-444./T}$		180-3000	Baulch et al. (2005)
R_n118	2	C_2H	+	CH_4	→	C_2H_2	+	CH_3	$3.60\times10^{-14}T^{0.94}e^{-328./T}$		150-780	Baulch et al. (2005)
R_n119a	2	C_2H	+	C_2H	→	C_4H	+	H	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n119b	2	C_2H	+	C_2H	→	C_2H_2	+	C_2	3.00×10^{-12}		300-2500	Tsang and Hampson (1986)
R_n120	2	C_2H	+	C_2H_2	→	C_4H_2	+	H	$4.37\times10^{-10}T^{-0.25}$		15-295	Chastaing et al. (1998)
R_n121a	2	C_2H	+	C_2H_3	→	C_4H_3	+	H	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n121b	2	C_2H	+	C_2H_3	→	C_2H_2	+	C_2H_2	1.60×10^{-12}		300-2500	Tsang and Hampson (1986)
R_n122	2	C_2H	+	C_2H_4	→	C_4H_4	+	H	$7.80\times10^{-11}e^{134./T}$		150-359	Opansky and Leone (1996),Kovács et al. (2010)
R_n123a	2	C_2H	+	C_2H_5	→	C_2H_4	+	C_2H_2	3.00×10^{-12}		300-2500	Tsang and Hampson (1986)
R_n123b	2	C_2H	+	C_2H_5	→	C_3H_3	+	CH_3	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n124	2	C_2H	+	C_2H_6	→	C_2H_2	+	C_2H_5	$6.75\times10^{-12}T^{0.28}e^{62./T}$		150-780	Baulch et al. (2005)
R_n125a	2	C_2H	+	CH_3CCH	→	C_5H_4	+	H	$4.64\times10^{-10}T^{-0.30}$		63-296	Carty et al. (2001),Goulay et al. (2007)
R_n125b	2	C_2H	+	CH_3CCH	→	C_4H_2	+	CH_3	$6.96\times10^{-10}T^{-0.30}$		63-296	Carty et al. (2001),Goulay et al. (2007)
R_n126	2	C_2H	+	CH_2CCH_2	→	C_5H_4	+	H	$1.95\times10^{-09}T^{-0.40}$		63-296	Carty et al. (2001),Goulay et al. (2011)
R_n127	2	C_2H	+	C_3H_6	→	C_4H_4	+	CH_3	2.16×10^{-10}		103-296	Vakhtin et al. (2001a),Woon and Park (2009),B
R_n128	2	C_2H	+	C_3H_8	→	C_3H_7	+	C_2H_2	$9.80\times10^{-11}e^{-71./T}$		96-361	Murphy et al. (2003)
R_n129	2	C_2H	+	C_4H_2	→	C_6H_2	+	H	$1.62\times10^{-09}T^{-0.31}$		20-300	Cheikh Sid Ely (2012),Gu et al. (2009b)
R_n130	2	C_2H	+	C_4H_4	→	C_6H_4	+	H	$1.03\times10^{-09}T^{-0.23}e^{4./T}$		-	est.(C2H+C4H2),Zhang et al. (2011)
R_n131	2	C_2H	+	C_4H_6	→	C_6H_6	+	H	3.00×10^{-10}		104-296	Nizamov and Leone (2004a),Jones et al. (2011)
R_n132a	2	C_2H	+	C_4H_8	→	C_4H_4	+	C_2H_5	1.32×10^{-10}		104-296	Nizamov and Leone (2004a),Woon and Park (2
R_n132b	2	C_2H	+	C_4H_8	→	C_5H_6	+	CH_3	8.80×10^{-11}		104-296	Nizamov and Leone (2004a),Woon and Park (2
R_n133	2	C_2H	+	C_4H_{10}	→	C_2H_2	+	C_4H_9	1.15×10^{-10}		104-296	Nizamov and Leone (2004a)
R_n134	2	C_2H	+	C_6H_2	→	C_8H_2	+	H	$1.03\times10^{-09}T^{-0.23}e^{4./T}$		-	est.(C2H+C4H2)
R_n135	2	C_2H	+	C_6H_6	→	C_8H_6	+	H	$9.10\times10^{-10}T^{-0.18}$		105-298	Goulay and Leone (2006)
R_n136a	4	C_2H_3	+	C_2H_3	→	C_4H_5	+	H	$1.20\times10^{-11}e^{400./T}$		300-700	Ismail et al. (2009),est.(AtomNumber)
									1.00×10^{-21}	0.40		
									1.20×10^{-11}			
R_n136b	2	C_2H_3	+	C_2H_3	→	C_2H_4	+	C_2H_2	2.40×10^{-11}		298	Fahr et al. (1991)

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	Type	Reaction							k	F_c	T range	Ref.
R_n137a	4	C_2H_3	+	C_2H_5	→	C_4H_8			6.50×10^{-11}		298	Laufer and Fahr (2004),est.(AtomNumber)
									1.00×10^{-21}	0.40		
									2.00×10^{-11}			
R_n137b	2	C_2H_3	+	C_2H_5	→	C_2H_4	+	C_2H_4	1.50×10^{-11}		298	Laufer and Fahr (2004)
R_n137c	2	C_2H_3	+	C_2H_5	→	C_2H_6	+	C_2H_2	1.50×10^{-11}		298	Laufer and Fahr (2004)
R_n138	4	C_2H_3	+	C_3	→	C_5H_3			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n139	4	C_2H_3	+	C_3H	→	C_5H_4			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n140	4	C_2H_3	+	C_3H_2	→	C_5H_5			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n141	4	C_2H_3	+	C_3H_3	→	C_5H_6			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n142a	4	C_2H_3	+	C_3H_5	→	C_5H_8			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n142b	2	C_2H_3	+	C_3H_5	→	CH_2CCH_2	+	C_2H_4	4.00×10^{-12}		300-2500	Tsang (1991)
R_n142c	2	C_2H_3	+	C_3H_5	→	C_3H_6	+	C_2H_2	8.00×10^{-12}		300-2500	Tsang (1991)
R_n143a	4	C_2H_3	+	C_3H_7	→	C_5H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n143b	2	C_2H_3	+	C_3H_7	→	C_3H_6	+	C_2H_4	$2.53\times10^{-10}T^{-0.70}$		300-2500	Tsang (1988)
R_n143c	2	C_2H_3	+	C_3H_7	→	C_3H_8	+	C_2H_2	$2.53\times10^{-10}T^{-0.70}$		300-2500	Tsang (1988)
R_n144	4	C_2H_3	+	C_4H_3	→	C_6H_6			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									8.00×10^{-11}			
R_n145	4	C_2H_3	+	C_4H_5	→	C_6H_8			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									8.00×10^{-11}			
R_n146	4	C_2H_3	+	C_4H_7	→	C_6H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									8.00×10^{-11}			
R_n147	4	C_2H_3	+	C_4H_9	→	C_6H_{12}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n148	4	C_2H_3 + C_6H_3 → C_8H_6	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n149	4	C_2H_3 + C_6H_5 → C_8H_8	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n150a	4	C_2H_5 + C_2H_5 → C_4H_{10}	$1.45\times10^{-09}T^{-0.70}e^{1./T}$		200-2000	Klippenstein et al. (2006),est.(AtomNumber)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n150b	2	C_2H_5 + C_2H_5 → C_2H_4 + C_2H_6	2.40×10^{-12}		300-1200	Baulch et al. (1994)
R_n151	4	C_2H_5 + C_3 → C_5H_5	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n152	4	C_2H_5 + C_3H → C_5H_6	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n153	4	C_2H_5 + C_3H_2 → C_5H_7	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n154	4	C_2H_5 + C_3H_3 → C_5H_8	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n155a	4	C_2H_5 + C_3H_5 → C_5H_{10}	$3.30\times10^{-11}e^{66./T}$		500-1200	Baulch et al. (2005),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			$3.30\times10^{-11}e^{66./T}$			
R_n155b	2	C_2H_5 + C_3H_5 → C_3H_6 + C_2H_4	$4.30\times10^{-12}e^{66./T}$		500-1200	Baulch et al. (2005)
R_n155c	2	C_2H_5 + C_3H_5 → CH_2CCH_2 + C_2H_6	$1.60\times10^{-12}e^{66./T}$		500-1200	Baulch et al. (2005)
R_n156a	2	C_2H_5 + C_3H_7 → C_3H_8 + C_2H_4	5.00×10^{-11}		-	ThisWork
R_n156b	2	C_2H_5 + C_3H_7 → C_3H_6 + C_2H_6	5.00×10^{-11}		-	ThisWork
R_n156c	4	C_2H_5 + C_3H_7 → C_5H_{12}	$5.37\times10^{-10}T^{-0.60}e^{161./T}$		200-2000	Klippenstein et al. (2006),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			$5.37\times10^{-10}T^{-0.60}e^{161./T}$			
R_n157	4	C_2H_5 + C_4H_3 → C_6H_8	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		

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	Type	Reaction					k	F_c	T range	Ref.
R_n158	4	C_2H_5	+	C_4H_5	$\rightarrow$	C_6H_{10}	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n159	4	C_2H_5	+	C_4H_7	$\rightarrow$	C_6H_{12}	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n160	4	C_2H_5	+	C_4H_9	$\rightarrow$	C_6H_{14}	8.00×10^{-11} $2.79\times10^{-09}T^{-0.89}e^{73./T}$ 1.00×10^{-17}	0.40	200-2000	Klippenstein et al. (2006),est.(AtomNumber)
R_n161	4	C_2H_5	+	C_6H_3	$\rightarrow$	C_8H_8	$2.79\times10^{-09}T^{-0.89}e^{73./T}$ 8.00×10^{-11} 1.00×10^{-13}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n162	4	C_2H_5	+	C_6H_5	$\rightarrow$	C_8H_{10}	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-13}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n163	4	C_3	+	C_3H_3	$\rightarrow$	C_6H_3	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n164	4	C_3	+	C_3H_5	$\rightarrow$	C_6H_5	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n165	4	C_3H	+	C_3H_3	$\rightarrow$	C_6H_4	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n166	4	C_3H	+	C_3H_5	$\rightarrow$	C_6H_6	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n167	4	C_3H_2	+	C_3H_3	$\rightarrow$	C_6H_5	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n168	4	C_3H_2	+	C_3H_5	$\rightarrow$	C_6H_7	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n169	4	C_3H_3	+	C_3H_3	$\rightarrow$	C_6H_6	8.00×10^{-11} 6.50×10^{-11} 1.00×10^{-17}	0.40	298-1000	Baulch et al. (2005),est.(AtomNumber)

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	Type	Reaction							k	F_c	T range	Ref.
R_n170a	4	C_3H_3	+	C_3H_5	$\rightarrow$	C_6H_8			6.50×10^{-11} 8.00×10^{-11} 1.00×10^{-17} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n170b	2	C_3H_3	+	C_3H_5	$\rightarrow$	CH_2CCH_2	+	CH_2CCH_2	1.00×10^{-13}		-	est.(C3H5+C3H5)
R_n171	4	C_3H_3	+	C_3H_7	$\rightarrow$	C_6H_{10}			8.00×10^{-11} 1.00×10^{-17} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n172	4	C_3H_3	+	C_4H_3	$\rightarrow$	C_7H_6			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n173	4	C_3H_3	+	C_4H_5	$\rightarrow$	C_7H_8			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n174	4	C_3H_3	+	C_4H_7	$\rightarrow$	C_7H_{10}			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n175	4	C_3H_3	+	C_4H_9	$\rightarrow$	C_7H_{12}			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n176	4	C_3H_3	+	C_6H_3	$\rightarrow$	C_9H_6			8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n177	4	C_3H_3	+	C_6H_5	$\rightarrow$	C_9H_8			8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n178a	4	C_3H_5	+	C_3H_5	$\rightarrow$	C_6H_{10}			2.30×10^{-11} 1.00×10^{-17} 2.30×10^{-11}	0.40	300-1000	Baulch et al. (2005),est.(AtomNumber)
R_n178b	2	C_3H_5	+	C_3H_5	$\rightarrow$	C_3H_6	+	CH_2CCH_2	1.00×10^{-13}		300-1000	Baulch et al. (2005)
R_n179a	4	C_3H_5	+	C_3H_7	$\rightarrow$	C_6H_{12}			8.00×10^{-11} 1.00×10^{-17} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n179b	2	C_3H_5	+	C_3H_7	$\rightarrow$	C_3H_8	+	CH_2CCH_2	$7.60\times10^{-12}T^{-0.35}e^{66./T}$		300-2500	Tsang (1991)
R_n179c	2	C_3H_5	+	C_3H_7	$\rightarrow$	C_3H_6	+	C_3H_6	$3.80\times10^{-11}T^{-0.35}e^{66./T}$		300-2500	Tsang (1991)
R_n180	4	C_3H_5	+	C_4H_3	$\rightarrow$	C_7H_8			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction							k	F_c	T range	Ref.
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n181	4	C_3H_5	+	C_4H_5	→	C_7H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n182	4	C_3H_5	+	C_4H_7	→	C_7H_{12}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n183	4	C_3H_5	+	C_4H_9	→	C_7H_{14}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n184	4	C_3H_5	+	C_6H_3	→	C_9H_8			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-11}	0.40		
									8.00×10^{-11}			
R_n185	4	C_3H_5	+	C_6H_5	→	C_9H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-11}	0.40		
									8.00×10^{-11}			
R_n186a	4	C_3H_7	+	C_3H_7	→	C_6H_{14}			$9.79\times10^{-10}T^{-0.86}e^{132./T}$		200-2000	Klippenstein et al. (2006),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									$9.79\times10^{-10}T^{-0.86}e^{132./T}$			
R_n186b	2	C_3H_7	+	C_3H_7	→	C_3H_8	+	C_3H_6	4.20×10^{-12}		300-1000	Baulch et al. (2005)
R_n187	4	C_3H_7	+	C_4H_3	→	C_7H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n188	4	C_3H_7	+	C_4H_5	→	C_7H_{12}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n189	4	C_3H_7	+	C_4H_7	→	C_7H_{14}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n190	4	C_3H_7	+	C_4H_9	→	C_7H_{16}			$9.66\times10^{-09}T^{-1.17}e^{65./T}$		200-2000	Klippenstein et al. (2006),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									$9.66\times10^{-09}T^{-1.17}e^{65./T}$			
R_n191	4	C_3H_7	+	C_6H_3	→	C_9H_{10}			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-11}	0.40		
									8.00×10^{-11}			

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	Type	Reaction	k	F_c	T range	Ref.
R_n192	4	C_3H_7 + C_6H_5 → C_9H_{12}	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-11}$	0.40		
			$8.00{\times}10^{-11}$			
R_n193	2	C_4H + H_2 → C_4H_2 + H	$3.50{\times}10^{-18}T^{2.32}e^{-444./T}$		-	est.(C2H+H2)
R_n194	2	C_4H + CH_4 → C_4H_2 + CH_3	$1.63{\times}10^{-11}e^{-610./T}$		200	Berteloite et al. (2008),Berteloite et al. (2010b
R_n195	2	C_4H + C_2H_2 → C_6H_2 + H	$7.63{\times}10^{-08}T^{-1.06}e^{-65./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010a)
R_n196	2	C_4H + C_2H_4 → C_6H_4 + H	$1.90{\times}10^{-09}T^{-0.40}e^{9./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010a)
R_n197	2	C_4H + C_2H_6 → C_4H_2 + C_2H_5	$3.19{\times}10^{-08}T^{-1.23}e^{-24./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010b
R_n198a	2	C_4H + CH_3CCH → C_7H_4 + H	$1.71{\times}10^{-08}T^{-0.82}e^{-47./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010a)
R_n198b	2	C_4H + CH_3CCH → C_6H_2 + CH_3	$1.71{\times}10^{-08}T^{-0.82}e^{-47./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010a)
R_n199	2	C_4H + CH_2CCH_2 → C_7H_4 + H	$3.07{\times}10^{-07}T^{-1.18}e^{-91./T}$		39-300	Berteloite et al. (2010a)
R_n200	2	C_4H + C_3H_6 → C_7H_6 + H	$3.89{\times}10^{-08}T^{-0.84}e^{-48./T}$		39-298	Berteloite et al. (2010a)
R_n201	2	C_4H + C_3H_8 → C_4H_2 + C_3H_7	$2.46{\times}10^{-07}T^{-1.36}e^{-56./T}$		39-298	Berteloite et al. (2008),Berteloite et al. (2010b
R_n202	2	C_4H + C_4H_2 → C_8H_2 + H	$7.63{\times}10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n203	2	C_4H + C_4H_4 → C_8H_4 + H	$7.63{\times}10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n204	2	C_4H + C_4H_6 → C_8H_6 + H	$6.65{\times}10^{-07}T^{-1.25}e^{-116./T}$		39-300	Berteloite et al. (2010a)
R_n205	2	C_4H + C_4H_8 → C_8H_8 + H	$2.04{\times}10^{-08}T^{-0.61}e^{-65./T}$		39-300	Berteloite et al. (2010a)
R_n206	2	C_4H + C_4H_{10} → C_4H_2 + C_4H_9	$4.82{\times}10^{-07}T^{-1.30}e^{-90./T}$		39-300	Berteloite et al. (2010b)
R_n207	2	C_4H + C_6H_2 → $C_{10}H_2$ + H	$7.63{\times}10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n208	2	C_4H_3 + C_2H_2 → C_6H_4 + H	$1.65{\times}10^{-27}T^{5.13}e^{-2730./T}$		50-300	ThisWork
R_n209	4	C_4H_3 + C_4H_3 → C_8H_6	$5.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-13}$	0.40		
			$5.00{\times}10^{-11}$			
R_n210	4	C_4H_3 + C_4H_5 → C_8H_8	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-13}$	0.40		
			$8.00{\times}10^{-11}$			
R_n211	4	C_4H_3 + C_4H_7 → C_8H_{10}	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-13}$	0.40		
			$8.00{\times}10^{-11}$			
R_n212	4	C_4H_3 + C_4H_9 → C_8H_{12}	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-13}$	0.40		
			$8.00{\times}10^{-11}$			
R_n213	4	C_4H_3 + C_6H_3 → $C_{10}H_6$	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)
			$1.00{\times}10^{-11}$	0.40		
			$8.00{\times}10^{-11}$			
R_n214	4	C_4H_3 + C_6H_5 → $C_{10}H_8$	$8.00{\times}10^{-11}$		-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n215	4	$C_4H_5 + C_4H_5 \rightarrow C_8H_{10}$	5.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			5.00×10^{-11}			
R_n216	4	$C_4H_5 + C_4H_7 \rightarrow C_8H_{12}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n217	4	$C_4H_5 + C_4H_9 \rightarrow C_8H_{14}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n218	4	$C_4H_5 + C_6H_3 \rightarrow C_{10}H_8$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n219	4	$C_4H_5 + C_6H_5 \rightarrow C_{10}H_{10}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n220	4	$C_4H_7 + C_4H_7 \rightarrow C_8H_{14}$	5.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n221	4	$C_4H_7 + C_4H_9 \rightarrow C_8H_{16}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n222	4	$C_4H_7 + C_6H_3 \rightarrow C_{10}H_{10}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n223	4	$C_4H_7 + C_6H_5 \rightarrow C_{10}H_{12}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n224	4	$C_4H_9 + C_4H_9 \rightarrow C_8H_{18}$	$2.27\times10^{-10}T^{-0.92}e^{350./T}$		200-2000	Klippenstein et al. (2006),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			$2.27\times10^{-10}T^{-0.92}e^{350./T}$			
R_n225	4	$C_4H_9 + C_6H_3 \rightarrow C_{10}H_{12}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n226a	4	$C_4H_9 + C_6H_5 \rightarrow C_{10}H_{14}$	$6.90\times10^{-10}T^{-0.75}e^{-28./T}$		290-972	Park et al. (1999),est.(AtomNumber)

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	Type	Reaction	k	F_c	T range	Ref.
			1.00×10^{-11}	0.40		
			$6.90\times10^{-10}T^{-0.75}e^{-28./T}$			
R_n226b	2	C_4H_9 + C_6H_5 → C_6H_6 + C_4H_8	$2.10\times10^{-11}e^{300./T}$		290-972	Park et al. (1999)
R_n227	2	C_6H + H_2 → C_6H_2 + H	$3.50\times10^{-18}T^{2.32}e^{-444./T}$		-	est.(C2H+H2)
R_n228	2	C_6H + CH_4 → C_6H_2 + CH_3	$1.63\times10^{-11}e^{-610./T}$		-	est.(C4H+CH4)
R_n229	2	C_6H + C_2H_2 → C_8H_2 + H	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n230	2	C_6H + C_2H_4 → C_8H_4 + H	$1.90\times10^{-09}T^{-0.40}e^{9./T}$		-	est.(C4H+C2H4)
R_n231	2	C_6H + C_2H_6 → C_6H_2 + C_2H_5	$3.19\times10^{-08}T^{-1.23}e^{-24./T}$		-	est.(C4H+C2H6)
R_n232a	2	C_6H + CH_3CCH → C_9H_4 + H	$1.71\times10^{-08}T^{-0.82}e^{-47./T}$		-	est.(C4H+CH3CCH)
R_n232b	2	C_6H + CH_3CCH → C_8H_2 + CH_3	$1.71\times10^{-08}T^{-0.82}e^{-47./T}$		-	est.(C4H+CH3CCH)
R_n233	2	C_6H + CH_2CCH_2 → C_9H_4 + H	$3.07\times10^{-07}T^{-1.18}e^{-91./T}$		-	est.(C4H+CH2CCH2)
R_n234	2	C_6H + C_3H_6 → C_9H_6 + H	$3.89\times10^{-08}T^{-0.84}e^{-48./T}$		-	est.(C4H+C3H6)
R_n235	2	C_6H + C_3H_8 → C_6H_2 + C_3H_7	$2.46\times10^{-07}T^{-1.36}e^{-56./T}$		-	est.(C4H+C3H8)
R_n236	2	C_6H + C_4H_2 → $C_{10}H_2$ + H	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n237	2	C_6H + C_4H_4 → $C_{10}H_4$ + H	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n238	2	C_6H + C_4H_6 → $C_{10}H_6$ + H	$6.65\times10^{-07}T^{-1.25}e^{-116./T}$		-	est.(C4H+C4H6)
R_n239	2	C_6H + C_4H_8 → $C_{10}H_8$ + H	$2.04\times10^{-08}T^{-0.61}e^{-65./T}$		-	est.(C4H+C4H8)
R_n240	2	C_6H + C_4H_{10} → C_6H_2 + C_4H_9	$4.82\times10^{-07}T^{-1.30}e^{-90./T}$		-	est.(C4H+C4H10)
R_n241	2	C_6H + C_6H_2 → $C_{12}H_2$ + H	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n242	4	C_6H_3 + C_6H_3 → $C_{12}H_6$	5.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			5.00×10^{-11}			
R_n243	4	C_6H_3 + C_6H_5 → $C_{12}H_8$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n244	4	C_6H_3 + C_7H_7 → $C_{13}H_{10}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n245	4	C_6H_3 + C_8H_9 → $C_{14}H_{12}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			8.00×10^{-11}			
R_n246	4	C_6H_5 + C_6H_5 → $C_{12}H_{10}$	5.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		
			5.00×10^{-11}			
R_n247	4	C_6H_5 + C_7H_7 → $C_{13}H_{12}$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-11}	0.40		

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	Type	Reaction	k	F_c	T range	Ref.
R_n248	4	C_6H_5 + C_8H_9 → $C_{14}H_{14}$	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n249	4	C_7H_7 + C_7H_7 → $C_{14}H_{14}$	8.00×10^{-11} $1.50\times10^{-10}T^{-0.23}$ 1.00×10^{-11}	0.40	250-400	Luther et al. (2004),est.(AtomNumber)
R_n250	4	C_7H_7 + C_8H_9 → $C_{15}H_{16}$	$1.50\times10^{-10}T^{-0.23}$ 8.00×10^{-11} 1.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n251	4	C_8H_9 + C_8H_9 → $C_{16}H_{18}$	8.00×10^{-11} 5.00×10^{-11} 1.00×10^{-11} 5.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n252	2	H + NH_3 → NH_2 + H_2	$7.78\times10^{-24}T^{3.93}e^{-4060./T}$		200-2000	Espinosa-Garcia and Corchado (1994)
R_n253	2	H + N_2H_4 → N_2H_3 + H_2	$1.17\times10^{-11}e^{-1260./T}$		222-657	Vaghjiani (1995)
R_n254	4	H + HCN → H_2CN	5.00×10^{-11} 1.00×10^{-11} $1.90\times10^{-11}T^{-2.88}e^{-442./T}$	0.06	70-250	ThisWork
R_n255	2	H + HNC → HCN + H	$4.12\times10^{-25}T^{5.13}e^{117./T}$		50-300	ThisWork
R_n256a	2	H + CH_2NH → H_2CN + H_2	$6.96\times10^{-22}T^{3.07}e^{171./T}$		50-300	ThisWork
R_n256b	4	H + CH_2NH → CH_2NH_2	$2.15\times10^{-30}T^{6.55}e^{258./T}$ $6.04\times10^{-24}T^{-2.03}e^{-54./T}$ $1.10\times10^{-13}T^{-1.32}e^{-150./T}$	0.08	50-300	ThisWork
R_n256c	4	H + CH_2NH → CH_2NH_2	$7.65\times10^{-31}T^{6.77}e^{271./T}$ $3.45\times10^{-24}T^{-2.26}e^{-44./T}$ $4.38\times10^{-14}T^{-1.60}e^{-84./T}$	0.09	50-300	ThisWork
R_n257	2	H + CH_3NH_2 → CH_2NH_2 + H_2	$1.34\times10^{-21}T^{3.44}e^{-1223./T}$		200-3000	Zhang et al. (2005)
R_n258	4	H + HC_3N → C_3H_2N	$2.02\times10^{-33}T^{7.97}e^{306./T}$ $5.69\times10^{-18}T^{-2.77}e^{-179./T}$ $4.10\times10^{-16}T^{0.38}e^{-207./T}$	0.40	50-300	ThisWork,est.(H+C4H2)
R_n259	4	H + C_3H_3N → C_3H_4N	$2.02\times10^{-33}T^{7.97}e^{306./T}$ $5.69\times10^{-18}T^{-2.77}e^{-179./T}$ $4.10\times10^{-16}T^{0.38}e^{-207./T}$	0.40	-	est.(H+HC3N)
R_n260	4	H + C_2N_2 → HC_2N_2	$2.02\times10^{-33}T^{7.97}e^{306./T}$ $5.69\times10^{-18}T^{-2.77}e^{-179./T}$ $4.10\times10^{-16}T^{0.38}e^{-207./T}$	0.40	-	est.(H+HC3N)

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	Type	Reaction	k	F_c	T range	Ref.
R_n261	4	$H + C_4N_2 \rightarrow HC_4N_2$	$2.02\times10^{-33}T^{7.97}e^{306./T}$		-	est.(H+HC3N)
			$5.69\times10^{-18}T^{-2.77}e^{-179./T}$	0.40		
			$4.10\times10^{-16}T^{0.38}e^{-207./T}$			
R_n262a	2	$C + NH_2 \rightarrow HCN + H$	$9.39\times10^{-11}T^{-0.20}e^{-6./T}$		10-300	Wakelam et al. (2015)
R_n262b	2	$C + NH_2 \rightarrow HNC + H$	$9.39\times10^{-11}T^{-0.20}e^{-6./T}$		10-300	Wakelam et al. (2015)
R_n263a	2	$CH + NH_3 \rightarrow CH_2NH + H$	$2.02\times10^{-10}T^{-0.05}$		10-300	Wakelam et al. (2015)
R_n263b	2	$CH + NH_3 \rightarrow NH + CH_3$	$1.06\times10^{-11}T^{-0.05}$		10-300	Wakelam et al. (2015)
R_n264a	2	$CH + HCN \rightarrow HC_2N + H$	$3.69\times10^{-10}T^{-0.17}$		100-296	Zabarnick et al. (1991),Hébrard et al. (2012)
R_n264b	2	$CH + HCN \rightarrow C_2N + H_2$	$3.69\times10^{-10}T^{-0.17}$		100-296	Zabarnick et al. (1991),Hébrard et al. (2012)
R_n265a	2	$CH + HNC \rightarrow HC_2N + H$	$3.69\times10^{-10}T^{-0.17}$		100-296	est.(CH+HCN)
R_n265b	2	$CH + HNC \rightarrow C_2N + H_2$	$3.69\times10^{-10}T^{-0.17}$		100-296	est.(CH+HCN)
R_n266	2	$CH + CH_3NH_2 \rightarrow C_2H_5N + H$	$3.11\times10^{-10}e^{170./T}$		297-677	Zabarnick et al. (1989)
R_n267	2	$CH_3 + N_2H_4 \rightarrow N_2H_3 + CH_4$	$1.32\times10^{-24}T^{4.00}e^{-2037./T}$		220-3000	Li and Zhang (2006)
R_n268	2	$CH_3 + HNC \rightarrow HCN + CH_3$	$3.00\times10^{-11}e^{-3668./T}$		-	Petrie (2002),Petrie and Osamura (2004)
R_n269	2	$C_2 + HCN \rightarrow C_3N + H$	$1.16\times10^{-08}T^{-0.82}e^{-9./T}$		90-200	Gu et al. (2009a)
R_n270	2	$C_2H + NH_3 \rightarrow C_2H_2 + NH_2$	$4.89\times10^{-09}T^{-0.90}$		104-294	Nizamov and Leone (2004b)
R_n271	2	$C_2H + HCN \rightarrow HC_3N + H$	$7.51\times10^{-17}T^{1.78}e^{-382./T}$		70-300	ThisWork
R_n272	2	$C_2H + HNC \rightarrow HC_3N + H$	3.00×10^{-10}		-	est.(Petrie02)
R_n273	2	$C_2H + CH_2NH \rightarrow C_3H_3N + H$	$7.80\times10^{-11}e^{134./T}$		150-359	est.(C2H+C2H4)
R_n274	2	$C_2H + CH_3NH_2 \rightarrow CH_3CCH + NH_2$	$4.90\times10^{-09}T^{-0.90}$		-	est.(C2H+NH3)
R_n275	2	$C_2H + CH_3CN \rightarrow CH_2CN + C_2H_2$	$1.79\times10^{-11}e^{-769./T}$		262-360	Hoobler and Leone (1997),Zhao et al. (2008)
R_n276	2	$C_2H + HC_3N \rightarrow HC_5N + H$	$1.47\times10^{-08}T^{-1.04}$		20-300	Cheikh Sid Ely (2012)
R_n277	2	$C_2H + C_3H_3N \rightarrow C_5H_3N + H$	$7.80\times10^{-11}e^{134./T}$		-	est.(C2H+C2H4)
R_n278	2	$C_2H + C_3H_5N \rightarrow C_5H_5N + H$	$3.35\times10^{-11}e^{-297./T}$		104-298	Zhao et al. (2008)
R_n279	2	$C_2H + HC_5N \rightarrow HC_7N + H$	$7.47\times10^{-09}T^{-0.91}e^{6./T}$		-	est.(C2H+HC3N)
R_n280	2	$C_2H_3 + HCN \rightarrow C_3H_3N + H$	$5.69\times10^{-26}T^{4.70}e^{-2357./T}$		80-300	ThisWork
R_n281	2	$C_2H_3 + HNC \rightarrow HCN + C_2H_3$	$3.00\times10^{-11}e^{-1996./T}$		-	Petrie (2002),Petrie and Osamura (2004)
R_n282	2	$C_2H_5 + HNC \rightarrow HCN + C_2H_5$	$3.00\times10^{-11}e^{-3560./T}$		-	Petrie (2002),Petrie and Osamura (2004)
R_n283	2	$C_4H + HC_3N \rightarrow HC_7N + H$	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n284	2	$C_4H + HC_5N \rightarrow HC_9N + H$	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n285	2	$C_6H + HC_3N \rightarrow HC_9N + H$	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n286	2	$C_6H + HC_5N \rightarrow HC_{11}N + H$	$7.63\times10^{-08}T^{-1.06}e^{-65./T}$		-	est.(C4H+C2H2)
R_n287	4	$N + H \rightarrow NH$	5.00×10^{-16}		298	Brown (1973),est.(AtomNumber)
			5.00×10^{-32}	0.40		
			5.00×10^{-16}			
R_n288	2	$N + CH \rightarrow CN + H$	$1.35\times10^{-11}T^{0.41}$		56-300	Wakelam et al. (2015)

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	Type	Reaction									k	F_c	T range	Ref.
R_n289a	2	N	+	$^3CH_2$	→	HCN	+	H			$1.90\times10^{-11}T^{0.17}$		10-300	Wakelam et al. (2015)
R_n289b	2	N	+	$^3CH_2$	→	HNC	+	H			$1.14\times10^{-11}T^{0.17}$		10-300	Wakelam et al. (2015)
R_n290a	2	N	+	CH_3	→	H_2CN	+	H			5.58×10^{-11}		150-200	Marston et al. (1989b),Marston et al. (1989a),I
R_n290b	2	N	+	CH_3	→	HCN	+	H	+	H	6.20×10^{-12}		150-200	Marston et al. (1989b),Marston et al. (1989a),I
R_n291	2	N	+	C_2H	→	C_2N	+	H			$4.55\times10^{-11}T^{0.17}$		-	**?**
R_n292a	2	N	+	C_2H_3	→	C_2H_2	+	NH			1.31×10^{-11}		298	Payne et al. (1996),Dutuit et al. (2013)
R_n292b	2	N	+	C_2H_3	→	CH_2CN	+	H			6.39×10^{-11}		298	Payne et al. (1996),Dutuit et al. (2013)
R_n293a	2	N	+	C_2H_5	→	C_2H_4	+	NH			7.15×10^{-11}		298	Stief et al. (1995)
R_n293b	2	N	+	C_2H_5	→	H_2CN	+	CH_3			3.85×10^{-11}		298	Stief et al. (1995)
R_n294	4	N	+	N	→	N_2					5.00×10^{-16}		90-611	Clyne and Stedman (1967),est.(AtomNumber)
											$1.78\times10^{-33}e^{485./T}$	0.40		
											5.00×10^{-16}			
R_n295	2	N	+	NH	→	N_2	+	H			$2.83\times10^{-11}T^{0.10}$		10-500	Wakelam et al. (2015)
R_n296	2	N	+	NH_2	→	N_2	+	H	+	H	1.20×10^{-10}		10-500	Wakelam et al. (2015)
R_n297	2	N	+	CN	→	N_2	+	C			$8.02\times10^{-12}T^{0.42}$		56-296	Daranlot et al. (2012)
R_n298	2	N	+	H_2CN	→	HCN	+	NH			$1.00\times10^{-10}e^{-200./T}$		200-363	Marston and Stief (1989),Nesbitt et al. (1990)
R_n299	2	N	+	C_2N	→	CN	+	CN			1.00×10^{-10}		10-300	Wakelam et al. (2015)
R_n300	4	N	+	HC_2N	→	C_2N_2	+	H			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
											1.00×10^{-21}	0.40		
											2.00×10^{-11}			
R_n301	4	N	+	C_3H_2N	→	$C_3H_2N_2$					8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
											1.00×10^{-19}	0.40		
											8.00×10^{-11}			
R_n302	4	N	+	C_3H_4N	→	$C_3H_4N_2$					8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
											1.00×10^{-19}	0.40		
											8.00×10^{-11}			
R_n303	1	$N(^2D)$			→	N	+	$h\nu$			2.30×10^{-05}		-	Okabe (1978)
R_n304	2	$N(^2D)$	+	N_2	→	N	+	N_2			1.70×10^{-14}		298	Herron (1999)
R_n305	2	$N(^2D)$	+	N_2I	→	N	+	N_2I			1.70×10^{-14}		-	est.(N2D+N2)
R_n306	2	$N(^2D)$	+	H_2	→	NH	+	H			$4.20\times10^{-11}e^{-880./T}$		200-300	Herron (1999)
R_n307a	2	$N(^2D)$	+	CH_4	→	CH_2NH	+	H			$3.84\times10^{-11}e^{-750./T}$		223-292	Herron (1999)
R_n307b	2	$N(^2D)$	+	CH_4	→	NH	+	CH_3			$9.60\times10^{-12}e^{-750./T}$		223-292	Herron (1999)
R_n308	2	$N(^2D)$	+	C_2H_2	→	HC_2N	+	H			$1.60\times10^{-10}e^{-270./T}$		220-300	Herron (1999)
R_n309a	2	$N(^2D)$	+	C_2H_4	→	CH_3CN	+	H			$2.23\times10^{-10}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit
R_n309b	2	$N(^2D)$	+	C_2H_4	→	CH_2CN	+	H_2			$1.96\times10^{-12}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit
R_n309c	2	$N(^2D)$	+	C_2H_4	→	H_2CN	+	$^3CH_2$			$1.56\times10^{-12}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit

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	Type	Reaction	k	F$_c$	T range	Ref.
R$_n$309d	2	N(^{2}D) + C_2H_4 → HCN + CH_3	$2.71\times10^{-12}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit
R$_n$309e	2	N(^{2}D) + C_2H_4 → HNC + CH_3	$5.06\times10^{-13}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit
R$_n$309f	2	N(^{2}D) + C_2H_4 → NH + C_2H_3	$2.30\times10^{-14}e^{-500./T}$		230-292	Sato et al. (1999),Balucani et al. (2012),Dutuit
R$_n$310a	2	N(^{2}D) + C_2H_6 → CH_2NH + CH_3	1.52×10^{-11}		298,94-175	Herron (1999),Balucani et al. (2010)
R$_n$310b	2	N(^{2}D) + C_2H_6 → C_2H_5N + H	2.72×10^{-12}		298,94-175	Herron (1999),Balucani et al. (2010)
R$_n$310c	2	N(^{2}D) + C_2H_6 → NH + C_2H_5	1.05×10^{-12}		298,94-175	Herron (1999),Balucani et al. (2010)
R$_n$311	2	N(^{2}D) + CH_3CCH → C_3H_3N + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$312	2	N(^{2}D) + CH_2CCH_2 → C_3H_3N + H	$2.30\times10^{-10}e^{-500./T}$		-	est.(N2D+C2H4)
R$_n$313	2	N(^{2}D) + C_3H_6 → C_3H_5N + H	6.60×10^{-11}		298	Herron (1999)
R$_n$314a	2	N(^{2}D) + C_3H_8 → CH_2NH + C_2H_5	9.67×10^{-12}		298	Herron (1999)
R$_n$314b	2	N(^{2}D) + C_3H_8 → C_2H_5N + CH_3	9.67×10^{-12}		298	Herron (1999)
R$_n$314c	2	N(^{2}D) + C_3H_8 → C_3H_7N + H	9.67×10^{-12}		298	Herron (1999)
R$_n$315	2	N(^{2}D) + C_4H_2 → HC_4N + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$316	2	N(^{2}D) + C_4H_4 → C_4H_3N + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$317	2	N(^{2}D) + C_4H_6 → C_4H_5N + H	6.60×10^{-11}		-	est.(N2D+C3H6)
R$_n$318	2	N(^{2}D) + C_4H_8 → C_4H_7N + H	6.60×10^{-11}		-	est.(N2D+C3H6)
R$_n$319a	2	N(^{2}D) + C_4H_{10} → CH_2NH + C_3H_7	7.75×10^{-12}		298	Herron (1999)
R$_n$319b	2	N(^{2}D) + C_4H_{10} → C_2H_5N + C_2H_5	7.75×10^{-12}		298	Herron (1999)
R$_n$319c	2	N(^{2}D) + C_4H_{10} → C_3H_7N + CH_3	7.75×10^{-12}		298	Herron (1999)
R$_n$319d	2	N(^{2}D) + C_4H_{10} → C_4H_9N + H	7.75×10^{-12}		298	Herron (1999)
R$_n$320	2	N(^{2}D) + C_6H_2 → HC_6N + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$321	2	N(^{2}D) + HCN → N_2 + CH	$1.07\times10^{-14}T^{1.82}e^{-149./T}$		50-300	ThisWork
R$_n$322	2	N(^{2}D) + HNC → CN_2 + H	$1.61\times10^{-15}T^{1.60}e^{102./T}$		50-300	ThisWork
R$_n$323	2	N(^{2}D) + CH_2NH → CH_2N_2 + H	$2.30\times10^{-10}e^{-500./T}$		-	est.(N2D+C2H4)
R$_n$324a	2	N(^{2}D) + CH_3CN → $C_2H_2N_2$ + H	$3.84\times10^{-11}e^{-750./T}$		-	est.(N2D+CH4)
R$_n$324b	2	N(^{2}D) + CH_3CN → CH_2CN + NH	$9.60\times10^{-12}e^{-750./T}$		-	est.(N2D+CH4)
R$_n$325	2	N(^{2}D) + HC_3N → C_3N_2 + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$326	2	N(^{2}D) + C_3H_3N → $C_3H_2N_2$ + H	$2.30\times10^{-10}e^{-500./T}$		-	est.(N2D+C2H4)
R$_n$327a	2	N(^{2}D) + C_3H_5N → $C_3H_4N_2$ + H	$3.84\times10^{-11}e^{-750./T}$		-	est.(N2D+CH4)
R$_n$327b	2	N(^{2}D) + C_3H_5N → C_3H_4N + NH	$9.60\times10^{-12}e^{-750./T}$		-	est.(N2D+CH4)
R$_n$328	2	N(^{2}D) + HC_5N → C_5N_2 + H	$1.60\times10^{-10}e^{-270./T}$		-	est.(N2D+C2H2)
R$_n$329	2	NH + H → N + H_2	$3.12\times10^{-16}T^{1.55}e^{-103./T}$		300-2000	Adam et al. (2005)
R$_n$330	2	NH + CH_3 → CH_2NH + H	$3.06\times10^{-10}T^{-0.11}e^{-7./T}$		20-500	ThisWork
R$_n$331	2	NH + C_2H_2 → CH_2CN + H	$2.00\times10^{-09}T^{-1.07}$		53-188	Mullen and Smith (2005)
R$_n$332	2	NH + C_2H_4 → NH_2 + C_2H_3	$1.16\times10^{-09}T^{-1.09}$		53-188	Mullen and Smith (2005)
R$_n$333	2	NH + C_2H_6 → NH_2 + C_2H_5	6.80×10^{-12}		53-188	Mullen and Smith (2005)

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	Type	Reaction	k	F_c	T range	Ref.
R_n334	2	$NH + CH_3CCH \rightarrow C_3H_4N + H$	$2.00\times10^{-09}T^{-1.07}$		-	est.(NH+C2H2)
R_n335	2	$NH + CH_2CCH_2 \rightarrow NH_2 + C_3H_3$	$1.16\times10^{-09}T^{-1.09}$		-	est.(NH+C2H4)
R_n336	2	$NH + C_3H_6 \rightarrow NH_2 + C_3H_5$	$6.24\times10^{-09}T^{-1.23}$		53-188	Mullen and Smith (2005)
R_n337	2	$NH + C_3H_8 \rightarrow NH_2 + C_3H_7$	6.80×10^{-12}		-	est.(NH+C2H6)
R_n338	2	$NH + C_4H_2 \rightarrow C_4H_2N + H$	$8.24\times10^{-09}T^{-1.23}$		53-188	Mullen and Smith (2005)
R_n339	2	$NH + C_4H_4 \rightarrow C_4H_4N + H$	$8.24\times10^{-09}T^{-1.23}$		-	est.(NH+C4H2)
R_n340	2	$NH + C_4H_6 \rightarrow C_4H_6N + H$	$6.24\times10^{-09}T^{-1.23}$		-	est.(NH+C3H6)
R_n341	2	$NH + C_4H_8 \rightarrow NH_2 + C_4H_7$	$6.24\times10^{-09}T^{-1.23}$		-	est.(NH+C3H6)
R_n342	2	$NH + C_4H_{10} \rightarrow NH_2 + C_4H_9$	6.80×10^{-12}		-	est.(NH+C2H6)
R_n343	2	$NH + C_6H_2 \rightarrow C_6H_2N + H$	$8.24\times10^{-09}T^{-1.23}$		-	est.(NH+C4H2)
R_n344a	2	$NH + NH \rightarrow NH_2 + N$	$9.40\times10^{-25}T^{3.88}e^{-172./T}$		300-2500	Klippenstein et al. (2009)
R_n344b	2	$NH + NH \rightarrow N_2 + H + H$	$1.04\times10^{-10}T^{-0.04}e^{81./T}$		200-2500	Klippenstein et al. (2009),est.(3CH2+3CH2)
R_n345	2	$NH + NH_2 \rightarrow N_2H_2 + H$	$7.07\times10^{-10}T^{-0.27}e^{39./T}$		200-2500	Klippenstein et al. (2009)
R_n346	2	$NH + NH_3 \rightarrow NH_2 + NH_2$	$8.53\times10^{-23}T^{3.41}e^{-7350./T}$		300-2500	Klippenstein et al. (2009)
R_n347	4	$NH_2 + H \rightarrow NH_3$	$1.50\times10^{-10}T^{0.13}e^{-2./T}$		-	est.(H+CH3)
			$2.56\times10^{-24}T^{-1.80}e^{-31./T}$	0.42		
			$2.05\times10^{-13}T^{-1.29}e^{-19./T}$			
R_n348a	2	$NH_2 + C \rightarrow HCN + H$	$9.39\times10^{-11}T^{-0.20}e^{-6./T}$		10-300	Wakelam et al. (2015)
R_n348b	2	$NH_2 + C \rightarrow HNC + H$	$9.39\times10^{-11}T^{-0.20}e^{-6./T}$		10-300	Wakelam et al. (2015)
R_n349	4	$NH_2 + CH_3 \rightarrow CH_3NH_2$	$1.20\times10^{-11}T^{0.42}$		200-400	Jodkowski et al. (1995),est.(CH3+CH3)
			$6.00\times10^{-18}T^{-3.85}$	0.33		
			$2.97\times10^{-06}T^{-3.23}e^{-74./T}$			
R_n350a	2	$NH_2 + C_2H_3 \rightarrow C_2H_4N + H$	$3.30\times10^{-11}e^{236./T}$		-	est.(CH3+C2H3)
R_n350b	2	$NH_2 + C_2H_3 \rightarrow C_2H_2 + NH_3$	$1.50\times10^{-11}e^{385./T}$		-	est.(CH3+C2H3)
R_n351a	4	$NH_2 + C_2H_5 \rightarrow C_2H_7N$	$2.86\times10^{-09}T^{-0.61}e^{-44./T}$		-	est.(CH3+C2H5)
			$4.15\times10^{-10}T^{-5.49}e^{-441./T}$	0.41		
			$5.24\times10^{-02}T^{-4.33}e^{-193./T}$			
R_n351b	2	$NH_2 + C_2H_5 \rightarrow C_2H_4 + NH_3$	$1.99\times10^{-08}T^{-1.58}e^{-38./T}$		-	est.(CH3+C2H5)
R_n352	4	$NH_2 + C_3H_3 \rightarrow C_3H_5N$	$6.80\times10^{-11}e^{130./T}$		-	est.(CH3+C3H3)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n353a	4	$NH_2 + C_3H_5 \rightarrow C_3H_7N$	$1.55\times10^{-09}T^{-0.54}e^{117./T}$		-	est.(CH3+C3H5)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n353b	2	$NH_2 + C_3H_5 \rightarrow CH_2CCH_2 + NH_3$	6.00×10^{-13}		-	est.(CH3+C3H5)
R_n354	4	$NH_2 + C_3H_7 \rightarrow C_3H_9N$	$5.33\times10^{-10}T^{-0.47}e^{97./T}$		-	est.(CH3+C3H7)

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	Type	Reaction							k	F_c	T range	Ref.
									1.00×10^{-21}	0.40		
									2.00×10^{-11}			
R_n355	4	NH_2	+	C_4H_3	→	C_4H_5N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n356	4	NH_2	+	C_4H_5	→	C_4H_7N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n357	4	NH_2	+	C_4H_7	→	C_4H_9N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n358	4	NH_2	+	C_4H_9	→	$C_4H_{11}N$			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n359	4	NH_2	+	C_6H_3	→	C_6H_5N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n360	4	NH_2	+	C_6H_5	→	C_6H_7N			$3.62\times10^{-09}T^{-0.62}e^{-29./T}$		-	est.(CH3+C6H5)
									1.00×10^{-15}	0.40		
									$3.62\times10^{-09}T^{-0.62}e^{-29./T}$			
R_n361a	2	NH_2	+	NH_2	→	NH_3	+	NH	$9.36\times10^{-24}T^{3.53}e^{-278./T}$		300-2500	Klippenstein et al. (2009)
R_n361b	4	NH_2	+	NH_2	→	N_2H_4			$9.33\times10^{-10}T^{-0.41}e^{-33./T}$		300-2500	Klippenstein et al. (2009),est.(CH3+CH3)
									$4.48\times10^{-14}T^{-5.49}e^{-1000./T}$	0.31		
									$2.97\times10^{-06}T^{-3.23}e^{-74./T}$			
R_n362	2	NH_2	+	H_2CN	→	NH_3	+	HCN	$2.29\times10^{-08}T^{-1.06}e^{-60./T}$		50-300	Yelle et al. (2010)
R_n363	4	NH_2	+	CH_2CN	→	$C_2H_4N_2$			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-21}	0.40		
									2.00×10^{-11}			
R_n364	4	NH_2	+	C_3H_2N	→	$C_3H_4N_2$			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n365	4	NH_2	+	C_3H_4N	→	$C_3H_6N_2$			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n366	2	N_2H_3	+	H	→	NH_2	+	NH_2	2.66×10^{-12}		300	Gehring et al. (1971)
R_n367	4	CN	+	H	→	HCN			$2.99\times10^{-09}T^{-0.50}$		500-2500	Tsang (1992),est.(AtomNumber)

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	Type	Reaction							k	F_c	T range	Ref.
									$2.40\times10^{-24}T^{-2.20}e^{-567./T}$	0.40		
									1.00×10^{-13}			
R_n368	2	CN	+	H_2	→	HCN	+	H	$1.80\times10^{-19}T^{2.60}e^{-960./T}$		200-3500	Baulch et al. (2005)
R_n369	2	CN	+	CH_4	→	HCN	+	CH_3	$5.73\times10^{-12}e^{-675./T}$		160-298,195	Sims et al. (1993),Gannon et al. (2007)
R_n370	2	CN	+	C_2H_2	→	HC_3N	+	H	$5.30\times10^{-09}T^{-0.52}e^{-19./T}$		25-298,195	Sims et al. (1993),Gannon et al. (2007)
R_n371	2	CN	+	C_2H_4	→	C_3H_3N	+	H	$1.40\times10^{-08}T^{-0.69}e^{-31./T}$		25-298,195	Sims et al. (1993),Gannon et al. (2007)
R_n372	2	CN	+	C_2H_6	→	HCN	+	C_2H_5	$5.90\times10^{-12}T^{0.22}e^{58./T}$		25-298	Sims et al. (1993)
R_n373	2	CN	+	CH_3CCH	→	C_4H_3N	+	H	4.10×10^{-10}		15-295	Carty et al. (2001),Balucani et al. (2002)
R_n374	2	CN	+	CH_2CCH_2	→	C_4H_3N	+	H	4.10×10^{-10}		15-295	Carty et al. (2001),Balucani et al. (2002)
R_n375a	2	CN	+	C_3H_6	→	C_3H_3N	+	CH_3	$2.61\times10^{-10}T^{-0.09}$		23-298	Morales et al. (2010),Gannon et al. (2007),Trev
R_n375b	2	CN	+	C_3H_6	→	C_4H_5N	+	H	$2.61\times10^{-10}T^{-0.09}$		23-298	Morales et al. (2010),Gannon et al. (2007),Trev
R_n376	2	CN	+	C_3H_8	→	HCN	+	C_3H_7	$2.44\times10^{-14}T^{1.19}e^{378./T}$		170-740	Yang et al. (1992c)
R_n377	2	CN	+	C_4H_2	→	HC_5N	+	H	$1.60\times10^{-09}T^{-0.24}e^{-11./T}$		20-300	Cheikh Sid Ely (2012),Fukuzawa et al. (1998)
R_n378	2	CN	+	C_4H_4	→	C_5H_3N	+	H	$1.07\times10^{-07}T^{-0.82}e^{-228./T}$		170-740	Yang et al. (1992b)
R_n379	2	CN	+	C_4H_6	→	C_5H_5N	+	H	$4.80\times10^{-10}e^{-9./T}$		23-298	Morales et al. (2011)
R_n380a	2	CN	+	C_4H_8	→	C_4H_5N	+	CH_3	1.58×10^{-10}		195-298	Gannon et al. (2007)
R_n380b	2	CN	+	C_4H_8	→	HCN	+	C_4H_7	1.58×10^{-10}		195-298	Gannon et al. (2007)
R_n381	2	CN	+	C_4H_{10}	→	HCN	+	C_4H_9	$3.61\times10^{-14}T^{1.16}e^{392./T}$		170-740	Yang et al. (1992c)
R_n382	2	CN	+	C_6H_2	→	HC_7N	+	H	$1.60\times10^{-09}T^{-0.24}e^{-11./T}$		-	est.(CN+C4H2)
R_n383	2	CN	+	C_6H_6	→	C_7H_5N	+	H	$2.70\times10^{-09}T^{-0.39}e^{-9./T}$		10-295	Faure09
R_n384	2	CN	+	NH_3	→	HCN	+	NH_2	$3.57\times10^{-09}T^{-0.85}$		10-300	Wakelam et al. (2015)
R_n385	4	CN	+	CN	→	C_2N_2			9.40×10^{-12}		500-2500	Tsang (1992),est.(AtomNumber)
									$9.44\times10^{-23}T^{-2.61}$	0.50		
									9.40×10^{-12}			
R_n386	2	CN	+	HCN	→	C_2N_2	+	H	$5.99\times10^{-22}T^{3.60}e^{-933./T}$		70-300	ThisWork
R_n387	2	CN	+	HNC	→	C_2N_2	+	H	3.00×10^{-11}		-	Petrie and Osamura (2004)
R_n388	2	CN	+	CH_2NH	→	H_2CN	+	HCN	$2.81\times10^{-19}T^{2.72}e^{718./T}$		-	est.(CN+H2CO)
R_n389	2	CN	+	CH_3NH_2	→	HCN	+	CH_2NH_2	$3.57\times10^{-09}T^{-0.85}$		-	est.(CN+NH3)
R_n390	2	CN	+	CH_3CN	→	C_2N_2	+	CH_3	$6.46\times10^{-11}e^{-1190./T}$		296-578	Zabarnick and Lin (1989)
R_n391	2	CN	+	HC_3N	→	C_4N_2	+	H	$8.18\times10^{-10}T^{-0.67}$		20-300	Cheikh Sid Ely et al. (2013)
R_n392	2	CN	+	C_3H_3N	→	$C_4H_2N_2$	+	H	$3.02\times10^{-11}e^{103./T}$		297-740	Butterfield et al. (1993)
R_n393	2	CN	+	C_3H_5N	→	C_2N_2	+	C_2H_5	$6.46\times10^{-11}e^{-1190./T}$		-	est.(CN+CH3CN)
R_n394	2	CN	+	HC_5N	→	C_6N_2	+	H	$8.18\times10^{-10}T^{-0.67}$		-	est.(CN+HC3N)
R_n395a	2	H_2CN	+	H	→	HCN	+	H_2	$2.77\times10^{-10}T^{-0.03}e^{-4./T}$		50-300	ThisWork
R_n395b	2	H_2CN	+	H	→	HNC	+	H_2	$6.07\times10^{-10}T^{-0.49}e^{-4./T}$		50-300	ThisWork
R_n396	2	H_2CN	+	CH_3	→	HCN	+	CH_4	$2.29\times10^{-08}T^{-1.06}e^{-60./T}$		-	est.(NH2+H2CN)

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	Type	Reaction	k	F_c	T range	Ref.
R_n397a	4	H_2CN + C_2H_3 → C_3H_4N + H	$1.20\times10^{-11}e^{400./T}$		300-700	est.(C2H3+C2H3)
			1.00×10^{-21}	0.40		
			1.20×10^{-11}			
R_n397b	2	H_2CN + C_2H_3 → HCN + C_2H_4	2.40×10^{-11}		298	est.(C2H3+C2H3)
R_n398a	4	H_2CN + C_2H_5 → C_3H_7N	6.50×10^{-11}		298	est.(C2H3+C2H5)
			1.00×10^{-21}	0.40		
			2.00×10^{-11}			
R_n398b	2	H_2CN + C_2H_5 → HCN + C_2H_6	1.50×10^{-11}		298	est.(C2H3+C2H5)
R_n398c	2	H_2CN + C_2H_5 → CH_2NH + C_2H_4	1.50×10^{-11}		298	est.(C2H3+C2H5)
R_n399	4	H_2CN + C_3 → C_4H_2N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n400	4	H_2CN + C_3H → C_4H_3N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n401	4	H_2CN + C_3H_2 → C_4H_4N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n402	4	H_2CN + C_3H_3 → C_4H_5N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n403a	4	H_2CN + C_3H_5 → C_4H_7N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n403b	2	H_2CN + C_3H_5 → CH_2NH + CH_2CCH_2	4.00×10^{-12}		300-2500	est.(C2H3+C3H5)
R_n403c	2	H_2CN + C_3H_5 → HCN + C_3H_6	8.00×10^{-12}		300-2500	est.(C2H3+C3H5)
R_n404a	4	H_2CN + C_3H_7 → C_4H_9N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-19}	0.40		
			8.00×10^{-11}			
R_n404b	2	H_2CN + C_3H_7 → HCN + C_3H_8	$2.53\times10^{-10}T^{-0.70}$		300-2500	est.(C2H3+C3H7)
R_n404c	2	H_2CN + C_3H_7 → CH_2NH + C_3H_6	$2.53\times10^{-10}T^{-0.70}$		300-2500	est.(C2H3+C3H7)
R_n405	4	H_2CN + C_4H_3 → C_5H_5N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n406	4	H_2CN + C_4H_5 → C_5H_7N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			

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	Type	Reaction	k	F_c	T range	Ref.
R_n407	4	H_2CN + C_4H_7 → C_5H_9N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n408	4	H_2CN + C_4H_9 → $C_5H_{11}N$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n409	4	H_2CN + C_6H_3 → C_7H_5N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n410	4	H_2CN + C_6H_5 → C_7H_7N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-13}	0.40		
			8.00×10^{-11}			
R_n411a	2	H_2CN + H_2CN → N_2 + C_2H_4	3.85×10^{-12}		296	Nizamov and Dagdigian (2003)
R_n411b	4	H_2CN + H_2CN → $C_2H_4N_2$	3.85×10^{-12}		296	Nizamov and Dagdigian (2003),est.(AtomNumb
			1.00×10^{-21}	0.40		
			3.85×10^{-12}			
R_n412	4	H_2CN + C_3H_2N → $C_4H_4N_2$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n413	4	H_2CN + C_3H_4N → $C_4H_6N_2$	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-17}	0.40		
			8.00×10^{-11}			
R_n414	2	C_2N + H → HCN + C	$1.06\times10^{-10}T^{0.17}$		10-300	?
R_n415	2	C_2N + C → CN + C_2	1.00×10^{-10}		10-300	Woodall et al. (2007)
R_n416	2	C_2N + C_2H_2 → HC_4N + H	6.59×10^{-11}		300	citeZhu08
R_n417	2	C_2N + C_2H_4 → CH_3C_3N + H	$8.13\times10^{-04}T^{-2.55}e^{-378./T}$		300-673	citeZhu08
R_n418	2	C_2N + C_3H_8 → HC_2N + C_3H_7	$5.79\times10^{-07}T^{-1.80}e^{-32./T}$		10-298	Zhu et al. (2003),Faure(PersComm)
R_n419	2	C_2N + C_4H_{10} → HC_2N + C_4H_9	$1.08\times10^{-07}T^{-1.37}e^{-25./T}$		10-298	Zhu et al. (2003),Faure(PersComm)
R_n420	2	HC_2N + H → C_2N + H_2	3.00×10^{-11}		200	Osamura and Petrie (2004)
R_n421	2	HC_2N + CH_3 → C_3H_3N + H	3.00×10^{-11}		200	Osamura and Petrie (2004)
R_n422	2	HC_2N + HC_2N → HC_4N_2 + H	3.00×10^{-11}		-	est.(HC2N+CH3)
R_n423	4	CH_2CN + H → CH_3CN	2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-12}			
R_n424	4	CH_2CN + CH_3 → C_3H_5N	8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-21}	0.40		

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	Type	Reaction				k	F_c	T range	Ref.
R_n425	4	CH_2CN +	C_2H_3	→	C_4H_5N	2.00×10^{-11} 8.00×10^{-11} 1.00×10^{-19}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n426	4	CH_2CN +	C_2H_5	→	C_4H_7N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-19}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n427	4	CH_2CN +	C_3H_3	→	C_5H_5N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n428	4	CH_2CN +	C_3H_5	→	C_5H_7N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n429	4	CH_2CN +	C_3H_7	→	C_5H_9N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n430	4	CH_2CN +	C_4H_3	→	C_6H_5N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-15}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n431	4	CH_2CN +	C_4H_5	→	C_6H_7N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-15}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n432	4	CH_2CN +	C_6H_3	→	C_8H_5N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n433	4	CH_2CN +	C_6H_5	→	C_8H_7N	8.00×10^{-11} 8.00×10^{-11} 1.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n434	4	CH_2CN +	CH_2CN	→	$C_4H_4N_2$	8.00×10^{-11} 5.00×10^{-11} 1.00×10^{-17}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n435	4	CH_2CN +	C_3H_2N	→	$C_5H_4N_2$	5.00×10^{-11} 8.00×10^{-11} 6.00×10^{-16}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n436	4	CH_2CN +	C_3H_4N	→	$C_5H_6N_2$	8.00×10^{-11} 8.00×10^{-11} 6.00×10^{-16} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction							k	F_c	T range	Ref.
R_n437	2	C_3N	+	H_2	→	HC_3N	+	H	$2.39\times10^{-18}T^{2.35}e^{-95./T}$		24-300	Fournier (2014)
R_n438	2	C_3N	+	CH_4	→	HC_3N	+	CH_3	$8.17\times10^{-10}T^{-0.57}e^{-3./T}$		24-300	Fournier (2014)
R_n439	2	C_3N	+	C_2H_2	→	HC_5N	+	H	$8.31\times10^{-09}T^{-0.58}e^{-33./T}$		24-300	Fournier (2014)
R_n440	2	C_3N	+	C_2H_4	→	HC_3N	+	C_2H_3	$3.76\times10^{-09}T^{-0.42}e^{-22./T}$		24-300	Fournier (2014)
R_n441	2	C_3N	+	C_2H_6	→	HC_3N	+	C_2H_5	$1.25\times10^{-08}T^{-0.69}e^{-30./T}$		24-300	Fournier (2014)
R_n442	2	C_3N	+	CH_3CCH	→	C_6H_3N	+	H	$4.70\times10^{-09}T^{-0.41}e^{-32./T}$		24-300	Fournier (2014)
R_n443	2	C_3N	+	CH_2CCH_2	→	C_6H_3N	+	H	$1.39\times10^{-08}T^{-0.57}e^{-50./T}$		24-300	Fournier (2014)
R_n444	2	C_3N	+	C_3H_6	→	C_6H_5N	+	H	$1.84\times10^{-08}T^{-0.64}e^{-51./T}$		24-300	Fournier (2014)
R_n445	2	C_3N	+	C_3H_8	→	HC_3N	+	C_3H_7	$8.29\times10^{-09}T^{-0.55}e^{-34./T}$		24-300	Fournier (2014)
R_n446	2	C_3N	+	C_4H_2	→	HC_7N	+	H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		20-400	ThisWork
R_n447	2	C_3N	+	C_4H_4	→	C_7H_3N	+	H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n448	2	C_3N	+	C_4H_6	→	C_7H_5N	+	H	$6.65\times10^{-07}T^{-1.25}e^{-116./T}$		-	est.(C4H+C4H6)
R_n449	2	C_3N	+	C_4H_8	→	C_7H_7N	+	H	$2.04\times10^{-08}T^{-0.61}e^{-65./T}$		-	est.(C4H+C4H8)
R_n450	2	C_3N	+	C_4H_{10}	→	HC_3N	+	C_4H_9	$4.82\times10^{-07}T^{-1.30}e^{-90./T}$		-	est.(C4H+C4H10)
R_n451	2	C_3N	+	C_6H_2	→	HC_9N	+	H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n452	2	C_3N	+	NH_3	→	HC_3N	+	NH_2	$1.43\times10^{-08}T^{-0.67}e^{-28./T}$		24-300	Fournier (2014)
R_n453	2	C_3N	+	HCN	→	C_4N_2	+	H	3.00×10^{-11}		200	Petrie and Osamura (2004)
R_n454	2	C_3N	+	HNC	→	C_4N_2	+	H	3.00×10^{-11}		-	Petrie and Osamura (2004)
R_n455	2	C_3N	+	HC_3N	→	C_6N_2	+	H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n456	4	C_3H_2N	+	H	→	C_3H_3N			2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-23}	0.00		
									2.00×10^{-12}			
R_n457	4	C_3H_2N	+	CH_3	→	C_4H_5N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-19}	0.40		
									8.00×10^{-11}			
R_n458	4	C_3H_2N	+	C_2H_3	→	C_5H_5N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									8.00×10^{-11}			
R_n459	4	C_3H_2N	+	C_2H_5	→	C_5H_7N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-17}	0.40		
									8.00×10^{-11}			
R_n460	4	C_3H_2N	+	C_3H_3	→	C_6H_5N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		
									8.00×10^{-11}			
R_n461	4	C_3H_2N	+	C_3H_5	→	C_6H_7N			8.00×10^{-11}		-	est.(Rad+Rad),est.(AtomNumber)
									1.00×10^{-15}	0.40		

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	Type	Reaction					k	F$_c$	T range	Ref.
							8.00×10^{-11}			
R$_n$462	4	C_3H_2N	+	C_3H_7	→	C_6H_9N	8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$463	4	C_3H_2N	+	C_4H_3	→	C_7H_5N	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$464	4	C_3H_2N	+	C_4H_5	→	C_7H_7N	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$465	4	C_3H_2N	+	C_4H_7	→	C_7H_9N	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$466	4	C_3H_2N	+	C_4H_9	→	$C_7H_{11}N$	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$467	4	C_3H_2N	+	C_6H_3	→	C_9H_5N	8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$468	4	C_3H_2N	+	C_6H_5	→	C_9H_7N	8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$469	4	C_3H_2N	+	C_3H_2N	→	$C_6H_4N_2$	5.00×10^{-11} 1.00×10^{-13} 5.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$470	4	C_3H_2N	+	C_3H_4N	→	$C_6H_6N_2$	8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$471	4	C_3H_4N	+	H	→	C_3H_5N	2.00×10^{-10} 1.00×10^{-23} 2.00×10^{-12}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$472	4	C_3H_4N	+	CH_3	→	C_4H_7N	8.00×10^{-11} 1.00×10^{-19} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R$_n$473	4	C_3H_4N	+	C_2H_3	→	C_5H_7N	8.00×10^{-11} 1.00×10^{-17} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)

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	Type	Reaction							k	F_c	T range	Ref.
R_n474	4	C_3H_4N	+	C_2H_5	→	C_5H_9N			8.00×10^{-11} 1.00×10^{-17} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n475	4	C_3H_4N	+	C_3H_3	→	C_6H_7N			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n476	4	C_3H_4N	+	C_3H_5	→	C_6H_9N			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n477	4	C_3H_4N	+	C_3H_7	→	$C_6H_{11}N$			8.00×10^{-11} 1.00×10^{-15} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n478	4	C_3H_4N	+	C_4H_3	→	C_7H_7N			8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n479	4	C_3H_4N	+	C_4H_5	→	C_7H_9N			8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n480	4	C_3H_4N	+	C_4H_7	→	$C_7H_{11}N$			8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n481	4	C_3H_4N	+	C_4H_9	→	$C_7H_{13}N$			8.00×10^{-11} 1.00×10^{-13} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n482	4	C_3H_4N	+	C_6H_3	→	C_9H_7N			8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n483	4	C_3H_4N	+	C_6H_5	→	C_9H_9N			8.00×10^{-11} 1.00×10^{-11} 8.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n484	4	C_3H_4N	+	C_3H_4N	→	$C_6H_8N_2$			5.00×10^{-11} 1.00×10^{-13} 5.00×10^{-11}	0.40	-	est.(Rad+Rad),est.(AtomNumber)
R_n485	2	C_5N	+	H_2	→	HC_5N	+	H	$3.50\times10^{-18}T^{2.32}e^{-444./T}$		-	est.(C2H+H2)
R_n486	2	C_5N	+	CH_4	→	HC_5N	+	CH_3	$1.63\times10^{-11}e^{-610./T}$		-	est.(C4H+CH4)
R_n487	2	C_5N	+	C_2H_2	→	HC_7N	+	H	5.00×10^{-10}		20-400	ThisWork

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	Type	Reaction	k	F_c	T range	Ref.
R_n488	2	C_5N + C_2H_4 → HC_5N + C_2H_3	$1.90\times10^{-09}T^{-0.40}e^{9./T}$		-	est.(C4H+C2H4)
R_n489	2	C_5N + C_2H_6 → HC_5N + C_2H_5	$3.19\times10^{-08}T^{-1.23}e^{-24./T}$		-	est.(C4H+C2H6)
R_n490	2	C_5N + CH_3CCH → C_8H_3N + H	$3.42\times10^{-08}T^{-0.82}e^{-47./T}$		-	est.(C4H+CH3CCH)
R_n491	2	C_5N + CH_2CCH_2 → C_8H_3N + H	$3.07\times10^{-07}T^{-1.18}e^{-91./T}$		-	est.(C4H+CH2CCH2)
R_n492	2	C_5N + C_3H_6 → C_8H_5N + H	$3.89\times10^{-08}T^{-0.84}e^{-48./T}$		-	est.(C4H+C3H6)
R_n493	2	C_5N + C_3H_8 → HC_5N + C_3H_7	$2.46\times10^{-07}T^{-1.36}e^{-56./T}$		-	est.(C4H+C3H8)
R_n494	2	C_5N + C_4H_2 → HC_9N + H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		20-400	ThisWork
R_n495	2	C_5N + C_4H_4 → C_9H_3N + H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n496	2	C_5N + C_4H_6 → C_9H_5N + H	$6.65\times10^{-07}T^{-1.25}e^{-116./T}$		-	est.(C4H+C4H6)
R_n497	2	C_5N + C_4H_8 → C_9H_7N + H	$2.04\times10^{-08}T^{-0.61}e^{-65./T}$		-	est.(C4H+C4H8)
R_n498	2	C_5N + C_4H_{10} → HC_5N + C_4H_9	$4.82\times10^{-07}T^{-1.30}e^{-90./T}$		-	est.(C4H+C4H10)
R_n499	2	C_5N + C_6H_2 → $HC_{11}N$ + H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n500	2	C_5N + HCN → C_6N_2 + H	3.00×10^{-11}		200	Petrie and Osamura (2004)
R_n501	2	C_5N + HNC → C_6N_2 + H	3.00×10^{-11}		-	Petrie and Osamura (2004)
R_n502	2	C_5N + HC_3N → C_8N_2 + H	$9.90\times10^{-10}T^{-0.06}e^{-9./T}$		-	est.(C3N+C4H2)
R_n503a	4	HC_2N_2 + H → HCN + HCN	2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-11}			
R_n503b	2	HC_2N_2 + H → C_2N_2 + H_2	1.00×10^{-10}		-	est.(Rad+Rad)
R_n504a	4	HC_4N_2 + H → HC_3N + HCN	2.00×10^{-10}		-	est.(Rad+Rad),est.(AtomNumber)
			1.00×10^{-23}	0.40		
			2.00×10^{-11}			
R_n504b	2	HC_4N_2 + H → C_4N_2 + H_2	1.00×10^{-10}		-	est.(Rad+Rad)
R_n505	4	$O(^3P)$ + H → OH	1.00×10^{-10}		100-500	Tsang and Hampson (1986),**?**
			$1.30\times10^{-29}T^{-1.00}$	0.40		
			$5.17\times10^{-20}T^{0.26}e^{-4./T}$			
R_n506a	2	$O(^3P)$ + $^3CH_2$ → CO + H + H	1.00×10^{-10}		10-300	Wakelam et al. (2015)
R_n506b	2	$O(^3P)$ + $^3CH_2$ → CO + H_2	4.00×10^{-11}		10-300	Wakelam et al. (2015)
R_n506c	2	$O(^3P)$ + $^3CH_2$ → HCO + H	2.00×10^{-12}		10-300	Wakelam et al. (2015)
R_n507a	2	$O(^3P)$ + CH_3 → H_2CO + H	1.10×10^{-10}		294-2500	Baulch et al. (2005)
R_n507b	2	$O(^3P)$ + CH_3 → CO + H_2 + H	2.80×10^{-11}		298	Baulch et al. (2005)
R_n508	2	$O(^3P)$ + C_2H → CO + CH	1.00×10^{-10}		10-298	Wakelam et al. (2015)
R_n509a	2	$O(^3P)$ + C_2H_2 → CO + $^3CH_2$	$3.90\times10^{-16}T^{1.40}e^{-1110./T}$		250-2500	Baulch et al. (2005)
R_n509b	2	$O(^3P)$ + C_2H_2 → HCCO + H	$1.56\times10^{-15}T^{1.40}e^{-1110./T}$		250-2500	Baulch et al. (2005)
R_n510a	2	$O(^3P)$ + C_2H_4 → HCO + CH_3	$1.35\times10^{-17}T^{1.88}e^{-92./T}$		220-2000	Baulch et al. (2005)
R_n510b	2	$O(^3P)$ + C_2H_4 → CH_2CHO + H	$7.88\times10^{-18}T^{1.88}e^{-92./T}$		220-2000	Baulch et al. (2005)

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	Type	Reaction	k	F_c	T range	Ref.
R_n510c	2	$O(^3P) + C_2H_4 \rightarrow CH_2CO + H_2$	$1.13\times10^{-18}T^{1.88}e^{-92./T}$		220-2000	Baulch et al. (2005)
R_n511a	2	$O(^3P) + HCO \rightarrow CO_2 + H$	5.00×10^{-11}		300-2500	Baulch et al. (2005)
R_n511b	2	$O(^3P) + HCO \rightarrow CO + OH$	5.00×10^{-11}		300-2500	Baulch et al. (2005)
R_n512a	2	$O(^3P) + HCCO \rightarrow CO + CO + H$	1.60×10^{-10}		280-2500	Baulch et al. (2005)
R_n512b	2	$O(^3P) + HCCO \rightarrow CO_2 + CH$	$4.90\times10^{-11}e^{-560./T}$		280-1000	Baulch et al. (2005)
R_n513a	2	$O(^3P) + CH_2CO \rightarrow CO_2 + {}^3CH_2$	$1.80\times10^{-12}e^{-680./T}$		296-1000	Baulch et al. (2005)
R_n513b	2	$O(^3P) + CH_2CO \rightarrow HCHO + CO$	$6.00\times10^{-13}e^{-680./T}$		296-1000	Baulch et al. (2005)
R_n513c	2	$O(^3P) + CH_2CO \rightarrow HCO + CO + H$	$6.00\times10^{-13}e^{-680./T}$		296-1000	Baulch et al. (2005)
R_n514a	2	$O(^3P) + CH_3CO \rightarrow CO_2 + CH_3$	2.60×10^{-10}		298	Baulch et al. (2005)
R_n514b	2	$O(^3P) + CH_3CO \rightarrow CH_2CO + OH$	8.80×10^{-11}		298	Baulch et al. (2005)
R_n515	1	$O(^1D) \rightarrow O(^3P) + h\nu$	6.70×10^{-03}		-	Okabe (1978)
R_n516	2	$O(^1D) + N_2 \rightarrow O(^3P) + N_2$	$2.15\times10^{-11}e^{110./T}$		200-300	Sander et al. (2006)
R_n517	2	$O(^1D) + H_2 \rightarrow OH + H$	1.20×10^{-10}		200-300	Sander et al. (2011)
R_n518a	2	$O(^1D) + CH_4 \rightarrow OH + CH_3$	1.31×10^{-10}		200-300	Sander et al. (2011)
R_n518b	2	$O(^1D) + CH_4 \rightarrow CH_2OH + H$	3.50×10^{-11}		200-300	Sander et al. (2011)
R_n518c	2	$O(^1D) + CH_4 \rightarrow H_2CO + H_2$	9.00×10^{-12}		200-300	Sander et al. (2011)
R_n519	2	$O(^1D) + C_2H_4 \rightarrow CH_2CO + H_2$	2.20×10^{-10}		298	Kajimoto and Fueno (1979)
R_n520	2	$O(^1D) + H_2O \rightarrow OH + OH$	$1.63\times10^{-10}e^{60./T}$		200-300	Sander et al. (2011)
R_n521a	2	$O(^1D) + CO \rightarrow O(^3P) + CO$	$4.70\times10^{-11}e^{63./T}$		113-333	Davidson et al. (1978)
R_n521b	4	$O(^1D) + CO \rightarrow CO_2$	8.00×10^{-11}		100-2100	Tully (1975)
			1.00×10^{-30}	0.40		
			2.00×10^{-12}			
R_n522	1	$O_1S \rightarrow O(^1D) + h\nu$	$1.30\times10^{+00}$		-	Koyano et al. (1975)
R_n523	4	$OH + H \rightarrow H_2O$	1.00×10^{-10}		300-3000	Baulch et al. (2005),est.(AtomNumber)
			$6.10\times10^{-26}T^{-2.00}$	0.40		
			6.00×10^{-16}			
R_n524	2	$OH + H_2 \rightarrow H_2O + H$	$2.80\times10^{-12}e^{-1800./T}$		200-300	Sander et al. (2011)
R_n525	2	$OH + {}^3CH_2 \rightarrow H_2CO + H$	$4.74\times10^{-11}T^{0.12}e^{81./T}$		300-2500	Jasper et al. (2007)
R_n526a	2	$OH + CH_3 \rightarrow H_2O + {}^1CH_2$	$9.40\times10^{-08}T^{-1.19}e^{-435./T}$		20-300	ThisWork
R_n526b	2	$OH + CH_3 \rightarrow H_2CO + H_2$	$2.94\times10^{-09}T^{-1.58}e^{-60./T}$		20-300	ThisWork
R_n526c	2	$OH + CH_3 \rightarrow CHOH + H_2$	$2.33\times10^{-08}T^{-1.54}e^{-60./T}$		20-300	ThisWork
R_n526d	2	$OH + CH_3 \rightarrow CHOH + H_2$	$3.49\times10^{-07}T^{-1.70}e^{-72./T}$		20-300	ThisWork
R_n527	2	$OH + CH_4 \rightarrow H_2O + CH_3$	$2.45\times10^{-12}e^{-1775./T}$		200-300	Sander et al. (2011)
R_n528a	2	$OH + C_2H \rightarrow CO + {}^3CH_2$	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n528b	2	$OH + C_2H \rightarrow O(^3P) + C_2H_2$	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n529	6	$OH + C_2H_2 \rightarrow CH_3CO$	Tabulated		228-1400	Sander et al. (2011)

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	Type	Reaction	k	F_c	T range	Ref.
R_n530	6	$OH + C_2H_4 \rightarrow HOCH_2CH_2$	Tabulated		200-300	Sander et al. (2011)
R_n531	2	$OH + C_2H_6 \rightarrow H_2O + C_2H_5$	$7.66\times10^{-12}e^{-1020./T}$		200-300	Sander et al. (2011)
R_n532a	5	$OH + CO \rightarrow CO_2 + H$	$1.63\times10^{-06}T^{6.10}$		200-300	Sander et al. (2011)
R_n532b	6	$OH + CO \rightarrow HOCO$	Tabulated		200-300	Sander et al. (2011)
R_n533	2	$OH + H_2CO \rightarrow HCO + H_2O$	$5.50\times10^{-12}e^{125./T}$		200-300	Sander et al. (2011)
R_n534a	2	$OH + CH_2CO \rightarrow CH_2OH + CO$	$1.68\times10^{-12}e^{510./T}$		296-1000	Baulch et al. (2005)
R_n534b	2	$OH + CH_2CO \rightarrow CO_2 + CH_3$	$1.04\times10^{-12}e^{510./T}$		296-1000	Baulch et al. (2005)
R_n534c	2	$OH + CH_2CO \rightarrow HCHO + HCO$	$5.60\times10^{-14}e^{510./T}$		296-1000	Baulch et al. (2005)
R_n534d	2	$OH + CH_2CO \rightarrow HCCO + H_2O$	$2.80\times10^{-14}e^{510./T}$		296-1000	Baulch et al. (2005)
R_n535	2	$H_2O + CH \rightarrow H_2CO + H$	$7.72\times10^{-08}T^{-1.31}e^{-40./T}$		50-296	Hickson et al. (2013),Bergeat et al. (2009)
R_n536a	2	$H_2O + {}^1CH_2 \rightarrow OH + CH_3$	$9.46\times10^{-08}T^{-1.19}e^{-67./T}$		20-300	ThisWork
R_n536b	2	$H_2O + {}^1CH_2 \rightarrow H_2CO + H_2$	$2.60\times10^{-08}T^{-1.91}e^{-58./T}$		20-300	ThisWork
R_n536c	2	$H_2O + {}^1CH_2 \rightarrow CHOH + H_2$	$2.21\times10^{-07}T^{-1.87}e^{-57./T}$		20-300	ThisWork
R_n536d	2	$H_2O + {}^1CH_2 \rightarrow CHOH + H_2$	$3.47\times10^{-06}T^{-2.06}e^{-69./T}$		20-300	ThisWork
R_n537	2	$H_2O + C_2H \rightarrow OH + C_2H_2$	$1.90\times10^{-11}e^{-200./T}$		295-451	Baulch et al. (2005)
R_n538	4	$CO + H \rightarrow HCO$	2.00×10^{-10}		300-800	Baulch et al. (2005),ThisWork
			$2.00\times10^{-35}T^{0.20}$	0.40		
			3.00×10^{-21}			
R_n539	4	$CO + CH \rightarrow HCCO$	$1.70\times10^{-09}T^{-0.40}$		200-1000	Baulch et al. (2005),ThisWork
			$6.30\times10^{-24}T^{-2.50}$	0.60		
			3.75×10^{-17}			
R_n540	4	$CO + CH_3 \rightarrow CH_3CO$	$3.10\times10^{-16}T^{1.05}e^{-1300./T}$		300-350	Baulch et al. (2005),ThisWork
			5.90×10^{-36}	0.60		
			1.10×10^{-28}			
R_n541	2	$HCO + H \rightarrow CO + H_2$	1.50×10^{-10}		298-2500	Baulch et al. (2005)
R_n542	2	$HCO + {}^3CH_2 \rightarrow CO + CH_3$	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n543	2	$HCO + CH_3 \rightarrow CO + CH_4$	2.00×10^{-10}		300-2500	Tsang and Hampson (1986)
R_n544	2	$HCO + C_2H \rightarrow CO + C_2H_2$	1.00×10^{-10}		300-2500	Tsang and Hampson (1986)
R_n545a	2	$H_2CO + CH \rightarrow CH_2CO + H$	$6.21\times10^{-10}T^{-0.32}e^{386./T}$		300-3000	Nguyen et al. (2014)
R_n545b	2	$H_2CO + CH \rightarrow CO + CH_3$	$1.23\times10^{-10}T^{-0.32}e^{386./T}$		300-3000	Nguyen et al. (2014)
R_n546	2	$H_2CO + C_2H \rightarrow CO + C_2H_2 + H$	1.00×10^{-10}		-	Dong et al. (2005)
R_n547	2	$CHOH + H \rightarrow H_2CO + H$	1.00×10^{-10}		20-300	ThisWork
R_n548	2	$CHOH + CH_3 \rightarrow CH_3CHO + H$	1.00×10^{-10}		20-300	ThisWork
R_n549a	2	$CH_2OH + H \rightarrow H_2CO + H_2$	2.03×10^{-11}		298	Baulch et al. (2005)
R_n549b	2	$CH_2OH + H \rightarrow CHOH + H_2$	2.03×10^{-11}		298	Baulch et al. (2005)
R_n549c	2	$CH_2OH + H \rightarrow OH + CH_3$	1.74×10^{-11}		298	Baulch et al. (2005)

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	Type	Reaction	k	F_c	T range	Ref.
R_n550a	2	CH_2OH + $^3CH_2$ → OH + C_2H_4	4.00×10^{-11}		300-2500	Tsang (1987)
R_n550b	2	CH_2OH + $^3CH_2$ → H_2CO + CH_3	2.00×10^{-12}		300-2500	Tsang (1987)
R_n551	2	CH_2OH + CH_3 → H_2CO + CH_4	4.00×10^{-12}		300-2500	Tsang (1987)
R_n552a	2	CH_2OH + C_2H → H_2CO + C_2H_2	6.00×10^{-11}		300-2500	Tsang (1987)
R_n552b	2	CH_2OH + C_2H → OH + C_3H_3	2.00×10^{-11}		300-2500	Tsang (1987)
R_n553a	2	$HCCO$ + H → CO + $^1CH_2$	2.02×10^{-10}		280-2000	Baulch et al. (2005)
R_n553b	2	$HCCO$ + H → CO + $^3CH_2$	1.76×10^{-11}		280-2000	Baulch et al. (2005)
R_n554	2	$HCCO$ + CH_3 → CO + C_2H_4	1.00×10^{-10}		-	Dobrijevic et al. (2014)
R_n555	2	CH_2CO + H → CO + CH_3	$5.40\times10^{-14}T^{0.85}e^{-1430./T}$		298-2000	Baulch et al. (2005)
R_n556a	2	CH_3CO + H → CH_2CO + H_2	1.90×10^{-11}		298	Bartels et al. (1991),Ohmori et al. (1990)
R_n556b	2	CH_3CO + H → HCO + CH_3	3.60×10^{-11}		298	Bartels et al. (1991),Ohmori et al. (1990)
R_n557	2	CH_3CO + $^3CH_2$ → CH_2CO + CH_3	3.00×10^{-11}		300-2500	Tsang and Hampson (1986)
R_n558a	2	CH_3CO + CH_3 → CO + C_2H_6	5.43×10^{-11}		298	Adachi et al. (1981)
R_n558b	2	CH_3CO + CH_3 → CH_2CO + CH_4	1.01×10^{-11}		298	Hassinen et al. (1990)
R_n558c	4	CH_3CO + CH_3 → CH_3COCH_3	6.97×10^{-11}		298	Hassinen et al. (1990)
			1.00×10^{-30}	0.40		
			2.00×10^{-11}			
R_n559	2	CH_3CO + C_2H → CH_2CO + C_2H_2	3.00×10^{-11}		300-1500	Tsang and Hampson (1986)
R_n560	2	$HOCH_2CH_2$ + H → CH_3CHO + H_2	8.31×10^{-11}		295	Bartels et al. (1982)
R_n561a	2	CO_2 + CH → HCO + CO	$5.30\times10^{-17}T^{1.51}e^{360./T}$		296-3500	Baulch et al. (2005)
R_n561b	2	CO_2 + CH → CO + CO + H	$5.30\times10^{-17}T^{1.51}e^{360./T}$		296-3500	Baulch et al. (2005)
R_n562	4	H + NO → HNO	1.00×10^{-10}		230-750	Baulch et al. (2005),est.(AtomNumber)
			$4.23\times10^{-30}T^{-0.77}$	0.40		
			1.00×10^{-13}			
R_n563	2	H + HNO → NO + H_2	$3.01\times10^{-11}e^{-500./T}$		298-2000	Tsang and Herron (1991)
R_n564	2	H + NCO → CO + NH	$1.53\times10^{-05}T^{-1.86}e^{-399./T}$		200-2500	Klippenstein et al. (2009)
R_n565	2	C + NCO → CO + CN	1.00×10^{-10}		10-300	Wakelam et al. (2015)
R_n566a	2	CH + NO → $O(^3P)$ + HCN	$2.40\times10^{-10}T^{-0.13}$		13-708	Bocherel et al. (1996),Baulch et al. (2005)
R_n566b	2	CH + NO → NCO + H	$5.57\times10^{-11}T^{-0.13}$		13-708	Bocherel et al. (1996),Baulch et al. (2005)
R_n566c	2	CH + NO → CO + NH	$2.79\times10^{-11}T^{-0.13}$		13-708	Bocherel et al. (1996),Baulch et al. (2005)
R_n566d	2	CH + NO → HCO + N	$2.09\times10^{-11}T^{-0.13}$		13-708	Bocherel et al. (1996),Baulch et al. (2005)
R_n566e	2	CH + NO → OH + CN	$3.48\times10^{-12}T^{-0.13}$		13-708	Bocherel et al. (1996),Baulch et al. (2005)
R_n567a	2	CH + HNO → NO + $^3CH_2$	3.80×10^{-11}		-	Dobrijevic et al. (2014)
R_n567b	2	CH + HNO → $HNCO$ + H	1.00×10^{-10}		-	Dobrijevic et al. (2014)
R_n568a	2	$^3CH_2$ + NO → $HNCO$ + H	$5.04\times10^{-12}e^{500./T}$		290-1000	Baulch et al. (2005)
R_n568b	2	$^3CH_2$ + NO → OH + HCN	$5.60\times10^{-13}e^{500./T}$		290-1000	Baulch et al. (2005)

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	Type	Reaction							k	F_c	T range	Ref.
R_n569	2	CH_3	+	HNO	→	NO	+	CH_4	$2.44\times10^{-13}T^{0.76}e^{-175./T}$		298-2500	Choi and Lin (2005)
R_n570a	2	C_2H	+	NO	→	CO	+	HCN	$7.70\times10^{-11}e^{-287./T}$		295-450	Baulch et al. (2005),Feng and Hershberger (201
R_n570b	2	C_2H	+	NO	→	HCO	+	CN	$2.30\times10^{-11}e^{-287./T}$		295-450	Baulch et al. (2005),Feng and Hershberger (201
R_n571	4	N	+	$O(^3P)$	→	NO			1.00×10^{-10}		196-298	Campbell and Gray (1973),est.(AtomNumber)
									$5.46\times10^{-33}e^{155./T}$	0.40		
									1.00×10^{-13}			
R_n572	2	N	+	OH	→	NO	+	H	$5.00\times10^{-11}e^{-6./T}$		10-300	Wakelam et al. (2015)
R_n573	2	N	+	HCO	→	NCO	+	H	1.00×10^{-10}		10-280	Wakelam et al. (2012)
R_n574	2	N	+	HCCO	→	CO	+	HCN	1.00×10^{-10}		-	Dobrijevic et al. (2014)
R_n575	2	N	+	NO	→	$O(^3P)$	+	N_2	$1.25\times10^{-10}T^{-0.20}e^{-20./T}$		10-300	Wakelam et al. (2015)
R_n576	2	N	+	NCO	→	CO	+	N_2	$2.30\times10^{-10}T^{-0.25}$		298-1700	Baulch et al. (2005)
R_n577a	2	$N(^2D)$	+	$O(^3P)$	→	N	+	$O(^3P)$	$1.65\times10^{-12}e^{-260./T}$		300-400	Herron (1999)
R_n577b	2	$N(^2D)$	+	$O(^3P)$	→	N	+	$O(^1D)$	$1.65\times10^{-12}e^{-260./T}$		300-400	Herron (1999)
R_n578	2	$N(^2D)$	+	OH	→	NO	+	H	4.50×10^{-11}		-	Dobrijevic et al. (2014)
R_n579a	2	$N(^2D)$	+	H_2O	→	OH	+	NH	1.30×10^{-11}		298	Herron (1999)
R_n579b	2	$N(^2D)$	+	H_2O	→	HNO	+	H	1.30×10^{-11}		298	Herron (1999)
R_n579c	2	$N(^2D)$	+	H_2O	→	NO	+	H_2	1.30×10^{-11}		298	Herron (1999)
R_n580	2	$N(^2D)$	+	CO	→	N	+	CO	1.90×10^{-12}		298	Herron (1999)
R_n581	2	$N(^2D)$	+	H_2CO	→	HNCO	+	H	4.00×10^{-11}		-	Dobrijevic et al. (2014)
R_n582	2	$N(^2D)$	+	CHOH	→	OH	+	HCN	1.00×10^{-10}		20-300	ThisWork
R_n583	2	$N(^2D)$	+	CO_2	→	NO	+	CO	3.60×10^{-13}		298	Herron (1999)
R_n584a	2	$N(^2D)$	+	NO	→	$O(^3P)$	+	N_2	2.00×10^{-11}		298	Herron (1999)
R_n584b	2	$N(^2D)$	+	NO	→	$O(^1D)$	+	N_2	2.00×10^{-11}		298	Herron (1999)
R_n584c	2	$N(^2D)$	+	NO	→	O_1S	+	N_2	2.00×10^{-11}		298	Herron (1999)
R_n585	2	$N(^2D)$	+	HNO	→	NO	+	NH	5.00×10^{-11}		-	Dobrijevic et al. (2014)
R_n586	2	NH	+	$O(^3P)$	→	NO	+	H	6.60×10^{-11}		10-300	Wakelam et al. (2015)
R_n587a	2	NH	+	OH	→	NO	+	H_2	4.00×10^{-11}		300-2000	Baulch et al. (2005)
R_n587b	2	NH	+	OH	→	HNO	+	H	4.00×10^{-11}		300-2000	Baulch et al. (2005)
R_n588a	2	NH	+	NO	→	OH	+	N_2	$4.56\times10^{-11}T^{-0.30}e^{0./T}$		53-375	Mullen and Smith (2005),Baulch et al. (2005)
R_n588b	2	NH	+	NO	→	N_2O	+	H	$1.82\times10^{-10}T^{-0.30}e^{0./T}$		53-375	Mullen and Smith (2005),Baulch et al. (2005)
R_n589a	2	NH_2	+	$O(^3P)$	→	HNO	+	H	$1.11\times10^{-10}T^{-0.10}$		10-300	Wakelam et al. (2015)
R_n589b	2	NH_2	+	$O(^3P)$	→	OH	+	NH	$1.24\times10^{-11}T^{-0.10}$		10-300	Wakelam et al. (2015)
R_n590a	4	NH_2	+	OH	→	NH_2OH			$3.10\times10^{-11}T^{0.20}$		200-500	Baulch et al. (2005),est.(N+O3P)
									$5.46\times10^{-33}e^{155./T}$	0.40		
									1.00×10^{-13}			
R_n590b	2	NH_2	+	OH	→	$O(^3P)$	+	NH_3	$4.20\times10^{-20}T^{2.30}e^{140./T}$		300-2000	Baulch et al. (2005)

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	Type	Reaction	k	F_c	T range	Ref.
R_n591a	2	NH_2 + NO → H_2O + N_2	$8.55\times10^{-09}T^{-1.20}e^{106./T}$		600-2200	Baulch et al. (2005)
R_n591b	2	NH_2 + NO → OH + N_2 + H	$1.43\times10^{-09}T^{-1.20}e^{106./T}$		600-2200	Baulch et al. (2005)
R_n591c	2	NH_2 + NO → OH + N_2H	$1.43\times10^{-09}T^{-1.20}e^{106./T}$		600-2200	Baulch et al. (2005)
R_n592	2	NH_2 + HNO → NO + NH_3	$6.02\times10^{-17}T^{1.63}e^{630./T}$		300-5000	Mebel et al. (1996)
R_n593	2	NH_3 + $O(^1D)$ → OH + NH_2	2.50×10^{-10}		200-300	Sander et al. (2011)
R_n594	2	NH_3 + OH → H_2O + NH_2	$1.70\times10^{-12}e^{-710./T}$		200-300	Sander et al. (2011)
R_n595a	2	CN + $O(^3P)$ → CO + N	7.50×10^{-12}		10-300	Wakelam et al. (2015)
R_n595b	2	CN + $O(^3P)$ → CO + $N(^2D)$	4.25×10^{-11}		10-300	Wakelam et al. (2015)
R_n596a	2	CN + OH → NCO + H	6.70×10^{-11}		1250-3000	Baulch et al. (2005)
R_n596b	2	CN + OH → $O(^3P)$ + HCN	$1.00\times10^{-11}e^{-1000./T}$		1250-3000	Baulch et al. (2005)
R_n597	2	CN + HCO → CO + HCN	1.00×10^{-10}		500-2500	Tsang (1992)
R_n598	2	CN + H_2CO → HCO + HCN	$2.81\times10^{-19}T^{2.72}e^{718./T}$		297-673	Yu and Lin (1993)
R_n599	4	CN + NO → ONCN	$2.04\times10^{-10}T^{-0.30}$		99-450	Sims et al. (1993),est.(AtomNumber)
			$4.24\times10^{-25}T^{-2.10}$	0.40		
			2.00×10^{-11}			
R_n600	2	CN + HNO → NO + HCN	3.00×10^{-11}		500-2500	Tsang (1992)
R_n601	2	CN + NCO → CO + CN_2	3.01×10^{-11}		500-2500	Tsang (1992)
R_n602	2	HCN + OH →	$1.20\times10^{-13}e^{-400./T}$		200-300	Sander et al. (2011)
R_n603a	2	H_2CN + $O(^3P)$ → OH + HCN	4.00×10^{-11}		-	Dobrijevic et al. (2014)
R_n603b	2	H_2CN + $O(^3P)$ → OH + HNC	1.00×10^{-11}		-	Dobrijevic et al. (2014)
R_n603c	2	H_2CN + $O(^3P)$ → HNCO + H	5.00×10^{-11}		-	Dobrijevic et al. (2014)
R_n604	2	H_2CN + OH →	7.70×10^{-12}		296	Nizamov and Dagdigian (2003)
R_n605	2	C_2N + $O(^3P)$ → CO + CN	6.00×10^{-12}		298	Woodall et al. (2007)
R_n606	2	C_3N + $O(^3P)$ → CO + C_2N	1.00×10^{-10}		10-300	Wakelam et al. (2015)
R_n607a	2	HCCO + NO → HNCO + CO	$8.00\times10^{-11}e^{-350./T}$		300-2000	Baulch et al. (2005)
R_n607b	2	HCCO + NO → CO_2 + HCN	$2.00\times10^{-11}e^{-350./T}$		300-2000	Baulch et al. (2005)
R_n608a	2	NCO + NO → CO_2 + N_2	$1.20\times10^{-05}T^{-2.08}e^{-441./T}$		300-2700	Baulch et al. (2005)
R_n608b	2	NCO + NO → CO + N_2O	$3.30\times10^{-07}T^{-1.93}e^{-400./T}$		300-2700	Baulch et al. (2005)

Table B.16: Positive ion reaction list.

	Type	Reaction									k	Ref.
$R_{cn}1$	2	CH	+	$O(^3P)$	→	HCO^+	+	e			$4.20\times10^{-13}e^{850.0/T}$	Baulch et al. (2005)
$R_{cn}2a$	2	H^+	+	H_2	→	H_3^+	+	hv			1.30×10^{-16}	McEwan and Anicich (2007)
$R_{cn}2b$	3	H^+	+	H_2	→	H_3^+					1.00×10^{-10}	McEwan and Anicich (2007)
											3.00×10^{-25}	
$R_{cn}3a$	2	H^+	+	CH_4	→	CH_3^+	+	H_2			3.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}3b$	2	H^+	+	CH_4	→	CH_4^+	+	H			7.47×10^{-10}	McEwan and Anicich (2007)
$R_{cn}4$	2	H^+	+	C_2H_2	→	$C_2H_2^+$	+	H			5.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}5a$	2	H^+	+	C_2H_4	→	$C_2H_4^+$	+	H			9.80×10^{-10}	McEwan and Anicich (2007)
$R_{cn}5b$	2	H^+	+	C_2H_4	→	$C_2H_3^+$	+	H_2			2.94×10^{-09}	McEwan and Anicich (2007)
$R_{cn}5c$	2	H^+	+	C_2H_4	→	$C_2H_2^+$	+	H_2	+	H	9.80×10^{-10}	McEwan and Anicich (2007)
$R_{cn}6a$	2	H^+	+	C_2H_6	→	$C_2H_5^+$	+	H_2			2.35×10^{-10}	McEwan and Anicich (2007)
$R_{cn}6b$	2	H^+	+	C_2H_6	→	$C_2H_4^+$	+	H_2	+	H	1.41×10^{-09}	McEwan and Anicich (2007)
$R_{cn}6c$	2	H^+	+	C_2H_6	→	$C_2H_3^+$	+	H_2	+	H_2	2.82×10^{-09}	McEwan and Anicich (2007)
$R_{cn}6d$	2	H^+	+	C_2H_6	→	CH_3^+	+	CH_4			2.35×10^{-10}	McEwan and Anicich (2007)
$R_{cn}7a$	2	H^+	+	CH_3CCH	→	$C_3H_4^+$	+	H			$1.50\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}7b$	2	H^+	+	CH_3CCH	→	$c-C_3H_3^+$	+	H_2			$7.50\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}7c$	2	H^+	+	CH_3CCH	→	$l-C_3H_3^+$	+	H_2			$7.50\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}8a$	2	H^+	+	C_4H_2	→	$C_4H_2^+$	+	H			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}8b$	2	H^+	+	C_4H_2	→	C_4H^+	+	H_2			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}9a$	2	H^+	+	C_5H_4	→	$C_5H_4^+$	+	H			$2.36\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}9b$	2	H^+	+	C_5H_4	→	$C_5H_3^+$	+	H_2			$2.36\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}10a$	2	H^+	+	C_6H_2	→	$C_6H_2^+$	+	H			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}10b$	2	H^+	+	C_6H_2	→	C_6H^+	+	H_2			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}11a$	2	H^+	+	C_7H_4	→	$C_7H_4^+$	+	H			$2.92\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}11b$	2	H^+	+	C_7H_4	→	$C_7H_3^+$	+	H_2			$2.92\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}12a$	2	H^+	+	C_8H_2	→	$C_8H_2^+$	+	H			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}12b$	2	H^+	+	C_8H_2	→	C_8H^+	+	H_2			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}13$	2	H^+	+	NH_3	→	NH_3^+	+	H			4.94×10^{-09}	Anicich (1993)
$R_{cn}14$	2	H^+	+	HCN	→	HCN^+	+	H			1.10×10^{-08}	McEwan and Anicich (2007)
$R_{cn}15$	2	H^+	+	CH_2NH	→	$HCNH^+$	+	H_2			1.40×10^{-08}	Su-Chesnavich
$R_{cn}16a$	2	H^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	H			$2.60\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}16b$	2	H^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	H_2			$2.60\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}17a$	2	H^+	+	CH_3CN	→	$C_2H_3N^+$	+	H			8.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}17b$	2	H^+	+	CH_3CN	→	HC_2NH^+	+	H_2			6.00×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
$R_{cn}17c$	2	H^+	+	CH_3CN	→	CH_3^+	+	HCN			3.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}18$	2	H^+	+	HC_3N	→	HC_3N^+	+	H			2.45×10^{-08}	Su-Chesnavich
$R_{cn}19a$	2	H^+	+	C_3H_3N	→	HC_3NH^+	+	H_2			$7.50\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}19b$	2	H^+	+	C_3H_3N	→	$C_3H_3N^+$	+	H			$7.50\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}20$	2	H^+	+	C_4H_3N	→	CH_3^+	+	HC_3N			$1.85\times10^{-08}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}21$	2	H^+	+	HC_5N	→	HC_5N^+	+	H			$4.00\times10^{-08}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}22$	2	H^+	+	$O(^3P)$	→	O^+	+	H			3.75×10^{-10}	Anicich (1993)
$R_{cn}23$	2	H^+	+	H_2O	→	H_2O^+	+	H			6.90×10^{-09}	McEwan and Anicich (2007)
$R_{cn}24a$	2	H^+	+	H_2CO	→	CH_2O^+	+	H			7.86×10^{-09}	Su-Chesnavich
$R_{cn}24b$	2	H^+	+	H_2CO	→	HCO^+	+	H_2			7.86×10^{-09}	Su-Chesnavich
$R_{cn}25$	2	H^+	+	CO_2	→	HCO^+	+	$O(^3P)$			3.80×10^{-09}	Anicich (1993)
$R_{cn}26$	2	H_2^+	+	H	→	H^+	+	H_2			6.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}27$	2	H_2^+	+	H_2	→	H_3^+	+	H			2.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}28a$	2	H_2^+	+	CH_4	→	CH_5^+	+	H			1.14×10^{-10}	McEwan and Anicich (2007)
$R_{cn}28b$	2	H_2^+	+	CH_4	→	CH_4^+	+	H_2			1.41×10^{-09}	McEwan and Anicich (2007)
$R_{cn}28c$	2	H_2^+	+	CH_4	→	CH_3^+	+	H_2	+	H	2.28×10^{-09}	McEwan and Anicich (2007)
$R_{cn}29a$	2	H_2^+	+	C_2H_2	→	$C_2H_3^+$	+	H			4.77×10^{-10}	McEwan and Anicich (2007)
$R_{cn}29b$	2	H_2^+	+	C_2H_2	→	$C_2H_2^+$	+	H_2			4.82×10^{-09}	McEwan and Anicich (2007)
$R_{cn}30a$	2	H_2^+	+	C_2H_4	→	$C_2H_4^+$	+	H_2			2.20×10^{-09}	McEwan and Anicich (2007)
$R_{cn}30b$	2	H_2^+	+	C_2H_4	→	$C_2H_3^+$	+	H_2	+	H	1.81×10^{-09}	McEwan and Anicich (2007)
$R_{cn}30c$	2	H_2^+	+	C_2H_4	→	$C_2H_2^+$	+	H_2	+	H_2	8.82×10^{-10}	McEwan and Anicich (2007)
$R_{cn}31a$	2	H_2^+	+	C_2H_6	→	$C_2H_6^+$	+	H_2			2.94×10^{-10}	McEwan and Anicich (2007)
$R_{cn}31b$	2	H_2^+	+	C_2H_6	→	$C_2H_5^+$	+	H_2	+	H	1.37×10^{-09}	McEwan and Anicich (2007)
$R_{cn}31c$	2	H_2^+	+	C_2H_6	→	$C_2H_4^+$	+	H_2	+	H_2	2.35×10^{-09}	McEwan and Anicich (2007)
$R_{cn}31d$	2	H_2^+	+	C_2H_6	→	$C_2H_3^+$	+	H_2	+	H_3	6.86×10^{-10}	McEwan and Anicich (2007)
$R_{cn}31e$	2	H_2^+	+	C_2H_6	→	$C_2H_2^+$	+	H_2	+	H_4	1.96×10^{-10}	McEwan and Anicich (2007)
$R_{cn}32$	2	H_2^+	+	N	→	NH^+	+	H			1.90×10^{-09}	Wakelam et al. (2015)
$R_{cn}33$	2	H_2^+	+	NH_3	→	NH_3^+	+	H_2			5.70×10^{-09}	Anicich (1993)
$R_{cn}34$	2	H_2^+	+	HCN	→	HCN^+	+	H_2			1.38×10^{-08}	Su-Chesnavich
$R_{cn}35$	2	H_2^+	+	N_2	→	N_2H^+	+	H			2.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}36a$	2	H_2^+	+	H_2O	→	H_3O^+	+	H			3.43×10^{-09}	McEwan and Anicich (2007)
$R_{cn}36b$	2	H_2^+	+	H_2O	→	H_2O^+	+	H_2			3.87×10^{-09}	McEwan and Anicich (2007)
$R_{cn}37$	2	H_2^+	+	CO	→	HCO^+	+	H			2.90×10^{-09}	McEwan and Anicich (2007)
$R_{cn}38a$	2	H_2^+	+	H_2CO	→	CH_2O^+	+	H_2			5.65×10^{-09}	Su-Chesnavich
$R_{cn}38b$	2	H_2^+	+	H_2CO	→	HCO^+	+	H_2	+	H	5.65×10^{-09}	Su-Chesnavich
$R_{cn}39$	2	H_2^+	+	CO_2	→	$OCOH^+$	+	H			2.35×10^{-09}	Anicich (1993)

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	Type	Reaction									k	Ref.
$R_{cn}40$	3	H_3^+	+	H_2	→	H_5^+					1.00×10^{-10} 9.00×10^{-30}	McEwan and Anicich (2007)
$R_{cn}41$	2	H_3^+	+	CH_4	→	CH_5^+	+	H_2			2.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}42$	2	H_3^+	+	C_2H_2	→	$C_2H_3^+$	+	H_2			3.20×10^{-09}	McEwan and Anicich (2007)
$R_{cn}43a$	2	H_3^+	+	C_2H_4	→	$C_2H_3^+$	+	H_2	+	H_2	2.03×10^{-09}	McEwan and Anicich (2007)
$R_{cn}43b$	2	H_3^+	+	C_2H_4	→	$C_2H_5^+$	+	H_2			8.70×10^{-10}	McEwan and Anicich (2007)
$R_{cn}44$	2	H_3^+	+	C_2H_6	→	$C_2H_5^+$	+	H_2	+	H_2	2.90×10^{-09}	McEwan and Anicich (2007)
$R_{cn}45a$	2	H_3^+	+	CH_3CCH	→	$C_3H_5^+$	+	H_2			2.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}45b$	2	H_3^+	+	CH_3CCH	→	$C_2H_3^+$	+	CH_4			9.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}46$	2	H_3^+	+	CH_2CCH_2	→	$c{-}C_3H_3^+$	+	H_2	+	H_2	2.90×10^{-09}	Milligan et al. (2002)
$R_{cn}47a$	2	H_3^+	+	C_3H_6	→	$C_2H_3^+$	+	CH_4	+	H_2	9.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}47b$	2	H_3^+	+	C_3H_6	→	$C_3H_5^+$	+	H_2	+	H_2	2.17×10^{-09}	McEwan and Anicich (2007)
$R_{cn}48$	2	H_3^+	+	C_3H_8	→	$C_3H_9^+$	+	H_2			3.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}49$	2	H_3^+	+	C_4H_2	→	$C_4H_3^+$	+	H_2			2.60×10^{-09}	McEwan and Anicich (2007)
$R_{cn}50$	2	H_3^+	+	C_5H_4	→	$C_5H_5^+$	+	H_2			$2.76\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}51$	2	H_3^+	+	C_6H_2	→	$C_6H_3^+$	+	H_2			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}52$	2	H_3^+	+	C_6H_6	→	$C_6H_7^+$	+	H_2			3.90×10^{-09}	Wakelam et al. (2015)
$R_{cn}53$	2	H_3^+	+	C_7H_4	→	$C_7H_5^+$	+	H_2			$3.40\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}54a$	2	H_3^+	+	C_7H_8	→	$C_7H_9^+$	+	H_2			2.93×10^{-09}	Milligan et al. (2002)
$R_{cn}54b$	2	H_3^+	+	C_7H_8	→	$C_7H_7^+$	+	H_2	+	H_2	7.80×10^{-10}	Milligan et al. (2002)
$R_{cn}54c$	2	H_3^+	+	C_7H_8	→	$C_6H_5^+$	+	CH_4	+	H_2	1.95×10^{-10}	Milligan et al. (2002)
$R_{cn}55$	2	H_3^+	+	C_8H_2	→	$C_8H_3^+$	+	H_2			2.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}56$	2	H_3^+	+	NH_3	→	NH_4^+	+	H_2			4.40×10^{-09}	Anicich (1993)
$R_{cn}57$	2	H_3^+	+	HCN	→	$HCNH^+$	+	H_2			7.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}58a$	2	H_3^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	H_2			1.60×10^{-10}	Anicich (1993)
$R_{cn}58b$	2	H_3^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	H_2	+	H	7.00×10^{-11}	Anicich (1993)
$R_{cn}58c$	2	H_3^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	H_2	+	H_2	7.60×10^{-10}	Anicich (1993)
$R_{cn}58d$	2	H_3^+	+	CH_3NH_2	→	CH_3^+	+	NH_3	+	H_2	1.00×10^{-11}	Anicich (1993)
$R_{cn}59$	2	H_3^+	+	CH_3CN	→	$C_2H_3NH^+$	+	H_2			8.90×10^{-09}	McEwan and Anicich (2007)
$R_{cn}60$	2	H_3^+	+	HC_3N	→	HC_3NH^+	+	H_2			9.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}61a$	2	H_3^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	H_2			8.19×10^{-09}	Milligan et al. (2002)
$R_{cn}61b$	2	H_3^+	+	C_3H_3N	→	$HCNH^+$	+	C_2H_2	+	H_2	9.10×10^{-10}	Milligan et al. (2002)
$R_{cn}62$	2	H_3^+	+	C_3H_5N	→	$C_3H_5NH^+$	+	H_2			1.00×10^{-09}	Wincel et al. (1989)
$R_{cn}63$	2	H_3^+	+	C_4H_3N	→	$C_4H_3NH^+$	+	H_2			$1.08\times10^{-08}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}64$	2	H_3^+	+	HC_5N	→	HC_5NH^+	+	H_2			$2.30\times10^{-08}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}65$	2	H_3^+	+	N_2	→	N_2H^+	+	H_2			1.86×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction	k	Ref.
$R_{cn}66$	2	$H_3^+ + C_2N_2 \rightarrow C_2N_2H^+ + H_2$	2.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}67a$	2	$H_3^+ + O(^3P) \rightarrow OH^+ + H_2$	8.40×10^{-10}	Milligan and McEwan (2000)
$R_{cn}67b$	2	$H_3^+ + O(^3P) \rightarrow H_2O^+ + H$	3.60×10^{-10}	Milligan and McEwan (2000)
$R_{cn}68$	2	$H_3^+ + H_2O \rightarrow H_3O^+ + H_2$	5.30×10^{-09}	McEwan and Anicich (2007)
$R_{cn}69$	2	$H_3^+ + CO \rightarrow HCO^+ + H_2$	1.74×10^{-09}	McEwan and Anicich (2007)
$R_{cn}70$	2	$H_3^+ + H_2CO \rightarrow CH_2OH^+ + H_2$	6.24×10^{-09}	Anicich (1993)
$R_{cn}71$	2	$H_3^+ + CO_2 \rightarrow OCOH^+ + H_2$	2.50×10^{-09}	Anicich (1993)
$R_{cn}72$	2	$H_5^+ + CH_4 \rightarrow CH_5^+ + H_2 + H_2$	2.00×10^{-09}	Capone et al. (1976)
$R_{cn}73a$	2	$C^+ + H_2 \rightarrow CH^+ + H$	1.20×10^{-16}	McEwan and Anicich (2007)
$R_{cn}73b$	3	$C^+ + H_2 \rightarrow CH_2^+$	1.00×10^{-10} 2.10×10^{-29}	McEwan and Anicich (2007)
$R_{cn}74a$	2	$C^+ + CH_4 \rightarrow C_2H_2^+ + H_2$	3.64×10^{-10}	McEwan and Anicich (2007)
$R_{cn}74b$	2	$C^+ + CH_4 \rightarrow C_2H_3^+ + H$	9.36×10^{-10}	McEwan and Anicich (2007)
$R_{cn}75$	2	$C^+ + C_2H_2 \rightarrow C_3H^+ + H$	2.63×10^{-09}	McEwan and Anicich (2007)
$R_{cn}76a$	2	$C^+ + C_2H_4 \rightarrow C_2H_3^+ + CH$	1.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}76b$	2	$C^+ + C_2H_4 \rightarrow C_2H_4^+ + C$	2.25×10^{-10}	McEwan and Anicich (2007)
$R_{cn}76c$	2	$C^+ + C_2H_4 \rightarrow C_3H^+ + H_2 + H$	7.50×10^{-11}	McEwan and Anicich (2007)
$R_{cn}76d$	2	$C^+ + C_2H_4 \rightarrow C_3H_2^+ + H_2$	4.35×10^{-10}	McEwan and Anicich (2007)
$R_{cn}76e$	2	$C^+ + C_2H_4 \rightarrow c{-}C_3H_3^+ + H$	6.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}77a$	2	$C^+ + C_2H_6 \rightarrow C_2H_2^+ + CH_4$	8.25×10^{-11}	McEwan and Anicich (2007)
$R_{cn}77b$	2	$C^+ + C_2H_6 \rightarrow C_2H_3^+ + CH_3$	4.95×10^{-10}	McEwan and Anicich (2007)
$R_{cn}77c$	2	$C^+ + C_2H_6 \rightarrow C_2H_4^+ + {}^3CH_2$	1.16×10^{-10}	McEwan and Anicich (2007)
$R_{cn}77d$	2	$C^+ + C_2H_6 \rightarrow C_2H_5^+ + CH$	2.31×10^{-10}	McEwan and Anicich (2007)
$R_{cn}77e$	2	$C^+ + C_2H_6 \rightarrow C_3H_2^+ + H_2 + H_2$	8.25×10^{-12}	McEwan and Anicich (2007)
$R_{cn}77f$	2	$C^+ + C_2H_6 \rightarrow c{-}C_3H_3^+ + H_2 + H$	7.10×10^{-10}	McEwan and Anicich (2007)
$R_{cn}78a$	2	$C^+ + CH_3CCH \rightarrow C_4H_2^+ + H_2$	5.70×10^{-10}	McEwan and Anicich (2007)
$R_{cn}78b$	2	$C^+ + CH_3CCH \rightarrow C_3H_4^+ + C$	5.70×10^{-10}	McEwan and Anicich (2007)
$R_{cn}78c$	2	$C^+ + CH_3CCH \rightarrow c{-}C_3H_3^+ + CH$	3.80×10^{-10}	McEwan and Anicich (2007)
$R_{cn}78d$	2	$C^+ + CH_3CCH \rightarrow C_2H_2^+ + C_2H_2$	1.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}78e$	2	$C^+ + CH_3CCH \rightarrow C_2H_3^+ + C_2H$	1.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}79a$	2	$C^+ + CH_2CCH_2 \rightarrow C_4H_2^+ + H_2$	5.60×10^{-10}	Bohme et al. (1982)
$R_{cn}79b$	2	$C^+ + CH_2CCH_2 \rightarrow c{-}C_3H_3^+ + CH$	1.75×10^{-10}	Bohme et al. (1982)
$R_{cn}79c$	2	$C^+ + CH_2CCH_2 \rightarrow l{-}C_3H_3^+ + CH$	1.75×10^{-10}	Bohme et al. (1982)
$R_{cn}79d$	2	$C^+ + CH_2CCH_2 \rightarrow C_2H_2^+ + C_2H_2$	2.80×10^{-10}	Bohme et al. (1982)
$R_{cn}79e$	2	$C^+ + CH_2CCH_2 \rightarrow C_3H_4^+ + C$	2.10×10^{-10}	Bohme et al. (1982)
$R_{cn}80a$	2	$C^+ + C_3H_6 \rightarrow C_2H_3^+ + C_2H_3$	6.00×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}80b	2	C^+	+	C_3H_6	→	$C_3H_5^+$	+	CH			4.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}80c	2	C^+	+	C_3H_6	→	$c-C_3H_3^+$	+	CH_3			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}80d	2	C^+	+	C_3H_6	→	$C_2H_2^+$	+	C_2H_4			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}80e	2	C^+	+	C_3H_6	→	$C_3H_6^+$	+	C			2.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}80f	2	C^+	+	C_3H_6	→	$C_4H_3^+$	+	H_2	+	H	2.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}81a	2	C^+	+	C_3H_8	→	$C_2H_3^+$	+	C_2H_5			6.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}81b	2	C^+	+	C_3H_8	→	$C_3H_7^+$	+	CH			5.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}81c	2	C^+	+	C_3H_8	→	$c-C_3H_3^+$	+	CH_4	+	H	3.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}81d	2	C^+	+	C_3H_8	→	$C_3H_8^+$	+	C			1.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}81e	2	C^+	+	C_3H_8	→	$C_4H_5^+$	+	H_2	+	H	9.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}82a	2	C^+	+	C_4H_2	→	C_5H^+	+	H			1.45×10^{-09}	McEwan and Anicich (2007)
R_{cn}82b	2	C^+	+	C_4H_2	→	$C_4H_2^+$	+	C			1.30×10^{-09}	McEwan and Anicich (2007)
R_{cn}82c	2	C^+	+	C_4H_2	→	C_3H^+	+	C_2H			1.45×10^{-10}	McEwan and Anicich (2007)
R_{cn}83a	2	C^+	+	C_5H_4	→	$C_5H_3^+$	+	CH			$4.93\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}83b	2	C^+	+	C_5H_4	→	$C_6H_2^+$	+	H_2			$4.93\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}83c	2	C^+	+	C_5H_4	→	$C_6H_3^+$	+	H			$4.93\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}84a	2	C^+	+	C_6H_2	→	C_7^+	+	H_2			1.20×10^{-09}	Wakelam et al. (2015)
R_{cn}84b	2	C^+	+	C_6H_2	→	C_7H^+	+	H			1.20×10^{-09}	Wakelam et al. (2015)
R_{cn}85a	2	C^+	+	C_7H_4	→	$C_7H_3^+$	+	CH			$9.00\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}85b	2	C^+	+	C_7H_4	→	$C_8H_2^+$	+	H_2			$9.00\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}86a	2	C^+	+	C_6H_6	→	$C_6H_6^+$	+	C			1.61×10^{-09}	Bohme et al. (1982)
R_{cn}86b	2	C^+	+	C_6H_6	→	$C_5H_3^+$	+	C_2H_3			4.08×10^{-10}	Bohme et al. (1982)
R_{cn}86c	2	C^+	+	C_6H_6	→	$C_7H_5^+$	+	H			2.40×10^{-10}	Bohme et al. (1982)
R_{cn}86d	2	C^+	+	C_6H_6	→	$c-C_3H_3^+$	+	C_4H_3			1.44×10^{-10}	Bohme et al. (1982)
R_{cn}87a	2	C^+	+	C_8H_2	→	$CXHYNZ^+$	+	H_2			1.20×10^{-09}	Wakelam et al. (2015)
R_{cn}87b	2	C^+	+	C_8H_2	→	$CXHYNZ^+$	+	H			1.20×10^{-09}	Wakelam et al. (2015)
R_{cn}88a	2	C^+	+	NH_3	→	NH_3^+	+	C			7.36×10^{-10}	Anicich (1993)
R_{cn}88b	2	C^+	+	NH_3	→	HCN^+	+	H_2			1.15×10^{-10}	Anicich (1993)
R_{cn}88c	2	C^+	+	NH_3	→	$HCNH^+$	+	H			1.45×10^{-09}	Anicich (1993)
R_{cn}89	2	C^+	+	HCN	→	C_2N^+	+	H			2.95×10^{-09}	McEwan and Anicich (2007)
R_{cn}90a	2	C^+	+	CH_3NH_2	→	CH_3^+	+	HCN	+	H	3.20×10^{-11}	Anicich (1993)
R_{cn}90b	2	C^+	+	CH_3NH_2	→	$HCNH^+$	+	CH_3			9.60×10^{-11}	Anicich (1993)
R_{cn}90c	2	C^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	CH			8.64×10^{-10}	Anicich (1993)
R_{cn}90d	2	C^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	C			2.21×10^{-09}	Anicich (1993)
R_{cn}91	2	C^+	+	CH_3CN	→	HC_3NH^+	+	H			5.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}92a	2	C^+	+	HC_3N	→	C_3^+	+	HCN			2.75×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction					k	Ref.
$R_{cn}92b$	2	C^+	+ HC_3N	→ C_3H^+	+ CN		3.85×10^{-09}	McEwan and Anicich (2007)
$R_{cn}92c$	2	C^+	+ HC_3N	→ C_2N^+	+ C_2H		1.10×10^{-10}	McEwan and Anicich (2007)
$R_{cn}92d$	2	C^+	+ HC_3N	→ C_4N^+	+ H		1.26×10^{-09}	McEwan and Anicich (2007)
$R_{cn}93a$	2	C^+	+ C_3H_3N	→ $C_3H_2^+$	+ HCN		9.84×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}93b$	2	C^+	+ C_3H_3N	→ $c-C_3H_3^+$	+ CN		1.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}93c$	2	C^+	+ C_3H_3N	→ HC_4NH^+	+ H		1.19×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}93d$	2	C^+	+ C_3H_3N	→ $C_4H_3N^+$	+ hv		1.23×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}94a$	2	C^+	+ C_4H_3N	→ $C_2H_3^+$	+ C_3N		$2.90\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}94b$	2	C^+	+ C_4H_3N	→ $C_4H_3^+$	+ CN		$2.90\times10^{-09}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}95a$	2	C^+	+ HC_5N	→ HC_5N^+	+ C		4.36×10^{-09}	Edwards et al. (2009)
$R_{cn}95b$	2	C^+	+ HC_5N	→ C_6N^+	+ H		2.35×10^{-09}	Edwards et al. (2009)
$R_{cn}96a$	2	C^+	+ C_2N_2	→ CNC^+	+ CN		2.09×10^{-10}	McEwan and Anicich (2007)
$R_{cn}96b$	2	C^+	+ C_2N_2	→ C_2N^+	+ CN		1.69×10^{-09}	McEwan and Anicich (2007)
$R_{cn}97a$	2	C^+	+ H_2O	→ H_2O^+	+ C		2.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}97b$	2	C^+	+ H_2O	→ HCO^+	+ H		2.16×10^{-09}	McEwan and Anicich (2007)
$R_{cn}98a$	2	C^+	+ H_2CO	→ CH_2^+	+ CO		2.27×10^{-09}	Anicich (1993)
$R_{cn}98b$	2	C^+	+ H_2CO	→ HCO^+	+ CH		8.40×10^{-10}	Anicich (1993)
$R_{cn}98c$	2	C^+	+ H_2CO	→ CH_2O^+	+ C		1.09×10^{-09}	Anicich (1993)
$R_{cn}99a$	2	C^+	+ CO_2	→ CO^+	+ CO		9.90×10^{-10}	Anicich (1993)
$R_{cn}99b$	2	C^+	+ CO_2	→ CO_2^+	+ C		1.10×10^{-10}	Anicich (1993)
$R_{cn}100$	2	CH^+	+ H	→ C^+	+ H_2		$7.84\times10^{-10}T^{0.22}$	Gerlich et al. (2011),Plašil et al. (2011)
$R_{cn}101$	2	CH^+	+ H_2	→ CH_2^+	+ H		1.20×10^{-09}	McEwan and Anicich (2007),Gerlich et al. (2011)
$R_{cn}102a$	2	CH^+	+ CH_4	→ $C_2H_2^+$	+ H_2	+ H	1.43×10^{-10}	McEwan and Anicich (2007)
$R_{cn}102b$	2	CH^+	+ CH_4	→ $C_2H_3^+$	+ H_2		1.09×10^{-09}	McEwan and Anicich (2007)
$R_{cn}102c$	2	CH^+	+ CH_4	→ $C_2H_4^+$	+ H		6.50×10^{-11}	McEwan and Anicich (2007)
$R_{cn}103$	2	CH^+	+ C_2H_2	→ $C_3H_2^+$	+ H		2.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}104$	2	CH^+	+ C_2H_6	→ $CXHYNZ^+$			2.60×10^{-09}	McEwan and Anicich (2007)
$R_{cn}105$	2	CH^+	+ N	→ CN^+	+ H		1.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}106a$	2	CH^+	+ NH_3	→ $HCNH^+$	+ H_2		1.84×10^{-09}	Anicich (1993)
$R_{cn}106b$	2	CH^+	+ NH_3	→ NH_3^+	+ CH		4.59×10^{-10}	Anicich (1993)
$R_{cn}106c$	2	CH^+	+ NH_3	→ NH_4^+	+ C		4.05×10^{-10}	Anicich (1993)
$R_{cn}107a$	2	CH^+	+ HCN	→ $HCNH^+$	+ C		2.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}107b$	2	CH^+	+ HCN	→ C_2N^+	+ H_2		4.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}107c$	2	CH^+	+ HCN	→ HC_2N^+	+ H		2.80×10^{-10}	McEwan and Anicich (2007)
$R_{cn}108a$	2	CH^+	+ CH_3NH_2	→ $CH_2NH_2^+$	+ $^3CH_2$		1.15×10^{-09}	Anicich (1993)
$R_{cn}108b$	2	CH^+	+ CH_3NH_2	→ $CH_3NH_2^+$	+ CH		2.30×10^{-10}	Anicich (1993)

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	Type	Reaction							k	Ref.
R_{cn}108c	2	CH^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	C	9.20×10^{-10}	Anicich (1993)
R_{cn}109	3	CH^+	+	N_2	→	$AdductN^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									5.30×10^{-29}	
R_{cn}110a	2	CH^+	+	$O(^3P)$	→	CO^+	+	H	1.75×10^{-10}	Anicich (1993)
R_{cn}110b	2	CH^+	+	$O(^3P)$	→	H^+	+	CO	1.75×10^{-10}	Anicich (1993)
R_{cn}111a	2	CH^+	+	H_2O	→	HCO^+	+	H_2	1.45×10^{-09}	McEwan and Anicich (2007)
R_{cn}111b	2	CH^+	+	H_2O	→	CH_2O^+	+	H	7.25×10^{-10}	McEwan and Anicich (2007)
R_{cn}111c	2	CH^+	+	H_2O	→	H_3O^+	+	C	7.25×10^{-10}	McEwan and Anicich (2007)
R_{cn}112	2	CH^+	+	CO	→	HCO^+	+	C	7.00×10^{-12}	McEwan and Anicich (2007)
R_{cn}113a	2	CH^+	+	H_2CO	→	CH_3^+	+	CO	9.60×10^{-10}	Anicich (1993)
R_{cn}113b	2	CH^+	+	H_2CO	→	HCO^+	+	$^3CH_2$	9.60×10^{-10}	Anicich (1993)
R_{cn}113c	2	CH^+	+	H_2CO	→	CH_2OH^+	+	C	9.60×10^{-10}	Anicich (1993)
R_{cn}113d	2	CH^+	+	H_2CO	→	CH_2CO^+	+	H	3.20×10^{-10}	Anicich (1993)
R_{cn}114	2	CH^+	+	CO_2	→	HCO^+	+	CO	1.27×10^{-09}	Glosík et al. (1993)
R_{cn}115	2	CH_2^+	+	H_2	→	CH_3^+	+	H	1.16×10^{-09}	McEwan and Anicich (2007)
R_{cn}116a	2	CH_2^+	+	CH_4	→	$C_2H_4^+$	+	H_2	9.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}116b	2	CH_2^+	+	CH_4	→	$C_2H_5^+$	+	H	3.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}117	2	CH_2^+	+	C_2H_2	→	$c-C_3H_3^+$	+	H	2.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}118	2	CH_2^+	+	C_2H_6	→	$CXHYNZ^+$			2.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}119a	2	CH_2^+	+	N	→	CN^+	+	H_2	1.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}119b	2	CH_2^+	+	N	→	HCN^+	+	H	1.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}120a	2	CH_2^+	+	NH_3	→	NH_4^+	+	CH	8.78×10^{-10}	Anicich (1993)
R_{cn}120b	2	CH_2^+	+	NH_3	→	$CH_2NH_2^+$	+	H	1.78×10^{-09}	Anicich (1993)
R_{cn}121	2	CH_2^+	+	HCN	→	HC_2NH^+	+	H	1.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}122a	2	CH_2^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	CH_3	1.15×10^{-09}	Anicich (1993)
R_{cn}122b	2	CH_2^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	$^3CH_2$	7.35×10^{-10}	Anicich (1993)
R_{cn}122c	2	CH_2^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	CH	2.10×10^{-10}	Anicich (1993)
R_{cn}123	2	CH_2^+	+	CH_3CN	→	$C_3H_3NH^+$	+	H	2.58×10^{-09}	Franklin et al. (1966)
R_{cn}124	2	CH_2^+	+	HC_3N	→	HC_3NH^+	+	CH	4.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}125	2	CH_2^+	+	C_3H_5N	→	$C_4H_5NH^+$	+	H	3.12×10^{-09}	Franklin et al. (1966)
R_{cn}126	3	CH_2^+	+	N_2	→	$CH_2^+N_2$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.40×10^{-28}	
R_{cn}127	2	CH_2^+	+	H_2O	→	CH_2OH^+	+	H	2.05×10^{-09}	McEwan and Anicich (2007)
R_{cn}128	3	CH_2^+	+	CO	→	CH_2CO^+			1.00×10^{-10}	McEwan and Anicich (2007)
									2.00×10^{-27}	
R_{cn}129a	2	CH_2^+	+	H_2CO	→	HCO^+	+	CH_3	2.81×10^{-09}	Anicich (1993)

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	Type	Reaction	k	Ref.
$R_{cn}129b$	2	$CH_2^+ + H_2CO \rightarrow CH_2CO^+ + H_2$	1.65×10^{-10}	Anicich (1993)
$R_{cn}129c$	2	$CH_2^+ + H_2CO \rightarrow CH_3CO^+ + H$	3.30×10^{-10}	Anicich (1993)
$R_{cn}130$	2	$CH_2^+ + CO_2 \rightarrow CH_2O^+ + CO$	1.24×10^{-09}	Glosík et al. (1993)
$R_{cn}131a$	2	$CH_3^+ + H_2 \rightarrow CH_5^+ + hv$	$4.04\times10^{-16}T^{2.30}e^{-30.0/T}$	Wakelam et al. (2015)
$R_{cn}131b$	3	$CH_3^+ + H_2 \rightarrow CH_5^+$	1.00×10^{-10} 1.10×10^{-28}	McEwan and Anicich (2007)
$R_{cn}132$	2	$CH_3^+ + CH_4 \rightarrow C_2H_5^+ + H_2$	1.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}133a$	2	$CH_3^+ + C_2H_2 \rightarrow c-C_3H_3^+ + H_2$	2.88×10^{-10}	McEwan and Anicich (2007)
$R_{cn}133b$	2	$CH_3^+ + C_2H_2 \rightarrow l-C_3H_3^+ + H_2$	8.63×10^{-10}	McEwan and Anicich (2007)
$R_{cn}134a$	2	$CH_3^+ + C_2H_4 \rightarrow C_2H_3^+ + CH_4$	4.88×10^{-10}	McEwan and Anicich (2007)
$R_{cn}134b$	2	$CH_3^+ + C_2H_4 \rightarrow c-C_3H_3^+ + H_2 + H_2$	4.24×10^{-11}	McEwan and Anicich (2007)
$R_{cn}134c$	2	$CH_3^+ + C_2H_4 \rightarrow C_3H_5^+ + H_2$	5.41×10^{-10}	McEwan and Anicich (2007)
$R_{cn}135a$	2	$CH_3^+ + C_2H_6 \rightarrow C_2H_5^+ + CH_4$	1.48×10^{-09}	McEwan and Anicich (2007)
$R_{cn}135b$	2	$CH_3^+ + C_2H_6 \rightarrow C_3H_5^+ + H_2 + H_2$	1.57×10^{-10}	McEwan and Anicich (2007)
$R_{cn}135c$	2	$CH_3^+ + C_2H_6 \rightarrow C_3H_7^+ + H_2$	1.04×10^{-10}	McEwan and Anicich (2007)
$R_{cn}136a$	2	$CH_3^+ + CH_3CCH \rightarrow C_2H_3^+ + C_2H_4$	2.85×10^{-10}	McEwan and Anicich (2007)
$R_{cn}136b$	2	$CH_3^+ + CH_3CCH \rightarrow C_2H_5^+ + C_2H_2$	1.14×10^{-09}	McEwan and Anicich (2007)
$R_{cn}136c$	2	$CH_3^+ + CH_3CCH \rightarrow c-C_3H_3^+ + CH_4$	2.85×10^{-10}	McEwan and Anicich (2007)
$R_{cn}136d$	2	$CH_3^+ + CH_3CCH \rightarrow C_4H_5^+ + H_2$	1.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}137$	2	$CH_3^+ + C_3H_8 \rightarrow C_3H_7^+ + CH_4$	1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}138a$	2	$CH_3^+ + C_4H_2 \rightarrow c-C_3H_3^+ + C_2H_2$	1.17×10^{-09}	McEwan and Anicich (2007)
$R_{cn}138b$	2	$CH_3^+ + C_4H_2 \rightarrow C_5H_3^+ + H_2$	1.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}139$	2	$CH_3^+ + C_6H_2 \rightarrow C_7H_3^+ + H_2$	1.20×10^{-09}	Fondren et al. (2009)
$R_{cn}140a$	2	$CH_3^+ + C_6H_6 \rightarrow C_5H_5^+ + C_2H_4$	9.40×10^{-11}	Fondren et al. (2009)
$R_{cn}140b$	2	$CH_3^+ + C_6H_6 \rightarrow C_6H_5^+ + CH_4$	5.83×10^{-10}	Fondren et al. (2009)
$R_{cn}140c$	2	$CH_3^+ + C_6H_6 \rightarrow C_6H_6^+ + CH_3$	3.20×10^{-10}	Fondren et al. (2009)
$R_{cn}140d$	2	$CH_3^+ + C_6H_6 \rightarrow C_7H_7^+ + H_2$	7.33×10^{-10}	Fondren et al. (2009)
$R_{cn}140e$	2	$CH_3^+ + C_6H_6 \rightarrow C_7H_9^+ + hv$	1.50×10^{-10}	Fondren et al. (2009)
$R_{cn}141$	2	$CH_3^+ + C_8H_2 \rightarrow CXHYNZ^+ + H_2$	1.20×10^{-09}	Wakelam et al. (2015)
$R_{cn}142a$	2	$CH_3^+ + N \rightarrow HCN^+ + H_2$	3.35×10^{-11}	McEwan and Anicich (2007)
$R_{cn}142b$	2	$CH_3^+ + N \rightarrow HCNH^+ + H$	3.35×10^{-11}	McEwan and Anicich (2007)
$R_{cn}143a$	2	$CH_3^+ + NH_3 \rightarrow NH_4^+ + {}^3CH_2$	2.63×10^{-10}	Anicich (1993)
$R_{cn}143b$	2	$CH_3^+ + NH_3 \rightarrow CH_2NH_2^+ + H_2$	1.49×10^{-09}	Anicich (1993)
$R_{cn}143c$	2	$CH_3^+ + NH_3 \rightarrow CH_3NH_3^+ + hv$	$9.40\times10^{-10}T^{0.90}$	Wakelam et al. (2015)
$R_{cn}144a$	2	$CH_3^+ + HCN \rightarrow C_2H_3NH^+ + hv$	2.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}144b$	3	$CH_3^+ + HCN \rightarrow C_2H_3NH^+$	1.00×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction	k	Ref.
			1.07×10^{-23}	
R_{cn}145a	2	$CH_3^+ + CH_3NH_2 \rightarrow CH_2NH_2^+ + CH_4$	1.44×10^{-09}	Anicich (1993)
R_{cn}145b	2	$CH_3^+ + CH_3NH_2 \rightarrow CH_3NH_2^+ + CH_3$	1.76×10^{-09}	Anicich (1993)
R_{cn}146a	2	$CH_3^+ + CH_3CN \rightarrow C_2H_5^+ + HCN$	6.66×10^{-10}	McEwan and Anicich (2007)
R_{cn}146b	2	$CH_3^+ + CH_3CN \rightarrow HCNH^+ + C_2H_4$	1.04×10^{-09}	McEwan and Anicich (2007)
R_{cn}146c	2	$CH_3^+ + CH_3CN \rightarrow C_3H_5NH^+ + hv$	9.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}146d	3	$CH_3^+ + CH_3CN \rightarrow C_3H_5NH^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			1.90×10^{-22}	
R_{cn}147a	2	$CH_3^+ + HC_3N \rightarrow c{-}C_3H_3^+ + HCN$	1.43×10^{-09}	McEwan and Anicich (2007)
R_{cn}147b	2	$CH_3^+ + HC_3N \rightarrow C_4H_3NH^+ + hv$	2.19×10^{-09}	McEwan and Anicich (2007)
R_{cn}147c	3	$CH_3^+ + HC_3N \rightarrow c{-}C_3H_3^+ + HCN$	1.00×10^{-10}	McEwan and Anicich (2007)
			1.52×10^{-23}	
R_{cn}147d	3	$CH_3^+ + HC_3N \rightarrow C_4H_3NH^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.28×10^{-23}	
R_{cn}148a	2	$CH_3^+ + C_3H_3N \rightarrow C_2H_3NH^+ + C_2H_2$	4.32×10^{-09}	Anicich and McEwan (1997)
R_{cn}148b	2	$CH_3^+ + C_3H_3N \rightarrow C_2H_3^+ + CH_3CN$	5.40×10^{-10}	Anicich and McEwan (1997)
R_{cn}148c	2	$CH_3^+ + C_3H_3N \rightarrow C_3H_5^+ + HCN$	2.70×10^{-10}	Anicich and McEwan (1997)
R_{cn}148d	2	$CH_3^+ + C_3H_3N \rightarrow C_3H_3NH^+ + {}^3CH_2$	2.70×10^{-10}	Anicich and McEwan (1997)
R_{cn}148e	3	$CH_3^+ + C_3H_3N \rightarrow c{-}C_3H_3^+ + HCN + H_2$	1.00×10^{-10}	Anicich and McEwan (1997)
			1.50×10^{-24}	
R_{cn}148f	3	$CH_3^+ + C_3H_3N \rightarrow HC_3NH^+ + CH_4$	1.00×10^{-10}	Anicich and McEwan (1997)
			2.75×10^{-24}	
R_{cn}148g	3	$CH_3^+ + C_3H_3N \rightarrow C_4H_5NH^+$	1.00×10^{-10}	Anicich and McEwan (1997)
			7.50×10^{-25}	
R_{cn}149	2	$CH_3^+ + C_3H_5N \rightarrow CXHYNZ^+$	2.55×10^{-09}	Anicich and McEwan (1997)
R_{cn}150a	2	$CH_3^+ + C_4H_5N \rightarrow C_3H_5^+ + CH_3CN$	3.35×10^{-11}	Fondren et al. (2009)
R_{cn}150b	2	$CH_3^+ + C_4H_5N \rightarrow C_2H_3N^+ + C_3H_5$	3.35×10^{-11}	Fondren et al. (2009)
R_{cn}150c	2	$CH_3^+ + C_4H_5N \rightarrow C_2H_3NH^+ + CH_3CCH$	1.12×10^{-10}	Fondren et al. (2009)
R_{cn}150d	2	$CH_3^+ + C_4H_5N \rightarrow C_3H_5N^+ + C_2H_3$	2.90×10^{-10}	Fondren et al. (2009)
R_{cn}150e	2	$CH_3^+ + C_4H_5N \rightarrow C_4H_5N^+ + CH_3$	1.43×10^{-09}	Fondren et al. (2009)
R_{cn}150f	2	$CH_3^+ + C_4H_5N \rightarrow C_4H_5NH^+ + {}^3CH_2$	1.56×10^{-10}	Fondren et al. (2009)
R_{cn}150g	2	$CH_3^+ + C_4H_5N \rightarrow C_5H_7NH^+ + hv$	1.78×10^{-10}	Fondren et al. (2009)
R_{cn}151	2	$CH_3^+ + HC_5N \rightarrow C_6H_3NH^+ + hv$	$8.60\times10^{-11}T^{1.40}$	Wakelam et al. (2015)
R_{cn}152a	2	$CH_3^+ + C_5H_5N \rightarrow C_5H_3NH^+ + CH_4$	5.42×10^{-10}	Fondren et al. (2009)
R_{cn}152b	2	$CH_3^+ + C_5H_5N \rightarrow C_5H_5N^+ + CH_3$	5.69×10^{-10}	Fondren et al. (2009)
R_{cn}152c	2	$CH_3^+ + C_5H_5N \rightarrow C_5H_5NH^+ + {}^3CH_2$	2.44×10^{-10}	Fondren et al. (2009)

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	Type	Reaction									k	Ref.
R_{cn}152d	2	CH_3^+	+	C_5H_5N	→	$C_6H_7NH^+$	+	hv			1.36×10^{-09}	Fondren et al. (2009)
R_{cn}153	3	CH_3^+	+	N_2	→	$CH_3^+N_2$					1.00×10^{-10}	McEwan and Anicich (2007)
											5.40×10^{-29}	
R_{cn}154a	2	CH_3^+	+	C_2N_2	→	HC_2NH^+	+	HCN			7.20×10^{-11}	McEwan and Anicich (2007)
R_{cn}154b	2	CH_3^+	+	C_2N_2	→	$C_3H_3N_2^+$	+	hv			1.80×10^{-11}	McEwan and Anicich (2007)
R_{cn}154c	3	CH_3^+	+	C_2N_2	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											8.00×10^{-24}	
R_{cn}155	2	CH_3^+	+	$O(^3P)$	→	HCO^+	+	H_2			4.10×10^{-10}	Scott et al. (2000)
R_{cn}156a	2	CH_3^+	+	H_2O	→	$CH_3OH_2^+$	+	hv			2.00×10^{-12}	Wakelam et al. (2015)
R_{cn}156b	3	CH_3^+	+	H_2O	→	$Adduct^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											6.00×10^{-25}	
R_{cn}157a	2	CH_3^+	+	CO	→	CH_3CO^+	+	hv			$1.20\times10^{-13}T^{1.30}$	Wakelam et al. (2015)
R_{cn}157b	3	CH_3^+	+	CO	→	CH_3CO^+					1.00×10^{-10}	McEwan and Anicich (2007)
											2.30×10^{-27}	
R_{cn}158	2	CH_3^+	+	H_2CO	→	HCO^+	+	CH_4			1.30×10^{-09}	Anicich (1993)
R_{cn}159	2	$CH_3^+N_2$	+	H_2	→	CH_5^+	+	N_2			7.00×10^{-14}	Albritton (1978)
R_{cn}160	2	CH_4^+	+	H	→	CH_3^+	+	H_2			5.00×10^{-10}	Gerlich and Smith (2006),Gerlich et al. (2011)
R_{cn}161	2	CH_4^+	+	H_2	→	CH_5^+	+	H			$3.30\times10^{-11}T^{1.12}$	Asvany et al. (2004),Gerlich et al. (2011)
R_{cn}162	2	CH_4^+	+	CH_4	→	CH_5^+	+	CH_3			1.14×10^{-09}	McEwan and Anicich (2007)
R_{cn}163a	2	CH_4^+	+	C_2H_2	→	$C_2H_2^+$	+	CH_4			1.44×10^{-09}	McEwan and Anicich (2007)
R_{cn}163b	2	CH_4^+	+	C_2H_2	→	$C_2H_3^+$	+	CH_3			1.12×10^{-09}	McEwan and Anicich (2007)
R_{cn}163c	2	CH_4^+	+	C_2H_2	→	$c-C_3H_3^+$	+	H_2	+	H	1.63×10^{-10}	McEwan and Anicich (2007)
R_{cn}164a	2	CH_4^+	+	C_2H_4	→	$C_2H_4^+$	+	CH_4			1.70×10^{-09}	McEwan and Anicich (2007)
R_{cn}164b	2	CH_4^+	+	C_2H_4	→	$C_2H_5^+$	+	CH_3			2.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}164c	2	CH_4^+	+	C_2H_4	→	$C_3H_5^+$	+	H_2	+	H	6.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}165	2	CH_4^+	+	C_2H_6	→	$C_2H_4^+$	+	CH_4	+	H_2	1.91×10^{-09}	McEwan and Anicich (2007)
R_{cn}166	2	CH_4^+	+	C_3H_6	→	CH_5^+	+	C_3H_5			1.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}167a	2	CH_4^+	+	NH_3	→	CH_5^+	+	NH_2			6.00×10^{-11}	Anicich (1993)
R_{cn}167b	2	CH_4^+	+	NH_3	→	NH_4^+	+	CH_3			1.35×10^{-09}	Anicich (1993)
R_{cn}167c	2	CH_4^+	+	NH_3	→	NH_3^+	+	CH_4			1.59×10^{-09}	Anicich (1993)
R_{cn}168a	2	CH_4^+	+	HCN	→	$HCNH^+$	+	CH_3			3.23×10^{-09}	McEwan and Anicich (2007)
R_{cn}168b	2	CH_4^+	+	HCN	→	$C_2H_3NH^+$	+	H			6.60×10^{-11}	McEwan and Anicich (2007)
R_{cn}169a	2	CH_4^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	CH_4			1.32×10^{-09}	Adams and Smith (1978),Smith and Adams (1978a),S
R_{cn}169b	2	CH_4^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	CH_4	+	H	8.80×10^{-10}	Adams and Smith (1978),Smith and Adams (1978a),S
R_{cn}170	2	CH_4^+	+	CH_3CN	→	$C_2H_3NH^+$	+	CH_3			3.92×10^{-09}	Blair and Harrison (1973)
R_{cn}171	2	CH_4^+	+	HC_3N	→	HC_3NH^+	+	CH_3			2.50×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
$R_{cn}172$	2	CH_4^+	+	H_2O	→	H_3O^+	+	CH_3			2.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}173a$	2	CH_4^+	+	CO	→	HCO^+	+	CH_3			1.04×10^{-09}	McEwan and Anicich (2007)
$R_{cn}173b$	2	CH_4^+	+	CO	→	CH_3CO^+	+	H			4.32×10^{-11}	McEwan and Anicich (2007)
$R_{cn}174a$	2	CH_4^+	+	H_2CO	→	CH_2O^+	+	CH_4			1.62×10^{-09}	Anicich (1993)
$R_{cn}174b$	2	CH_4^+	+	H_2CO	→	CH_2OH^+	+	CH_3			1.98×10^{-09}	Anicich (1993)
$R_{cn}175a$	2	CH_4^+	+	CO_2	→	$OCOH^+$	+	CH_3			9.90×10^{-10}	Anicich (1993)
$R_{cn}175b$	2	CH_4^+	+	CO_2	→	CH_3CO^+	+	OH			1.00×10^{-11}	Anicich (1993)
$R_{cn}176$	2	CH_5^+	+	H	→	CH_4^+	+	H_2			2.30×10^{-11}	Gerlich and Borodi (2009),Gerlich et al. (2011)
$R_{cn}177$	2	CH_5^+	+	CH_3	→	$C_2H_6^+$	+	H_2			5.00×10^{-10}	Capone et al. (1976)
$R_{cn}178$	3	CH_5^+	+	CH_4	→	$CH_5^+CH_4$					1.00×10^{-10}	Dheandhanoo et al. (1984)
											$8.00\times10^{-30}T^{3.50}$	
$R_{cn}179$	2	CH_5^+	+	C_2H_2	→	$C_2H_3^+$	+	CH_4			1.48×10^{-09}	McEwan and Anicich (2007)
$R_{cn}180$	2	CH_5^+	+	C_2H_4	→	$C_2H_5^+$	+	CH_4			1.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}181a$	2	CH_5^+	+	C_2H_6	→	$C_2H_5^+$	+	CH_4	+	H_2	2.03×10^{-10}	McEwan and Anicich (2007)
$R_{cn}181b$	2	CH_5^+	+	C_2H_6	→	$C_2H_7^+$	+	CH_4			1.15×10^{-09}	McEwan and Anicich (2007)
$R_{cn}182$	2	CH_5^+	+	CH_3CCH	→	$CXHYNZ^+$					2.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}183$	2	CH_5^+	+	CH_2CCH_2	→	$C_3H_5^+$	+	CH_4			1.60×10^{-09}	Langevin
$R_{cn}184$	2	CH_5^+	+	C_3H_6	→	$CXHYNZ^+$					2.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}185$	2	CH_5^+	+	C_3H_8	→	$C_3H_9^+$	+	CH_4			1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}186$	2	CH_5^+	+	C_4H_2	→	$C_4H_3^+$	+	CH_4			1.70×10^{-09}	Langevin
$R_{cn}187$	2	CH_5^+	+	C_5H_4	→	$C_5H_5^+$	+	CH_4			3.00×10^{-09}	Su-Chesnavich
$R_{cn}188$	2	CH_5^+	+	C_6H_2	→	$C_6H_3^+$	+	CH_4			2.20×10^{-09}	Langevin
$R_{cn}189$	2	CH_5^+	+	C_6H_6	→	$C_6H_7^+$	+	CH_4			2.00×10^{-09}	Spanel et al. (1995)
$R_{cn}190$	2	CH_5^+	+	C_7H_4	→	$C_7H_5^+$	+	CH_4			3.60×10^{-09}	Su-Chesnavich
$R_{cn}191$	2	CH_5^+	+	C_7H_8	→	$C_7H_9^+$	+	CH_4			2.30×10^{-09}	Su-Chesnavich
$R_{cn}192$	2	CH_5^+	+	C_8H_2	→	$C_8H_3^+$	+	CH_4			2.60×10^{-09}	Langevin
$R_{cn}193$	2	CH_5^+	+	NH_3	→	NH_4^+	+	CH_4			2.40×10^{-09}	Anicich (1993)
$R_{cn}194$	2	CH_5^+	+	HCN	→	$HCNH^+$	+	CH_4			5.80×10^{-09}	Su-Chesnavich
$R_{cn}195$	2	CH_5^+	+	HNC	→	$HCNH^+$	+	CH_4			6.00×10^{-09}	Su-Chesnavich
$R_{cn}196$	2	CH_5^+	+	CH_2NH	→	$CH_2NH_2^+$	+	CH_4			4.20×10^{-09}	Su-Chesnavich
$R_{cn}197$	2	CH_5^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	CH_4			2.25×10^{-09}	Su and Bowers (1973)
$R_{cn}198$	2	CH_5^+	+	CH_3CN	→	$C_2H_3NH^+$	+	CH_4			4.90×10^{-09}	Blair and Harrison (1973)
$R_{cn}199$	2	CH_5^+	+	HC_3N	→	HC_3NH^+	+	CH_4			4.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}200$	2	CH_5^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	CH_4			7.00×10^{-09}	Su-Chesnavich
$R_{cn}201$	2	CH_5^+	+	C_3H_5N	→	$C_3H_5NH^+$	+	CH_4			7.20×10^{-09}	Su-Chesnavich
$R_{cn}202$	2	CH_5^+	+	C_4H_3N	→	$C_4H_3NH^+$	+	CH_4			8.20×10^{-09}	Su-Chesnavich

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	Type	Reaction	k	Ref.
R_{cn}203	2	$CH_5^+ + C_4H_5N \rightarrow C_4H_5NH^+ + CH_4$	6.60×10^{-09}	Su-Chesnavich
R_{cn}204	2	$CH_5^+ + HC_5N \rightarrow HC_5NH^+ + CH_4$	7.60×10^{-09}	Su-Chesnavich
R_{cn}205	2	$CH_5^+ + C_5H_5N \rightarrow C_5H_5NH^+ + CH_4$	4.40×10^{-09}	Su-Chesnavich
R_{cn}206	2	$CH_5^+ + C_6H_3N \rightarrow C_6H_3NH^+ + CH_4$	1.00×10^{-08}	Su-Chesnavich
R_{cn}207	2	$CH_5^+ + C_6H_7N \rightarrow C_6H_7NH^+ + CH_4$	3.00×10^{-09}	Su-Chesnavich
R_{cn}208	3	$CH_5^+ + N_2 \rightarrow CH_5^+N_2$	1.00×10^{-10}	Speller et al. (1995)
			1.00×10^{-27}	
R_{cn}209	2	$CH_5^+ + N_2H_4 \rightarrow N_2H_5^+ + CH_4$	1.40×10^{-09}	Su-Chesnavich
R_{cn}210a	2	$CH_5^+ + O(^3P) \rightarrow H_3O^+ + {}^3CH_2$	2.35×10^{-10}	Anicich (1993)
R_{cn}210b	2	$CH_5^+ + O(^3P) \rightarrow CH_2OH^+ + H_2$	4.80×10^{-12}	Anicich (1993)
R_{cn}211	2	$CH_5^+ + H_2O \rightarrow H_3O^+ + CH_4$	3.70×10^{-09}	McEwan and Anicich (2007)
R_{cn}212	2	$CH_5^+ + CO \rightarrow HCO^+ + CH_4$	9.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}213	2	$CH_5^+ + H_2CO \rightarrow CH_2OH^+ + CH_4$	4.50×10^{-09}	Anicich (1993)
R_{cn}214	2	$CH_5^+ + CO_2 \rightarrow OCOH^+ + CH_4$	3.25×10^{-11}	Anicich (1993)
R_{cn}215	2	$CH_5^+CH_4 + N_2 \rightarrow CH_5^+ + CH_4 + N_2$	$1.40\times10^{-08}T^{3.50}e^{2230.0/T}$	Dheandhanoo et al. (1984)
R_{cn}216	2	$CH_5^+N_2 + N_2 \rightarrow CH_5^+ + N_2 + N_2$	3.00×10^{-14}	Speller et al. (1995)
R_{cn}217	2	$C_2H^+ + H_2 \rightarrow C_2H_2^+ + H$	1.24×10^{-09}	McEwan and Anicich (2007)
R_{cn}218a	2	$C_2H^+ + CH_4 \rightarrow C_2H_2^+ + CH_3$	3.74×10^{-10}	McEwan and Anicich (2007)
R_{cn}218b	2	$C_2H^+ + CH_4 \rightarrow c-C_3H_3^+ + H_2$	3.74×10^{-10}	McEwan and Anicich (2007)
R_{cn}218c	2	$C_2H^+ + CH_4 \rightarrow C_3H_4^+ + H$	1.32×10^{-10}	McEwan and Anicich (2007)
R_{cn}218d	2	$C_2H^+ + CH_4 \rightarrow C_3H_5^+$	2.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}219	2	$C_2H^+ + C_2H_2 \rightarrow C_4H_2^+ + H$	1.85×10^{-09}	McEwan and Anicich (2007)
R_{cn}220a	2	$C_2H^+ + C_2H_4 \rightarrow C_4H_3^+ + H_2$	8.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}220b	2	$C_2H^+ + C_2H_4 \rightarrow C_4H_2^+ + H_2 + H$	1.70×10^{-10}	McEwan and Anicich (2007)
R_{cn}221a	2	$C_2H^+ + C_2H_6 \rightarrow c-C_3H_3^+ + CH_4$	9.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}221b	2	$C_2H^+ + C_2H_6 \rightarrow C_4H_4^+ + H_2 + H$	3.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}221c	2	$C_2H^+ + C_2H_6 \rightarrow C_4H_5^+ + H_2$	6.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}222	2	$C_2H^+ + C_3H_8 \rightarrow CXHYNZ^+$	4.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}223	2	$C_2H^+ + N \rightarrow CH^+ + CN$	9.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}224a	2	$C_2H^+ + NH_3 \rightarrow NH_4^+ + C_2$	1.63×10^{-09}	Su-Chesnavich
R_{cn}224b	2	$C_2H^+ + NH_3 \rightarrow HC_2NH^+ + H_2$	1.63×10^{-09}	Su-Chesnavich
R_{cn}225a	2	$C_2H^+ + HCN \rightarrow C_2H_2^+ + CN$	5.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}225b	2	$C_2H^+ + HCN \rightarrow HCNH^+ + C_2$	9.45×10^{-10}	McEwan and Anicich (2007)
R_{cn}225c	2	$C_2H^+ + HCN \rightarrow HC_3N^+ + H$	1.21×10^{-09}	McEwan and Anicich (2007)
R_{cn}226	2	$C_2H^+ + CH_3CN \rightarrow C_4H_3N^+ + H$	3.64×10^{-09}	Franklin et al. (1966)
R_{cn}227a	2	$C_2H^+ + HC_3N \rightarrow C_4H^+ + HCN$	7.60×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}227b	2	C_2H^+	+	HC_3N	→	$C_4H_2^+$	+	CN			4.56×10^{-10}	McEwan and Anicich (2007)
R_{cn}227c	2	C_2H^+	+	HC_3N	→	HC_3NH^+	+	C_2			1.41×10^{-09}	McEwan and Anicich (2007)
R_{cn}227d	2	C_2H^+	+	HC_3N	→	HC_5N^+	+	H			1.18×10^{-09}	McEwan and Anicich (2007)
R_{cn}228	2	C_2H^+	+	C_3H_3N	→	HC_3NH^+	+	C_2H_2			4.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}229a	2	C_2H^+	+	$O(^3P)$	→	C^+	+	HCO			8.25×10^{-11}	Anicich (1993)
R_{cn}229b	2	C_2H^+	+	$O(^3P)$	→	CH^+	+	CO			8.25×10^{-11}	Anicich (1993)
R_{cn}229c	2	C_2H^+	+	$O(^3P)$	→	HCO^+	+	C			8.25×10^{-11}	Anicich (1993)
R_{cn}229d	2	C_2H^+	+	$O(^3P)$	→	CO^+	+	CH			8.25×10^{-11}	Anicich (1993)
R_{cn}230	2	C_2H^+	+	H_2O	→	CH_2CO^+	+	H			3.66×10^{-09}	Su-Chesnavich
R_{cn}231	2	C_2H^+	+	H_2CO	→	CH_2OH^+	+	C_2			4.17×10^{-09}	Su-Chesnavich
R_{cn}232a	2	$C_2H_2^+$	+	H_2	→	$C_2H_3^+$	+	H			1.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}232b	3	$C_2H_2^+$	+	H_2	→	$C_2H_4^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											1.30×10^{-27}	
R_{cn}233a	2	$C_2H_2^+$	+	CH_4	→	$C_3H_4^+$	+	H_2			1.87×10^{-10}	McEwan and Anicich (2007)
R_{cn}233b	2	$C_2H_2^+$	+	CH_4	→	$C_3H_5^+$	+	H			7.03×10^{-10}	McEwan and Anicich (2007)
R_{cn}234a	2	$C_2H_2^+$	+	C_2H_2	→	$C_4H_2^+$	+	H_2			4.48×10^{-10}	McEwan and Anicich (2007)
R_{cn}234b	2	$C_2H_2^+$	+	C_2H_2	→	$C_4H_3^+$	+	H			9.52×10^{-10}	McEwan and Anicich (2007)
R_{cn}234c	3	$C_2H_2^+$	+	C_2H_2	→	$C_4H_4^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											1.60×10^{-26}	
R_{cn}235a	2	$C_2H_2^+$	+	C_2H_4	→	$C_2H_4^+$	+	C_2H_2			4.14×10^{-10}	McEwan and Anicich (2007)
R_{cn}235b	2	$C_2H_2^+$	+	C_2H_4	→	$c-C_3H_3^+$	+	CH_3			6.49×10^{-10}	McEwan and Anicich (2007)
R_{cn}235c	2	$C_2H_2^+$	+	C_2H_4	→	$C_4H_5^+$	+	H			3.17×10^{-10}	McEwan and Anicich (2007)
R_{cn}236a	2	$C_2H_2^+$	+	C_2H_6	→	$C_2H_4^+$	+	C_2H_4			2.48×10^{-10}	McEwan and Anicich (2007)
R_{cn}236b	2	$C_2H_2^+$	+	C_2H_6	→	$C_2H_5^+$	+	C_2H_3			1.24×10^{-10}	McEwan and Anicich (2007)
R_{cn}236c	2	$C_2H_2^+$	+	C_2H_6	→	$c-C_3H_3^+$	+	CH_3	+	H_2	8.28×10^{-11}	McEwan and Anicich (2007)
R_{cn}236d	2	$C_2H_2^+$	+	C_2H_6	→	$C_3H_4^+$	+	CH_4			1.38×10^{-11}	McEwan and Anicich (2007)
R_{cn}236e	2	$C_2H_2^+$	+	C_2H_6	→	$C_3H_5^+$	+	CH_3			7.45×10^{-10}	McEwan and Anicich (2007)
R_{cn}236f	2	$C_2H_2^+$	+	C_2H_6	→	$C_4H_5^+$	+	H_2	+	H	6.90×10^{-11}	McEwan and Anicich (2007)
R_{cn}236g	2	$C_2H_2^+$	+	C_2H_6	→	$C_4H_7^+$	+	H			1.24×10^{-10}	McEwan and Anicich (2007)
R_{cn}237a	2	$C_2H_2^+$	+	CH_3CCH	→	$C_3H_4^+$	+	C_2H_2			7.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}237b	2	$C_2H_2^+$	+	CH_3CCH	→	$C_3H_5^+$	+	C_2H			7.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}237c	2	$C_2H_2^+$	+	CH_3CCH	→	$C_5H_5^+$	+	H			6.75×10^{-10}	McEwan and Anicich (2007)
R_{cn}238	2	$C_2H_2^+$	+	C_3H_6	→	$C_3H_6^+$	+	C_2H_2			1.30×10^{-09}	McEwan and Anicich (2007)
R_{cn}239a	2	$C_2H_2^+$	+	C_3H_8	→	$C_3H_6^+$	+	C_2H_4			2.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}239b	2	$C_2H_2^+$	+	C_3H_8	→	$C_3H_7^+$	+	C_2H_3			7.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}239c	2	$C_2H_2^+$	+	C_3H_8	→	$C_3H_8^+$	+	C_2H_2			4.20×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
R_{cn}239d	2	$C_2H_2^+$	+	C_3H_8	→	$C_4H_7^+$	+	CH_3	7.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}240a	2	$C_2H_2^+$	+	C_4H_2	→	$C_4H_2^+$	+	C_2H_2	1.53×10^{-09}	McEwan and Anicich (2007)
R_{cn}240b	2	$C_2H_2^+$	+	C_4H_2	→	$C_6H_2^+$	+	H_2	1.70×10^{-10}	McEwan and Anicich (2007)
R_{cn}241a	2	$C_2H_2^+$	+	C_6H_2	→	$C_6H_2^+$	+	C_2H_2	5.00×10^{-10}	Wakelam et al. (2015)
R_{cn}241b	2	$C_2H_2^+$	+	C_6H_2	→	$C_8H_2^+$	+	H_2	5.00×10^{-10}	Wakelam et al. (2015)
R_{cn}241c	2	$C_2H_2^+$	+	C_6H_2	→	$C_8H_3^+$	+	H	5.00×10^{-10}	Wakelam et al. (2015)
R_{cn}242	2	$C_2H_2^+$	+	C_6H_6	→	$C_6H_6^+$	+	C_2H_2	1.00×10^{-09}	Rudolph and Melton (1960)
R_{cn}243a	2	$C_2H_2^+$	+	C_8H_2	→	$CXHYNZ^+$	+	H	1.00×10^{-09}	Wakelam et al. (2015)
R_{cn}243b	2	$C_2H_2^+$	+	C_8H_2	→	$CXHYNZ^+$	+	H_2	1.00×10^{-09}	Wakelam et al. (2015)
R_{cn}244a	2	$C_2H_2^+$	+	N	→	CH^+	+	HCN	2.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}244b	2	$C_2H_2^+$	+	N	→	C_2N^+	+	H_2	7.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}244c	2	$C_2H_2^+$	+	N	→	HC_2N^+	+	H	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}245a	2	$C_2H_2^+$	+	NH_3	→	NH_3^+	+	C_2H_2	2.14×10^{-09}	Anicich (1993)
R_{cn}245b	2	$C_2H_2^+$	+	NH_3	→	NH_4^+	+	C_2H	9.61×10^{-10}	Anicich (1993)
R_{cn}246a	2	$C_2H_2^+$	+	HCN	→	$HCNH^+$	+	C_2H	2.38×10^{-10}	McEwan and Anicich (2007)
R_{cn}246b	2	$C_2H_2^+$	+	HCN	→	HC_3NH^+	+	H	1.22×10^{-10}	McEwan and Anicich (2007)
R_{cn}247a	2	$C_2H_2^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	C_2H	1.30×10^{-09}	Anicich (1993)
R_{cn}247b	2	$C_2H_2^+$	+	CH_3NH_2	→	$CH_3NH_2^+$	+	C_2H_2	7.56×10^{-10}	Anicich (1993)
R_{cn}247c	2	$C_2H_2^+$	+	CH_3NH_2	→	$CH_2NH_2^+$	+	C_2H_3	6.48×10^{-10}	Anicich (1993)
R_{cn}248a	2	$C_2H_2^+$	+	CH_3CN	→	$C_2H_3NH^+$	+	C_2H	8.36×10^{-10}	McEwan and Anicich (2007)
R_{cn}248b	2	$C_2H_2^+$	+	CH_3CN	→	$C_3H_5^+$	+	CN	1.06×10^{-09}	McEwan and Anicich (2007)
R_{cn}248c	2	$C_2H_2^+$	+	CH_3CN	→	$C_3H_4^+$	+	HCN	1.06×10^{-09}	McEwan and Anicich (2007)
R_{cn}248d	2	$C_2H_2^+$	+	CH_3CN	→	$C_4H_5N^+$	+	hv	8.74×10^{-10}	McEwan and Anicich (2007)
R_{cn}249a	2	$C_2H_2^+$	+	HC_3N	→	$C_4H_2^+$	+	HCN	3.70×10^{-10}	McEwan and Anicich (2007)
R_{cn}249b	3	$C_2H_2^+$	+	HC_3N	→	$C_5H_3N^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									2.30×10^{-26}	
R_{cn}250a	2	$C_2H_2^+$	+	C_3H_3N	→	$c-C_3H_3^+$	+	CH_2CN	6.45×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}250b	2	$C_2H_2^+$	+	C_3H_3N	→	$C_3H_3N^+$	+	C_2H_2	2.36×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}250c	2	$C_2H_2^+$	+	C_3H_3N	→	$C_3H_3NH^+$	+	C_2H	6.45×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}250d	2	$C_2H_2^+$	+	C_3H_3N	→	$C_5H_5N^+$	+	hv	6.45×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}251	2	$C_2H_2^+$	+	C_3H_5N	→	$C_3H_5^+$	+	CH_2CN	4.20×10^{-09}	Edwards et al. (2008)
R_{cn}252a	2	$C_2H_2^+$	+	$O(^3P)$	→	HCO^+	+	CH	1.00×10^{-10}	Scott et al. (2000)
R_{cn}252b	2	$C_2H_2^+$	+	$O(^3P)$	→	HC_2O^+	+	H	1.00×10^{-10}	Scott et al. (2000)
R_{cn}253	2	$C_2H_2^+$	+	H_2O	→	H_3O^+	+	C_2H	2.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}254	2	$C_2H_2^+$	+	CO	→	$C_2H_2CO^+$	+	hv	2.30×10^{-14}	McEwan and Anicich (2007)
R_{cn}255	2	$C_2H_2^+$	+	H_2CO	→	CH_2O^+	+	C_2H_2	4.13×10^{-09}	Su-Chesnavich

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	Type	Reaction	k	Ref.
$R_{cn}256$	2	$C_2H_3^+$ + H → $C_2H_2^+$ + H_2	6.80×10^{-11}	McEwan and Anicich (2007)
$R_{cn}257$	3	$C_2H_3^+$ + H_2 → $C_2H_5^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.00×10^{-29}	
$R_{cn}258a$	2	$C_2H_3^+$ + CH_4 → $C_3H_5^+$ + H_2	1.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}258b$	3	$C_2H_3^+$ + CH_4 → $C_3H_7^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			3.00×10^{-28}	
$R_{cn}259a$	2	$C_2H_3^+$ + C_2H_2 → $C_4H_3^+$ + H_2	2.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}259b$	3	$C_2H_3^+$ + C_2H_2 → $C_4H_5^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.98×10^{-25}	
$R_{cn}260a$	2	$C_2H_3^+$ + C_2H_4 → $C_2H_5^+$ + C_2H_2	8.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}260b$	3	$C_2H_3^+$ + C_2H_4 → $C_4H_7^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			9.00×10^{-27}	
$R_{cn}261a$	2	$C_2H_3^+$ + C_2H_6 → $C_2H_5^+$ + C_2H_4	2.91×10^{-10}	McEwan and Anicich (2007)
$R_{cn}261b$	2	$C_2H_3^+$ + C_2H_6 → $C_3H_5^+$ + CH_4	2.48×10^{-10}	McEwan and Anicich (2007)
$R_{cn}261c$	2	$C_2H_3^+$ + C_2H_6 → $C_4H_7^+$ + H_2	8.06×10^{-11}	McEwan and Anicich (2007)
$R_{cn}262$	2	$C_2H_3^+$ + CH_3CCH → $C_3H_5^+$ + C_2H_2	1.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}263$	2	$C_2H_3^+$ + C_3H_6 → $C_4H_5^+$ + CH_4	8.70×10^{-10}	McEwan and Anicich (2007)
$R_{cn}264a$	2	$C_2H_3^+$ + C_3H_8 → $C_3H_7^+$ + C_2H_4	9.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}264b$	2	$C_2H_3^+$ + C_3H_8 → $C_4H_7^+$ + CH_4	5.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}265a$	2	$C_2H_3^+$ + C_4H_2 → $C_4H_3^+$ + C_2H_2	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}265b$	2	$C_2H_3^+$ + C_4H_2 → $C_6H_3^+$ + H_2	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}265c$	2	$C_2H_3^+$ + C_4H_2 → $C_6H_4^+$ + H	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}266a$	2	$C_2H_3^+$ + C_6H_2 → $C_6H_3^+$ + C_2H_2	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}266b$	2	$C_2H_3^+$ + C_6H_2 → $C_8H_3^+$ + H_2	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}266c$	2	$C_2H_3^+$ + C_6H_2 → $CXHYNZ^+$ + H	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}267$	2	$C_2H_3^+$ + C_6H_6 → $C_6H_7^+$ + C_2H_2	1.60×10^{-09}	Spanel et al. (1995)
$R_{cn}268a$	2	$C_2H_3^+$ + N → HC_2N^+ + H_2	1.98×10^{-11}	McEwan and Anicich (2007)
$R_{cn}268b$	2	$C_2H_3^+$ + N → HC_2NH^+ + H	2.20×10^{-12}	McEwan and Anicich (2007)
$R_{cn}269$	2	$C_2H_3^+$ + NH_3 → NH_4^+ + C_2H_2	2.48×10^{-09}	Anicich (1993)
$R_{cn}270$	2	$C_2H_3^+$ + HCN → $HCNH^+$ + C_2H_2	2.30×10^{-09}	McEwan and Anicich (2007)
$R_{cn}271$	2	$C_2H_3^+$ + HC_3N → HC_3NH^+ + C_2H_2	3.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}272a$	2	$C_2H_3^+$ + C_3H_3N → $C_3H_3NH^+$ + C_2H_2	3.52×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}272b$	2	$C_2H_3^+$ + C_3H_3N → $C_5H_5NH^+$ + hv	8.80×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}273$	2	$C_2H_3^+$ + C_3H_5N → $C_3H_5NH^+$ + C_2H_2	1.60×10^{-09}	Franklin et al. (1966)
$R_{cn}274a$	2	$C_2H_3^+$ + C_2N_2 → $C_2N_2H^+$ + C_2H_2	5.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}274b$	3	$C_2H_3^+$ + C_2N_2 → $AdductN^+$	1.00×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction	k	Ref.
			1.30×10^{-26}	
$R_{cn}275a$	2	$C_2H_3^+$ + $O(^3P)$ → CH_3^+ + CO	5.00×10^{-12}	Scott et al. (2000)
$R_{cn}275b$	2	$C_2H_3^+$ + $O(^3P)$ → CH_2CO^+ + H	8.50×10^{-11}	Scott et al. (2000)
$R_{cn}275c$	2	$C_2H_3^+$ + $O(^3P)$ → CH_3CO^+ + hv	1.00×10^{-11}	Scott et al. (2000)
$R_{cn}276$	2	$C_2H_3^+$ + H_2O → H_3O^+ + C_2H_2	1.11×10^{-09}	McEwan and Anicich (2007)
$R_{cn}277$	2	$C_2H_3^+$ + CO → $C_2H_3CO^+$	5.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}278$	2	$C_2H_4^+$ + H → $C_2H_3^+$ + H_2	3.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}279$	2	$C_2H_4^+$ + CH_3 → CH_3^+ + C_2H_4	1.00×10^{-09}	Capone et al. (1976)
$R_{cn}280$	3	$C_2H_4^+$ + CH_4 → Adduct$^+$	1.00×10^{-10}	Capone et al. (1976)
			1.00×10^{-29}	
$R_{cn}281a$	2	$C_2H_4^+$ + C_2H_2 → $c-C_3H_3^+$ + CH_3	6.47×10^{-10}	McEwan and Anicich (2007)
$R_{cn}281b$	2	$C_2H_4^+$ + C_2H_2 → $C_4H_5^+$ + H	1.93×10^{-10}	McEwan and Anicich (2007)
$R_{cn}281c$	3	$C_2H_4^+$ + C_2H_2 → $C_4H_6^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			3.10×10^{-27}	
$R_{cn}282a$	2	$C_2H_4^+$ + C_2H_4 → $C_3H_4^+$ + CH_4	4.74×10^{-11}	McEwan and Anicich (2007)
$R_{cn}282b$	2	$C_2H_4^+$ + C_2H_4 → $C_3H_5^+$ + CH_3	7.03×10^{-10}	McEwan and Anicich (2007)
$R_{cn}282c$	2	$C_2H_4^+$ + C_2H_4 → $C_4H_7^+$ + H	4.74×10^{-11}	McEwan and Anicich (2007)
$R_{cn}282d$	3	$C_2H_4^+$ + C_2H_4 → $C_4H_8^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			6.30×10^{-26}	
$R_{cn}283a$	2	$C_2H_4^+$ + C_2H_6 → $C_3H_6^+$ + CH_4	3.60×10^{-13}	McEwan and Anicich (2007)
$R_{cn}283b$	2	$C_2H_4^+$ + C_2H_6 → $C_3H_7^+$ + CH_3	4.79×10^{-12}	McEwan and Anicich (2007)
$R_{cn}284a$	2	$C_2H_4^+$ + CH_3CCH → $C_3H_4^+$ + C_2H_4	2.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}284b$	2	$C_2H_4^+$ + CH_3CCH → $C_4H_5^+$ + CH_3	3.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}284c$	2	$C_2H_4^+$ + CH_3CCH → $C_5H_7^+$ + H	5.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}285a$	2	$C_2H_4^+$ + C_3H_6 → $C_3H_6^+$ + C_2H_4	1.17×10^{-10}	McEwan and Anicich (2007)
$R_{cn}285b$	2	$C_2H_4^+$ + C_3H_6 → $C_4H_7^+$ + C_2H_3	1.30×10^{-11}	McEwan and Anicich (2007)
$R_{cn}286a$	2	$C_2H_4^+$ + C_3H_8 → $C_3H_6^+$ + C_2H_6	6.60×10^{-10}	McEwan and Anicich (2007)
$R_{cn}286b$	2	$C_2H_4^+$ + C_3H_8 → $C_3H_7^+$ + C_2H_5	5.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}287a$	2	$C_2H_4^+$ + C_4H_2 → $C_5H_3^+$ + CH_3	5.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}287b$	2	$C_2H_4^+$ + C_4H_2 → $C_6H_4^+$ + H_2	5.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}287c$	3	$C_2H_4^+$ + C_4H_2 → $C_6H_6^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			6.80×10^{-26}	
$R_{cn}288a$	2	$C_2H_4^+$ + C_6H_2 → $C_7H_3^+$ + CH_3	5.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}288b$	2	$C_2H_4^+$ + C_6H_2 → CXHYNZ$^+$ + H_2	5.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}289$	2	$C_2H_4^+$ + N → $C_2H_3N^+$ + H	3.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}290a$	2	$C_2H_4^+$ + NH_3 → NH_3^+ + C_2H_4	1.24×10^{-10}	Anicich (1993)

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	Type	Reaction	k	Ref.
R_{cn}290b	2	$C_2H_4^+$ + NH_3 → NH_4^+ + C_2H_3	1.94×10^{-09}	Anicich (1993)
R_{cn}291	3	$C_2H_4^+$ + HCN → $C_3H_5N^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			1.90×10^{-27}	
R_{cn}292	2	$C_2H_4^+$ + CH_3NH_2 → $CH_3NH_3^+$ + C_2H_3	6.46×10^{-10}	Petrank et al. (1992)
R_{cn}293	2	$C_2H_4^+$ + CH_3CN → $C_2H_3NH^+$ + C_2H_3	2.85×10^{-09}	Petrank et al. (1992)
R_{cn}294a	2	$C_2H_4^+$ + HC_3N → HC_3NH^+ + C_2H_3	1.27×10^{-09}	McEwan and Anicich (2007)
R_{cn}294b	2	$C_2H_4^+$ + HC_3N → $C_5H_3NH^+$ + H	2.25×10^{-10}	McEwan and Anicich (2007)
R_{cn}295	2	$C_2H_4^+$ + C_3H_5N → $C_3H_5NH^+$ + C_2H_3	4.50×10^{-09}	Edwards et al. (2008)
R_{cn}296a	2	$C_2H_4^+$ + $O(^3P)$ → CH_3^+ + HCO	1.08×10^{-10}	Scott et al. (2000)
R_{cn}296b	2	$C_2H_4^+$ + $O(^3P)$ → HCO^+ + CH_3	8.40×10^{-11}	Scott et al. (2000)
R_{cn}296c	2	$C_2H_4^+$ + $O(^3P)$ → CH_2O^+ + H_2 + H	2.40×10^{-11}	Scott et al. (2000)
R_{cn}296d	2	$C_2H_4^+$ + $O(^3P)$ → CH_2CO^+ + H_2	1.20×10^{-11}	Scott et al. (2000)
R_{cn}296e	2	$C_2H_4^+$ + $O(^3P)$ → CH_3CO^+ + H	1.20×10^{-11}	Scott et al. (2000)
R_{cn}297	2	$C_2H_5^+$ + H → $C_2H_4^+$ + H_2	1.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}298	3	$C_2H_5^+$ + H_2 → $C_2H_7^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			1.00×10^{-30}	
R_{cn}299	2	$C_2H_5^+$ + CH_3 → $C_2H_4^+$ + CH_4	5.00×10^{-10}	Capone et al. (1976)
R_{cn}300a	2	$C_2H_5^+$ + CH_4 → $C_3H_7^+$ + H_2	9.00×10^{-14}	McEwan and Anicich (2007)
R_{cn}300b	3	$C_2H_5^+$ + CH_4 → $C_2H_5^+CH_4$	1.00×10^{-10}	Dheandhanoo et al. (1984)
			$1.40\times10^{-30}T^{3.70}$	
R_{cn}301a	2	$C_2H_5^+$ + C_2H_2 → $c-C_3H_3^+$ + CH_4	6.84×10^{-11}	McEwan and Anicich (2007)
R_{cn}301b	2	$C_2H_5^+$ + C_2H_2 → $C_4H_5^+$ + H_2	1.22×10^{-10}	McEwan and Anicich (2007)
R_{cn}301c	3	$C_2H_5^+$ + C_2H_2 → $C_4H_7^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.50×10^{-24}	
R_{cn}302a	2	$C_2H_5^+$ + C_2H_4 → $C_3H_5^+$ + CH_4	3.55×10^{-10}	McEwan and Anicich (2007)
R_{cn}302b	3	$C_2H_5^+$ + C_2H_4 → $C_4H_9^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			1.34×10^{-25}	
R_{cn}303a	2	$C_2H_5^+$ + C_2H_6 → $C_3H_7^+$ + CH_4	5.46×10^{-12}	McEwan and Anicich (2007)
R_{cn}303b	2	$C_2H_5^+$ + C_2H_6 → $C_4H_9^+$ + H_2	3.35×10^{-11}	McEwan and Anicich (2007)
R_{cn}304a	2	$C_2H_5^+$ + CH_3CCH → $C_3H_5^+$ + C_2H_4	1.26×10^{-09}	McEwan and Anicich (2007)
R_{cn}304b	2	$C_2H_5^+$ + CH_3CCH → $C_4H_5^+$ + CH_4	1.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}305	2	$C_2H_5^+$ + CH_2CCH_2 → $C_3H_5^+$ + C_2H_4	1.40×10^{-09}	Langevin
R_{cn}306	2	$C_2H_5^+$ + C_3H_6 → $C_3H_7^+$ + C_2H_4	1.60×10^{-09}	Su-Chesnavich
R_{cn}307	2	$C_2H_5^+$ + C_3H_8 → $C_3H_7^+$ + C_2H_6	6.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}308	2	$C_2H_5^+$ + C_4H_2 → $C_4H_3^+$ + C_2H_4	1.50×10^{-09}	Langevin
R_{cn}309	2	$C_2H_5^+$ + C_5H_4 → $C_5H_5^+$ + C_2H_4	2.50×10^{-09}	Su-Chesnavich

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	Type	Reaction	k	Ref.
$R_{cn}310$	2	$C_2H_5^+ + C_6H_2 \rightarrow C_6H_3^+ + C_2H_4$	1.80×10^{-09}	Langevin
$R_{cn}311$	2	$C_2H_5^+ + C_6H_6 \rightarrow C_6H_7^+ + C_2H_4$	2.90×10^{-10}	Žabka et al. (2009)
$R_{cn}312$	2	$C_2H_5^+ + C_7H_4 \rightarrow C_7H_5^+ + C_2H_4$	2.90×10^{-09}	Su-Chesnavich
$R_{cn}313$	2	$C_2H_5^+ + C_7H_8 \rightarrow C_7H_9^+ + C_2H_4$	1.90×10^{-09}	Su-Chesnavich
$R_{cn}314$	2	$C_2H_5^+ + C_8H_2 \rightarrow C_8H_3^+ + C_2H_4$	2.10×10^{-09}	Langevin
$R_{cn}315$	2	$C_2H_5^+ + NH_3 \rightarrow NH_4^+ + C_2H_4$	2.09×10^{-09}	Anicich (1993)
$R_{cn}316$	2	$C_2H_5^+ + HCN \rightarrow HCNH^+ + C_2H_4$	2.70×10^{-09}	McEwan and Anicich (2007)
$R_{cn}317$	2	$C_2H_5^+ + HNC \rightarrow HCNH^+ + C_2H_4$	5.20×10^{-09}	Su-Chesnavich
$R_{cn}318a$	2	$C_2H_5^+ + CH_2NH \rightarrow CH_2NH_2^+ + C_2H_4$	2.57×10^{-09}	Edwards et al. (2008)
$R_{cn}318b$	2	$C_2H_5^+ + CH_2NH \rightarrow C_3H_7NH^+ + hv$	1.35×10^{-10}	Edwards et al. (2008)
$R_{cn}319a$	2	$C_2H_5^+ + CH_3NH_2 \rightarrow CH_3NH_3^+ + C_2H_4$	1.52×10^{-09}	Edwards et al. (2008)
$R_{cn}319b$	2	$C_2H_5^+ + CH_3NH_2 \rightarrow C_3H_9NH^+ + hv$	3.80×10^{-10}	Edwards et al. (2008)
$R_{cn}320$	2	$C_2H_5^+ + CH_3CN \rightarrow C_2H_3NH^+ + C_2H_4$	3.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}321$	2	$C_2H_5^+ + HC_3N \rightarrow HC_3NH^+ + C_2H_4$	3.55×10^{-09}	McEwan and Anicich (2007)
$R_{cn}322$	2	$C_2H_5^+ + C_3H_3N \rightarrow C_3H_3NH^+ + C_2H_4$	5.80×10^{-09}	Su-Chesnavich
$R_{cn}323$	2	$C_2H_5^+ + C_3H_5N \rightarrow C_3H_5NH^+ + C_2H_4$	6.00×10^{-09}	Su-Chesnavich
$R_{cn}324$	2	$C_2H_5^+ + C_4H_3N \rightarrow C_4H_3NH^+ + C_2H_4$	6.70×10^{-09}	Su-Chesnavich
$R_{cn}325$	2	$C_2H_5^+ + C_4H_5N \rightarrow C_4H_5NH^+ + C_2H_4$	5.40×10^{-09}	Su-Chesnavich
$R_{cn}326$	2	$C_2H_5^+ + HC_5N \rightarrow HC_5NH^+ + C_2H_4$	4.70×10^{-09}	Edwards et al. (2009)
$R_{cn}327$	2	$C_2H_5^+ + C_5H_5N \rightarrow C_5H_5NH^+ + C_2H_4$	3.60×10^{-09}	Su-Chesnavich
$R_{cn}328$	2	$C_2H_5^+ + C_6H_3N \rightarrow C_6H_3NH^+ + C_2H_4$	8.10×10^{-09}	Su-Chesnavich
$R_{cn}329$	2	$C_2H_5^+ + C_6H_7N \rightarrow C_6H_7NH^+ + C_2H_4$	2.40×10^{-09}	Su-Chesnavich
$R_{cn}330$	3	$C_2H_5^+ + N_2 \rightarrow C_2H_5^+N_2$	1.00×10^{-10}	Speller et al. (1995)
			1.00×10^{-27}	
$R_{cn}331$	2	$C_2H_5^+ + N_2H_4 \rightarrow N_2H_5^+ + C_2H_4$	1.20×10^{-09}	Su-Chesnavich
$R_{cn}332a$	2	$C_2H_5^+ + C_2N_2 \rightarrow C_2N_2H^+ + C_2H_4$	8.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}332b$	3	$C_2H_5^+ + C_2N_2 \rightarrow AdductN^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.00×10^{-24}	
$R_{cn}333$	2	$C_2H_5^+ + H_2O \rightarrow H_3O^+ + C_2H_4$	1.86×10^{-09}	McEwan and Anicich (2007)
$R_{cn}334$	2	$C_2H_5^+ + H_2CO \rightarrow CH_2OH^+ + C_2H_4$	3.10×10^{-09}	Anicich (1993)
$R_{cn}335$	3	$C_2H_5^+ + CO_2 \rightarrow Adduct^+$	1.00×10^{-10}	Hiraoka et al. (2003)
			1.00×10^{-25}	
$R_{cn}336$	2	$C_2H_5^+CH_4 + N_2 \rightarrow C_2H_5^+ + CH_4 + N_2$	$1.00\times10^{-09}T^{3.70}e^{1650.0/T}$	Dheandhanoo et al. (1984)
$R_{cn}337$	2	$C_2H_5^+N_2 + N_2 \rightarrow C_2H_5^+ + N_2 + N_2$	4.00×10^{-14}	Speller et al. (1995)
$R_{cn}338$	2	$C_2H_6^+ + H \rightarrow C_2H_5^+ + H_2$	1.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}339$	2	$C_2H_6^+ + CH_3 \rightarrow CH_3^+ + C_2H_6$	1.00×10^{-09}	Capone et al. (1976)

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	Type	Reaction	k	Ref.
$R_{cn}340$	3	$C_2H_6^+ + CH_4 \rightarrow Adduct^+$	1.00×10^{-10} 1.00×10^{-29}	Capone et al. (1976)
$R_{cn}341a$	2	$C_2H_6^+ + C_2H_2 \rightarrow C_2H_5^+ + C_2H_3$	2.47×10^{-10}	McEwan and Anicich (2007)
$R_{cn}341b$	2	$C_2H_6^+ + C_2H_2 \rightarrow C_3H_5^+ + CH_3$	9.10×10^{-10}	McEwan and Anicich (2007)
$R_{cn}341c$	2	$C_2H_6^+ + C_2H_2 \rightarrow C_4H_7^+ + H$	1.43×10^{-10}	McEwan and Anicich (2007)
$R_{cn}342$	2	$C_2H_6^+ + C_2H_4 \rightarrow C_2H_4^+ + C_2H_6$	1.15×10^{-09}	McEwan and Anicich (2007)
$R_{cn}343a$	2	$C_2H_6^+ + C_2H_6 \rightarrow C_3H_8^+ + CH_4$	7.98×10^{-12}	McEwan and Anicich (2007)
$R_{cn}343b$	2	$C_2H_6^+ + C_2H_6 \rightarrow C_3H_9^+ + CH_3$	1.10×10^{-11}	McEwan and Anicich (2007)
$R_{cn}344a$	2	$C_2H_6^+ + NH_3 \rightarrow NH_3^+ + C_2H_6$	6.24×10^{-10}	Huntress (1977)
$R_{cn}344b$	2	$C_2H_6^+ + NH_3 \rightarrow NH_4^+ + C_2H_5$	1.61×10^{-09}	Huntress (1977)
$R_{cn}345a$	2	$C_2H_6^+ + HCN \rightarrow HCNH^+ + C_2H_5$	1.14×10^{-09}	McEwan and Anicich (2007)
$R_{cn}345b$	2	$C_2H_6^+ + HCN \rightarrow C_3H_5NH^+ + H$	6.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}346$	2	$C_2H_6^+ + H_2O \rightarrow H_3O^+ + C_2H_5$	2.95×10^{-09}	McEwan and Anicich (2007)
$R_{cn}347$	2	$C_2H_7^+ + H \rightarrow C_2H_6^+ + H_2$	1.00×10^{-10}	Capone et al. (1976)
$R_{cn}348$	2	$C_2H_7^+ + CH_3 \rightarrow C_2H_6^+ + CH_4$	5.00×10^{-10}	Capone et al. (1976)
$R_{cn}349$	3	$C_2H_7^+ + CH_4 \rightarrow C_2H_7^+CH_4$	1.00×10^{-10} 1.00×10^{-29}	Molina-Cuberos et al. (1999a)
$R_{cn}350$	2	$C_2H_7^+ + NH_2 \rightarrow C_2H_6^+ + NH_3$	1.00×10^{-10}	Capone et al. (1979)
$R_{cn}351$	2	$C_2H_7^+ + NH_3 \rightarrow NH_4^+ + C_2H_6$	1.80×10^{-09}	Hemsworth et al. (1974)
$R_{cn}352a$	2	$C_2H_7^+ + HCN \rightarrow HCNH^+ + C_2H_6$	1.98×10^{-09}	Mackay et al. (1980)
$R_{cn}352b$	2	$C_2H_7^+ + HCN \rightarrow C_2H_3NH^+ + CH_4$	2.20×10^{-10}	Mackay et al. (1980)
$R_{cn}353$	2	$C_2H_7^+CH_4 + N_2 \rightarrow C_2H_7^+ + CH_4 + N_2$	9.00×10^{-11}	Speller et al. (1995)
$R_{cn}354a$	2	$C_3H^+ + H_2 \rightarrow C_3H_2^+ + H$	$1.40\times10^{-11}T^{1.05}$	Savić and Gerlich (2005)
$R_{cn}354b$	2	$C_3H^+ + H_2 \rightarrow c{-}C_3H_3^+ + hv$	$1.15\times10^{-11}T^{1.10}$	Savić and Gerlich (2005)
$R_{cn}354c$	2	$C_3H^+ + H_2 \rightarrow l{-}C_3H_3^+ + hv$	$1.15\times10^{-11}T^{1.10}$	Savić and Gerlich (2005)
$R_{cn}354d$	3	$C_3H^+ + H_2 \rightarrow c{-}C_3H_3^+$	1.00×10^{-10} 2.30×10^{-27}	McEwan and Anicich (2007)
$R_{cn}355a$	2	$C_3H^+ + CH_4 \rightarrow C_2H_3^+ + C_2H_2$	7.83×10^{-10}	McEwan and Anicich (2007)
$R_{cn}355b$	2	$C_3H^+ + CH_4 \rightarrow C_4H_3^+ + H_2$	8.70×10^{-11}	McEwan and Anicich (2007)
$R_{cn}355c$	3	$C_3H^+ + CH_4 \rightarrow C_4H_5^+$	1.00×10^{-10} 3.70×10^{-26}	McEwan and Anicich (2007)
$R_{cn}356$	2	$C_3H^+ + C_2H_2 \rightarrow C_5H_2^+ + H$	8.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}357a$	2	$C_3H^+ + C_2H_4 \rightarrow c{-}C_3H_3^+ + C_2H_2$	9.02×10^{-10}	McEwan and Anicich (2007)
$R_{cn}357b$	2	$C_3H^+ + C_2H_4 \rightarrow C_5H_3^+ + H_2$	4.75×10^{-11}	McEwan and Anicich (2007)
$R_{cn}357c$	3	$C_3H^+ + C_2H_4 \rightarrow C_5H_5^+$	1.00×10^{-10} 6.80×10^{-26}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
$R_{cn}358$	2	C_3H^+	+	CH_3CCH	→	$C_4H_3^+$	+	C_2H_2	1.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}359$	2	C_3H^+	+	CH_2CCH_2	→	$C_4H_3^+$	+	C_2H_2	1.40×10^{-09}	Anicich (1993)
$R_{cn}360a$	2	C_3H^+	+	C_3H_6	→	$C_4H_4^+$	+	C_2H_3	1.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}360b$	2	C_3H^+	+	C_3H_6	→	$C_4H_3^+$	+	C_2H_4	8.80×10^{-10}	McEwan and Anicich (2007)
$R_{cn}361$	2	C_3H^+	+	C_3H_8	→	$CXHYNZ^+$			1.60×10^{-09}	McEwan and Anicich (2007)
$R_{cn}362a$	2	C_3H^+	+	C_4H_2	→	$C_5H_2^+$	+	C_2H	1.02×10^{-09}	McEwan and Anicich (2007)
$R_{cn}362b$	2	C_3H^+	+	C_4H_2	→	C_5H^+	+	C_2H_2	1.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}362c$	2	C_3H^+	+	C_4H_2	→	$C_4H_2^+$	+	C_3H	6.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}363a$	2	C_3H^+	+	N	→	C_3N^+	+	H	2.43×10^{-10}	McEwan and Anicich (2007)
$R_{cn}363b$	2	C_3H^+	+	N	→	HC_3N^+			2.70×10^{-11}	McEwan and Anicich (2007)
$R_{cn}364a$	2	C_3H^+	+	NH_3	→	NH_3^+	+	C_3H	3.30×10^{-10}	Anicich and McEwan (1997)
$R_{cn}364b$	2	C_3H^+	+	NH_3	→	NH_4^+	+	C_3	7.43×10^{-10}	Anicich and McEwan (1997)
$R_{cn}364c$	2	C_3H^+	+	NH_3	→	$HCNH^+$	+	C_2H_2	4.13×10^{-10}	Anicich and McEwan (1997)
$R_{cn}364d$	2	C_3H^+	+	NH_3	→	$C_3H_3N^+$	+	H	1.65×10^{-10}	Anicich and McEwan (1997)
$R_{cn}365a$	2	C_3H^+	+	HCN	→	$HCNH^+$	+	C_3	3.60×10^{-12}	McEwan and Anicich (2007)
$R_{cn}365b$	2	C_3H^+	+	HCN	→	HC_4NH^+	+	hv	3.64×10^{-11}	McEwan and Anicich (2007)
$R_{cn}365c$	3	C_3H^+	+	HCN	→	HC_4NH^+			1.00×10^{-10}	McEwan and Anicich (2007)
									8.80×10^{-26}	
$R_{cn}366a$	2	C_3H^+	+	CH_3CN	→	$C_2H_3^+$	+	HC_3N	6.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}366b$	2	C_3H^+	+	CH_3CN	→	$C_2H_3NH^+$	+	C_3	4.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}366c$	2	C_3H^+	+	CH_3CN	→	HC_3NH^+	+	C_2H_2	9.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}366d$	2	C_3H^+	+	CH_3CN	→	$C_5H_3NH^+$			9.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}367$	2	C_3H^+	+	HC_3N	→	HC_6NH^+	+	hv	1.25×10^{-09}	McEwan and Anicich (2007)
$R_{cn}368$	2	C_3H^+	+	C_3H_3N	→	$C_6H_3NH^+$	+	hv	4.50×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}369$	2	C_3H^+	+	C_2N_2	→	$HC_5N_2^+$	+	hv	4.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}370a$	2	C_3H^+	+	H_2O	→	HCO^+	+	C_2H_2	4.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}370b$	2	C_3H^+	+	H_2O	→	$C_2H_3^+$	+	CO	4.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}371$	3	C_3H^+	+	CO	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									2.90×10^{-27}	
$R_{cn}372a$	2	C_3H^+	+	H_2CO	→	$c{-}C_3H_3^+$	+	CO	5.00×10^{-10}	Prodnuk et al. (1992)
$R_{cn}372b$	2	C_3H^+	+	H_2CO	→	$l{-}C_3H_3^+$	+	CO	5.00×10^{-10}	Prodnuk et al. (1992)
$R_{cn}373$	2	$C_3H_2^+$	+	CH_4	→	$c{-}C_3H_3^+$	+	CH_3	5.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}374$	2	$C_3H_2^+$	+	C_2H_2	→	$C_5H_3^+$	+	H	9.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}375a$	2	$C_3H_2^+$	+	C_2H_4	→	$c{-}C_3H_3^+$	+	C_2H_3	2.75×10^{-10}	McEwan and Anicich (2007)
$R_{cn}375b$	2	$C_3H_2^+$	+	C_2H_4	→	$C_3H_4^+$	+	C_2H_2	6.60×10^{-10}	McEwan and Anicich (2007)
$R_{cn}375c$	2	$C_3H_2^+$	+	C_2H_4	→	$C_5H_5^+$	+	H	2.75×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
R_{cn}376a	2	$C_3H_2^+$	+	CH_3CCH	→	$C_4H_2^+$	+	C_2H_4	1.17×10^{-10}	McEwan and Anicich (2007)
R_{cn}376b	2	$C_3H_2^+$	+	CH_3CCH	→	$C_4H_3^+$	+	C_2H_3	1.56×10^{-10}	McEwan and Anicich (2007)
R_{cn}376c	2	$C_3H_2^+$	+	CH_3CCH	→	$C_4H_4^+$	+	C_2H_2	5.33×10^{-10}	McEwan and Anicich (2007)
R_{cn}376d	2	$C_3H_2^+$	+	CH_3CCH	→	$C_5H_3^+$	+	CH_3	2.34×10^{-10}	McEwan and Anicich (2007)
R_{cn}376e	2	$C_3H_2^+$	+	CH_3CCH	→	$C_6H_5^+$	+	H	2.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}377a	2	$C_3H_2^+$	+	CH_2CCH_2	→	$C_4H_2^+$	+	C_2H_4	5.60×10^{-11}	Anicich (1993)
R_{cn}377b	2	$C_3H_2^+$	+	CH_2CCH_2	→	$C_4H_3^+$	+	C_2H_3	1.96×10^{-10}	Anicich (1993)
R_{cn}377c	2	$C_3H_2^+$	+	CH_2CCH_2	→	$C_4H_4^+$	+	C_2H_2	7.00×10^{-10}	Anicich (1993)
R_{cn}377d	2	$C_3H_2^+$	+	CH_2CCH_2	→	$C_5H_3^+$	+	CH_3	1.26×10^{-10}	Anicich (1993)
R_{cn}377e	2	$C_3H_2^+$	+	CH_2CCH_2	→	$C_6H_5^+$	+	H	2.94×10^{-10}	Anicich (1993)
R_{cn}378a	2	$C_3H_2^+$	+	C_3H_6	→	$c-C_3H_3^+$	+	C_3H_5	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}378b	2	$C_3H_2^+$	+	C_3H_6	→	$C_4H_4^+$	+	C_2H_4	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}378c	2	$C_3H_2^+$	+	C_3H_6	→	$C_5H_5^+$	+	CH_3	2.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}378d	2	$C_3H_2^+$	+	C_3H_6	→	$C_6H_7^+$	+	H	4.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}379a	2	$C_3H_2^+$	+	C_3H_8	→	$c-C_3H_3^+$	+	C_3H_7	3.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}379b	2	$C_3H_2^+$	+	C_3H_8	→	$C_3H_7^+$	+	C_3H_3	5.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}379c	2	$C_3H_2^+$	+	C_3H_8	→	$C_4H_6^+$	+	C_2H_4	1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}379d	2	$C_3H_2^+$	+	C_3H_8	→	$C_4H_8^+$	+	C_2H_2	6.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}379e	2	$C_3H_2^+$	+	C_3H_8	→	$C_5H_7^+$	+	CH_3	1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}380a	2	$C_3H_2^+$	+	C_4H_2	→	$C_7H_3^+$	+	H	3.00×10^{-10}	Wakelam et al. (2015)
R_{cn}380b	2	$C_3H_2^+$	+	C_4H_2	→	$C_7H_2^+$	+	H_2	3.00×10^{-10}	Wakelam et al. (2015)
R_{cn}381a	2	$C_3H_2^+$	+	C_6H_2	→	$CXHYNZ^+$	+	H	3.00×10^{-10}	Wakelam et al. (2015)
R_{cn}381b	2	$C_3H_2^+$	+	C_6H_2	→	$CXHYNZ^+$	+	H_2	3.00×10^{-10}	Wakelam et al. (2015)
R_{cn}382a	2	$C_3H_2^+$	+	N	→	$C_2H_2^+$	+	CN	3.74×10^{-11}	McEwan and Anicich (2007)
R_{cn}382b	2	$C_3H_2^+$	+	N	→	$HCNH^+$	+	C_2	6.60×10^{-12}	McEwan and Anicich (2007)
R_{cn}383a	2	$C_3H_2^+$	+	NH_3	→	NH_4^+	+	C_3H	4.60×10^{-10}	Prodnuk et al. (1992)
R_{cn}383b	2	$C_3H_2^+$	+	NH_3	→	CH_2NH^+	+	C_2H_2	1.15×10^{-10}	Prodnuk et al. (1992)
R_{cn}383c	2	$C_3H_2^+$	+	NH_3	→	$C_2H_5^+$	+	CN	1.15×10^{-10}	Prodnuk et al. (1992)
R_{cn}383d	2	$C_3H_2^+$	+	NH_3	→	$C_3H_3NH^+$	+	H	1.38×10^{-09}	Prodnuk et al. (1992)
R_{cn}383e	2	$C_3H_2^+$	+	NH_3	→	$C_3H_5N^+$	+	hv	2.30×10^{-10}	Prodnuk et al. (1992)
R_{cn}384	2	$C_3H_2^+$	+	HCN	→	$CXHYNZ^+$			1.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}385a	2	$C_3H_2^+$	+	C_3H_3N	→	HC_4NH^+	+	C_2H_3	5.00×10^{-11}	Prodnuk et al. (1992)
R_{cn}385b	2	$C_3H_2^+$	+	C_3H_3N	→	$C_5H_4^+$	+	HCN	5.00×10^{-11}	Prodnuk et al. (1992)
R_{cn}385c	2	$C_3H_2^+$	+	C_3H_3N	→	$C_6H_5N^+$	+	hv	9.00×10^{-10}	Prodnuk et al. (1992)
R_{cn}386a	2	$C_3H_2^+$	+	H_2CO	→	$c-C_3H_3^+$	+	HCO	3.00×10^{-10}	Prodnuk et al. (1992)
R_{cn}386b	2	$C_3H_2^+$	+	H_2CO	→	$l-C_3H_3^+$	+	HCO	3.00×10^{-10}	Prodnuk et al. (1992)

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	Type	Reaction									k	Ref.
R_{cn}386c	2	$C_3H_2^+$	+	H_2CO	$\rightarrow$	CH_2CO^+	+	C_2H_2			4.00×10^{-10}	Prodnuk et al. (1992)
R_{cn}387	2	$c-C_3H_3^+$	+	C_7H_8	$\rightarrow$	$CXHYNZ^+$					3.80×10^{-11}	Adams et al. (2010)
R_{cn}388	2	$c-C_3H_3^+$	+	C_3H_3N	$\rightarrow$	$C_6H_5NH^+$	+	hv			5.00×10^{-11}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}389a	2	$l-C_3H_3^+$	+	C_2H_2	$\rightarrow$	$c-C_3H_3^+$	+	C_2H_2			2.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}389b	3	$l-C_3H_3^+$	+	C_2H_2	$\rightarrow$	$C_5H_5^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											2.50×10^{-24}	
R_{cn}390a	2	$l-C_3H_3^+$	+	C_2H_4	$\rightarrow$	$C_5H_5^+$	+	H_2			5.50×10^{-10}	Anicich and McEwan (1997)
R_{cn}390b	2	$l-C_3H_3^+$	+	C_2H_4	$\rightarrow$	$C_5H_7^+$	+	hv			5.50×10^{-10}	Anicich and McEwan (1997)
R_{cn}391	3	$l-C_3H_3^+$	+	CH_3CCH	$\rightarrow$	$C_6H_7^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											2.20×10^{-26}	
R_{cn}392a	2	$l-C_3H_3^+$	+	C_3H_8	$\rightarrow$	$C_3H_7^+$	+	CH_3CCH			8.04×10^{-10}	McEwan and Anicich (2007)
R_{cn}392b	2	$l-C_3H_3^+$	+	C_3H_8	$\rightarrow$	$C_4H_7^+$	+	C_2H_4			3.96×10^{-10}	McEwan and Anicich (2007)
R_{cn}393a	2	$l-C_3H_3^+$	+	C_4H_2	$\rightarrow$	$c-C_3H_3^+$	+	C_4H_2			3.36×10^{-10}	McEwan and Anicich (2007)
R_{cn}393b	2	$l-C_3H_3^+$	+	C_4H_2	$\rightarrow$	$C_5H_3^+$	+	C_2H_2			1.06×10^{-09}	McEwan and Anicich (2007)
R_{cn}393c	3	$l-C_3H_3^+$	+	C_4H_2	$\rightarrow$	$C_7H_5^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											6.20×10^{-26}	
R_{cn}394a	2	$l-C_3H_3^+$	+	C_6H_6	$\rightarrow$	$C_7H_7^+$	+	C_2H_2			7.00×10^{-10}	Smyth et al. (1981),Smyth et al. (1982)
R_{cn}394b	2	$l-C_3H_3^+$	+	C_6H_6	$\rightarrow$	$CXHYNZ^+$	+	H_2			7.00×10^{-10}	Smyth et al. (1981),Smyth et al. (1982)
R_{cn}395a	2	$l-C_3H_3^+$	+	C_7H_8	$\rightarrow$	$Adduct^+$	+	hv			8.17×10^{-10}	Adams et al. (2010)
R_{cn}395b	2	$l-C_3H_3^+$	+	C_7H_8	$\rightarrow$	$C_7H_7^+$	+	CH_3CCH			5.32×10^{-10}	Adams et al. (2010)
R_{cn}395c	2	$l-C_3H_3^+$	+	C_7H_8	$\rightarrow$	$CXHYNZ^+$	+	H_2			3.23×10^{-10}	Adams et al. (2010)
R_{cn}395d	2	$l-C_3H_3^+$	+	C_7H_8	$\rightarrow$	$CXHYNZ^+$	+	H_2	+	H	2.28×10^{-10}	Adams et al. (2010)
R_{cn}396	2	$l-C_3H_3^+$	+	N	$\rightarrow$	HC_3N^+	+	H_2			5.80×10^{-11}	McEwan and Anicich (2007)
R_{cn}397a	2	$l-C_3H_3^+$	+	NH_3	$\rightarrow$	NH_4^+	+	C_3H_2			1.80×10^{-10}	Anicich and McEwan (1997)
R_{cn}397b	2	$l-C_3H_3^+$	+	NH_3	$\rightarrow$	$HCNH^+$	+	C_2H_4			1.20×10^{-10}	Anicich and McEwan (1997)
R_{cn}397c	3	$l-C_3H_3^+$	+	NH_3	$\rightarrow$	$C_3H_5NH^+$					1.00×10^{-10}	Anicich and McEwan (1997)
											5.00×10^{-24}	
R_{cn}398	3	$l-C_3H_3^+$	+	HCN	$\rightarrow$	$C_4H_3NH^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											4.90×10^{-26}	
R_{cn}399a	2	$l-C_3H_3^+$	+	CH_3CN	$\rightarrow$	$CXHYNZ^+$					1.60×10^{-10}	Anicich and McEwan (1997)
R_{cn}399b	3	$l-C_3H_3^+$	+	CH_3CN	$\rightarrow$	$C_5H_5NH^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											3.40×10^{-25}	
R_{cn}400a	2	$l-C_3H_3^+$	+	HC_3N	$\rightarrow$	$CXHYNZ^+$					9.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}400b	2	$l-C_3H_3^+$	+	HC_3N	$\rightarrow$	$C_6H_3NH^+$	+	hv			3.50×10^{-12}	McEwan and Anicich (2007)
R_{cn}401	2	$l-C_3H_3^+$	+	C_3H_3N	$\rightarrow$	$C_6H_5NH^+$	+	hv			2.00×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}402	2	$l-C_3H_3^+$	+	C_3H_5N	$\rightarrow$	$C_6H_7NH^+$	+	hv			3.00×10^{-10}	Edwards et al. (2008)

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	Type	Reaction									k	Ref.
$R_{cn}403a$	2	$l-C_3H_3^+$	+	C_4H_5N	→	$C_7H_7NH^+$	+	hv			1.18×10^{-10}	Mathews and Adams (2011)
$R_{cn}403b$	2	$l-C_3H_3^+$	+	C_4H_5N	→	$C_4H_5N^+$	+	C_3H_3			2.24×10^{-11}	Mathews and Adams (2011)
$R_{cn}404a$	2	$l-C_3H_3^+$	+	C_5H_5N	→	$AdductN^+$	+	hv			1.76×10^{-09}	Adams et al. (2010)
$R_{cn}404b$	2	$l-C_3H_3^+$	+	C_5H_5N	→	$C_5H_5NH^+$	+	C_3H_2			4.40×10^{-10}	Adams et al. (2010)
$R_{cn}405a$	2	$l-C_3H_3^+$	+	$O(^3P)$	→	$C_2H_2CO^+$	+	H			4.50×10^{-11}	Scott et al. (2000)
$R_{cn}405b$	2	$l-C_3H_3^+$	+	$O(^3P)$	→	HC_3O^+	+	H_2			2.25×10^{-11}	Scott et al. (2000)
$R_{cn}405c$	2	$l-C_3H_3^+$	+	$O(^3P)$	→	$C_2H_3^+$	+	CO			4.50×10^{-11}	Scott et al. (2000)
$R_{cn}405d$	2	$l-C_3H_3^+$	+	$O(^3P)$	→	$C_2H_2^+$	+	HCO			3.75×10^{-11}	Scott et al. (2000)
$R_{cn}406a$	2	$l-C_3H_3^+$	+	H_2O	→	H_3O^+	+	C_3H_2			3.20×10^{-12}	McEwan and Anicich (2007)
$R_{cn}406b$	2	$l-C_3H_3^+$	+	H_2O	→	$C_2H_3CO^+$	+	H_2			2.40×10^{-12}	McEwan and Anicich (2007)
$R_{cn}406c$	2	$l-C_3H_3^+$	+	H_2O	→	$C_2H_5CO^+$	+	hv			2.40×10^{-12}	McEwan and Anicich (2007)
$R_{cn}407$	2	$l-C_3H_3^+$	+	H_2CO	→	$C_3H_5^+$	+	CO			1.00×10^{-09}	Prodnuk et al. (1992)
$R_{cn}408$	2	$C_3H_4^+$	+	H	→	$c-C_3H_3^+$	+	H_2			3.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}409a$	2	$C_3H_4^+$	+	C_2H_2	→	$C_5H_5^+$	+	H			4.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}409b$	3	$C_3H_4^+$	+	C_2H_2	→	$C_5H_6^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											3.30×10^{-26}	
$R_{cn}410a$	2	$C_3H_4^+$	+	C_2H_4	→	$C_4H_5^+$	+	CH_3			9.13×10^{-11}	McEwan and Anicich (2007)
$R_{cn}410b$	2	$C_3H_4^+$	+	C_2H_4	→	$C_5H_7^+$	+	H			7.39×10^{-10}	McEwan and Anicich (2007)
$R_{cn}410c$	3	$C_3H_4^+$	+	C_2H_4	→	$C_5H_8^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											8.40×10^{-27}	
$R_{cn}411a$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_3H_5^+$	+	C_3H_3			1.98×10^{-10}	McEwan and Anicich (2007)
$R_{cn}411b$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_4H_4^+$	+	C_2H_4			2.20×10^{-11}	McEwan and Anicich (2007)
$R_{cn}411c$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_4H_6^+$	+	C_2H_2			2.20×10^{-11}	McEwan and Anicich (2007)
$R_{cn}411d$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_5H_5^+$	+	CH_3			2.20×10^{-11}	McEwan and Anicich (2007)
$R_{cn}411e$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_6H_5^+$	+	H_2	+	H	8.80×10^{-11}	McEwan and Anicich (2007)
$R_{cn}411f$	2	$C_3H_4^+$	+	CH_3CCH	→	$C_6H_7^+$	+	H			7.48×10^{-10}	McEwan and Anicich (2007)
$R_{cn}412a$	2	$C_3H_4^+$	+	CH_2CCH_2	→	$C_4H_4^+$	+	C_2H_4			5.50×10^{-11}	Anicich (1993)
$R_{cn}412b$	2	$C_3H_4^+$	+	CH_2CCH_2	→	$C_4H_6^+$	+	C_2H_2			1.10×10^{-11}	Anicich (1993)
$R_{cn}412c$	2	$C_3H_4^+$	+	CH_2CCH_2	→	$C_5H_5^+$	+	CH_3			1.10×10^{-11}	Anicich (1993)
$R_{cn}412d$	2	$C_3H_4^+$	+	CH_2CCH_2	→	$C_6H_5^+$	+	H_2	+	H	7.70×10^{-11}	Anicich (1993)
$R_{cn}412e$	2	$C_3H_4^+$	+	CH_2CCH_2	→	$C_6H_7^+$	+	H			9.57×10^{-10}	Anicich (1993)
$R_{cn}413$	2	$C_3H_4^+$	+	C_3H_6	→	$C_4H_6^+$	+	C_2H_4			1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}414$	2	$C_3H_4^+$	+	C_3H_8	→	$CXHYNZ^+$					1.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}415a$	2	$C_3H_4^+$	+	C_4H_2	→	$C_5H_4^+$	+	C_2H_2			1.26×10^{-10}	McEwan and Anicich (2007)
$R_{cn}415b$	2	$C_3H_4^+$	+	C_4H_2	→	$C_7H_5^+$	+	H			1.67×10^{-09}	McEwan and Anicich (2007)
$R_{cn}415c$	3	$C_3H_4^+$	+	C_4H_2	→	$C_7H_6^+$					1.00×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
									1.00×10^{-26}	
R_{cn}416a	2	$C_3H_4^+$	+	N	→	$C_3H_3N^+$	+	H	1.00×10^{-10}	Wakelam et al. (2015)
R_{cn}416b	2	$C_3H_4^+$	+	N	→	HC_3NH^+	+	H_2	1.00×10^{-10}	Wakelam et al. (2015)
R_{cn}417a	2	$C_3H_4^+$	+	NH_3	→	NH_3^+	+	CH_3CCH	2.10×10^{-10}	Operti et al. (2004)
R_{cn}417b	2	$C_3H_4^+$	+	NH_3	→	NH_4^+	+	C_3H_3	1.29×10^{-09}	Operti et al. (2004)
R_{cn}418a	2	$C_3H_4^+$	+	HC_3N	→	HC_3NH^+	+	C_3H_3	1.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}418b	3	$C_3H_4^+$	+	HC_3N	→	$C_6H_5N^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									4.30×10^{-26}	
R_{cn}419a	2	$C_3H_4^+$	+	C_3H_5N	→	$C_3H_5NH^+$	+	C_3H_3	3.71×10^{-09}	Edwards et al. (2008)
R_{cn}419b	2	$C_3H_4^+$	+	C_3H_5N	→	$C_6H_9N^+$	+	hv	1.95×10^{-10}	Edwards et al. (2008)
R_{cn}420a	2	$C_3H_5^+$	+	H	→	$C_2H_2^+$	+	CH_4	5.00×10^{-13}	McEwan and Anicich (2007)
R_{cn}420b	2	$C_3H_5^+$	+	H	→	$C_2H_3^+$	+	CH_3	9.50×10^{-12}	McEwan and Anicich (2007)
R_{cn}421	2	$C_3H_5^+$	+	H_2	→	$C_3H_7^+$	+	hv	1.00×10^{-13}	Lin et al. (2013)
R_{cn}422a	2	$C_3H_5^+$	+	C_2H_2	→	$C_5H_5^+$	+	H_2	3.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}422b	3	$C_3H_5^+$	+	C_2H_2	→	$C_5H_7^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									3.20×10^{-26}	
R_{cn}423a	2	$C_3H_5^+$	+	C_2H_4	→	$C_5H_7^+$	+	H_2	8.90×10^{-11}	McEwan and Anicich (2007)
R_{cn}423b	3	$C_3H_5^+$	+	C_2H_4	→	$C_5H_9^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.80×10^{-23}	
R_{cn}424a	2	$C_3H_5^+$	+	CH_3CCH	→	$C_6H_7^+$	+	H_2	3.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}424b	3	$C_3H_5^+$	+	CH_3CCH	→	$C_6H_9^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									6.80×10^{-26}	
R_{cn}425a	2	$C_3H_5^+$	+	C_3H_6	→	$C_4H_7^+$	+	C_2H_4	1.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}425b	3	$C_3H_5^+$	+	C_3H_6	→	$C_6H_{11}^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									6.40×10^{-26}	
R_{cn}426a	2	$C_3H_5^+$	+	C_3H_8	→	$C_3H_7^+$	+	C_3H_6	3.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}426b	2	$C_3H_5^+$	+	C_3H_8	→	$C_4H_7^+$	+	C_2H_6	2.82×10^{-11}	McEwan and Anicich (2007)
R_{cn}426c	2	$C_3H_5^+$	+	C_3H_8	→	$C_4H_9^+$	+	C_2H_4	5.17×10^{-11}	McEwan and Anicich (2007)
R_{cn}426d	3	$C_3H_5^+$	+	C_3H_8	→	$C_6H_{13}^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									3.20×10^{-27}	
R_{cn}427a	2	$C_3H_5^+$	+	C_4H_2	→	$C_5H_5^+$	+	C_2H_2	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}427b	3	$C_3H_5^+$	+	C_4H_2	→	$C_7H_7^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									8.30×10^{-26}	
R_{cn}428a	2	$C_3H_5^+$	+	C_6H_6	→	$C_7H_7^+$	+	C_2H_4	1.03×10^{-09}	Houriet et al. (1978)
R_{cn}428b	2	$C_3H_5^+$	+	C_6H_6	→	$C_6H_7^+$	+	CH_3CCH	1.15×10^{-10}	Houriet et al. (1978)
R_{cn}429a	2	$C_3H_5^+$	+	C_7H_8	→	$CXHYNZ^+$	+	C_2H_4	1.04×10^{-09}	Houriet et al. (1978)

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	Type	Reaction							k	Ref.
R_{cn}429b	2	$C_3H_5^+$	+	C_7H_8	→	$C_7H_9^+$	+	CH_3CCH	2.18×10^{-10}	Houriet et al. (1978)
R_{cn}429c	2	$C_3H_5^+$	+	C_7H_8	→	$C_7H_7^+$	+	C_3H_6	1.88×10^{-10}	Houriet et al. (1978)
R_{cn}430	2	$C_3H_5^+$	+	NH_3	→	NH_4^+	+	CH_3CCH	9.00×10^{-10}	Operti et al. (2004)
R_{cn}431a	2	$C_3H_5^+$	+	HCN	→	$C_4H_5NH^+$	+	hv	5.00×10^{-12}	McEwan and Anicich (2007)
R_{cn}431b	3	$C_3H_5^+$	+	HCN	→	$C_4H_5NH^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									9.30×10^{-27}	
R_{cn}432a	2	$C_3H_5^+$	+	CH_2NH	→	$CH_2NH_2^+$	+	CH_3CCH	1.75×10^{-09}	Edwards et al. (2008)
R_{cn}432b	2	$C_3H_5^+$	+	CH_2NH	→	$C_4H_7NH^+$	+	hv	7.50×10^{-10}	Edwards et al. (2008)
R_{cn}433a	2	$C_3H_5^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	CH_3CCH	7.60×10^{-10}	Edwards et al. (2008)
R_{cn}433b	2	$C_3H_5^+$	+	CH_3NH_2	→	$CH_2NH_2^+$	+	C_3H_6	4.75×10^{-10}	Edwards et al. (2008)
R_{cn}433c	2	$C_3H_5^+$	+	CH_3NH_2	→	$C_4H_9NH^+$	+	hv	6.65×10^{-10}	Edwards et al. (2008)
R_{cn}434a	2	$C_3H_5^+$	+	HC_3N	→	HC_3NH^+	+	CH_3CCH	3.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}434b	3	$C_3H_5^+$	+	HC_3N	→	$C_6H_5NH^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									9.50×10^{-26}	
R_{cn}435a	2	$C_3H_5^+$	+	C_3H_3N	→	$C_3H_3NH^+$	+	CH_3CCH	1.00×10^{-09}	McEwan et al. (1998)
R_{cn}435b	3	$C_3H_5^+$	+	C_3H_3N	→	$C_6H_7NH^+$			1.00×10^{-10}	McEwan et al. (1998)
									1.00×10^{-25}	
R_{cn}436a	2	$C_3H_5^+$	+	C_3H_5N	→	$C_3H_5NH^+$	+	CH_3CCH	2.68×10^{-09}	Edwards et al. (2008)
R_{cn}436b	2	$C_3H_5^+$	+	C_3H_5N	→	$C_6H_9NH^+$	+	hv	1.44×10^{-09}	Edwards et al. (2008)
R_{cn}437a	2	$C_3H_6^+$	+	C_2H_2	→	$C_4H_5^+$	+	CH_3	8.04×10^{-11}	McEwan and Anicich (2007)
R_{cn}437b	2	$C_3H_6^+$	+	C_2H_2	→	$C_5H_7^+$	+	H	5.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}437c	3	$C_3H_6^+$	+	C_2H_2	→	$C_5H_8^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									7.30×10^{-27}	
R_{cn}438a	2	$C_3H_6^+$	+	C_2H_4	→	$C_4H_7^+$	+	CH_3	1.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}438b	3	$C_3H_6^+$	+	C_2H_4	→	$C_5H_{10}^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									4.40×10^{-26}	
R_{cn}439a	2	$C_3H_6^+$	+	C_3H_6	→	$C_3H_7^+$	+	C_3H_5	2.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}439b	2	$C_3H_6^+$	+	C_3H_6	→	$C_4H_7^+$	+	C_2H_5	2.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}439c	2	$C_3H_6^+$	+	C_3H_6	→	$C_4H_8^+$	+	C_2H_4	4.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}439d	2	$C_3H_6^+$	+	C_3H_6	→	$C_5H_9^+$	+	CH_3	4.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}440a	2	$C_3H_6^+$	+	NH_3	→	$CH_2NH_2^+$	+	C_2H_5	5.70×10^{-10}	Lias and Buckley (1984)
R_{cn}440b	2	$C_3H_6^+$	+	NH_3	→	$CH_3NH_2^+$	+	C_2H_4	1.30×10^{-10}	Lias and Buckley (1984)
R_{cn}440c	2	$C_3H_6^+$	+	NH_3	→	NH_4^+	+	C_3H_5	3.00×10^{-10}	Lias and Buckley (1984)
R_{cn}441a	2	$C_3H_6^+$	+	HCN	→	$C_2H_3N^+$	+	C_2H_4	1.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}441b	2	$C_3H_6^+$	+	HCN	→	$C_4H_5NH^+$	+	H	2.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}442	2	$C_3H_7^+$	+	H	→	$C_3H_6^+$	+	H_2	3.70×10^{-11}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
$R_{cn}443$	3	$C_3H_7^+$	+	CH_4	→	$C_3H_7^+CH_4$					1.00×10^{-10}	Vacher et al. (1997)
											1.00×10^{-27}	
$R_{cn}444$	2	$C_3H_7^+$	+	C_2H_6	→	$C_4H_9^+$	+	CH_4			1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}445$	2	$C_3H_7^+$	+	C_3H_6	→	$C_4H_9^+$	+	C_2H_4			4.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}446$	2	$C_3H_7^+$	+	C_3H_8	→	$C_3H_7^+$	+	C_3H_8			1.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}447$	2	$C_3H_7^+$	+	NH_3	→	NH_4^+	+	C_3H_6			1.71×10^{-09}	Hemsworth et al. (1974)
$R_{cn}448$	3	$C_3H_7^+$	+	HCN	→	$C_4H_7NH^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											6.20×10^{-27}	
$R_{cn}449$	2	$C_3H_7^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	C_3H_6			1.65×10^{-09}	Su and Bowers (1973)
$R_{cn}450$	3	$C_3H_7^+$	+	N_2	→	$C_3H_7^+N_2$					1.00×10^{-10}	Speller et al. (1995)
											1.00×10^{-27}	
$R_{cn}451$	2	$C_3H_7^+CH_4$	+	N_2	→	$C_3H_7^+$	+	CH_4	+	N_2	4.00×10^{-09}	Vacher et al. (1997)
$R_{cn}452$	2	$C_3H_7^+N_2$	+	N_2	→	$C_3H_7^+$	+	N_2	+	N_2	6.00×10^{-11}	Speller et al. (1995)
$R_{cn}453$	2	$C_3H_9^+$	+	NH_2	→	$C_3H_8^+$	+	NH_3			1.00×10^{-10}	Capone et al. (1979)
$R_{cn}454$	2	$C_3H_9^+$	+	NH_3	→	NH_4^+	+	C_3H_8			5.00×10^{-10}	Capone et al. (1980)
$R_{cn}455$	2	C_4H^+	+	H	→	$C_4H_2^+$	+	hv			$6.00\times10^{-14}T^{1.50}$	Wakelam et al. (2015)
$R_{cn}456$	2	C_4H^+	+	H_2	→	$C_4H_2^+$	+	H			1.65×10^{-10}	Wakelam et al. (2015)
$R_{cn}457$	2	C_4H^+	+	CH_4	→	$C_5H_3^+$	+	H_2			1.10×10^{-09}	Wakelam et al. (2015)
$R_{cn}458$	2	C_4H^+	+	C_2H_2	→	$C_6H_2^+$	+	H			1.50×10^{-09}	Wakelam et al. (2015)
$R_{cn}459a$	2	C_4H^+	+	C_2H_4	→	$C_4H_3^+$	+	C_2H_2			7.50×10^{-10}	Wakelam et al. (2015)
$R_{cn}459b$	2	C_4H^+	+	C_2H_4	→	$C_6H_4^+$	+	H			7.50×10^{-10}	Wakelam et al. (2015)
$R_{cn}460$	2	C_4H^+	+	CH_3CCH	→	$C_7H_4^+$	+	H			$6.45\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}461$	2	C_4H^+	+	C_4H_2	→	$C_8H_2^+$	+	H			1.60×10^{-09}	Wakelam et al. (2015)
$R_{cn}462$	2	$C_4H_2^+$	+	H	→	$C_4H_3^+$	+	hv			7.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}463$	2	$C_4H_2^+$	+	H_2	→	$C_4H_4^+$	+	hv			5.00×10^{-13}	McEwan and Anicich (2007)
$R_{cn}464a$	2	$C_4H_2^+$	+	C_2H_2	→	$C_6H_3^+$	+	H			1.40×10^{-11}	McEwan and Anicich (2007)
$R_{cn}464b$	2	$C_4H_2^+$	+	C_2H_2	→	$C_6H_4^+$	+	hv			2.66×10^{-10}	McEwan and Anicich (2007)
$R_{cn}464c$	3	$C_4H_2^+$	+	C_2H_2	→	$C_6H_4^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											2.30×10^{-23}	
$R_{cn}465a$	2	$C_4H_2^+$	+	C_2H_4	→	$C_4H_4^+$	+	C_2H_2			7.05×10^{-10}	McEwan and Anicich (2007)
$R_{cn}465b$	2	$C_4H_2^+$	+	C_2H_4	→	$C_6H_4^+$	+	H_2			7.50×10^{-11}	McEwan and Anicich (2007)
$R_{cn}465c$	2	$C_4H_2^+$	+	C_2H_4	→	$C_6H_5^+$	+	H			7.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}465d$	3	$C_4H_2^+$	+	C_2H_4	→	$C_6H_6^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											3.40×10^{-26}	
$R_{cn}466a$	2	$C_4H_2^+$	+	CH_3CCH	→	$C_5H_4^+$	+	C_2H_2			1.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}466b$	2	$C_4H_2^+$	+	CH_3CCH	→	$C_7H_5^+$	+	H			1.17×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction	k	Ref.
R_{cn}467a	2	$C_4H_2^+ + C_4H_2 \rightarrow C_6H_2^+ + C_2H_2$	1.40×10^{-09}	McEwan and Anicich (2007)
R_{cn}467b	3	$C_4H_2^+ + C_4H_2 \rightarrow$ Adduct$^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			3.00×10^{-26}	
R_{cn}468	2	$C_4H_2^+ + C_6H_6 \rightarrow C_6H_6^+ + C_4H_2$	1.46×10^{-09}	Lifshitz and Weiss (1980b)
R_{cn}469a	2	$C_4H_2^+ + N \rightarrow C_3H^+ + HCN$	1.71×10^{-10}	McEwan and Anicich (2007)
R_{cn}469b	2	$C_4H_2^+ + N \rightarrow HC_4N^+ + H$	9.50×10^{-12}	McEwan and Anicich (2007)
R_{cn}469c	2	$C_4H_2^+ + N \rightarrow HCNH^+ + C_3$	9.50×10^{-12}	McEwan and Anicich (2007)
R_{cn}470	3	$C_4H_2^+ + HCN \rightarrow C_5H_3N^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			2.00×10^{-26}	
R_{cn}471a	2	$C_4H_2^+ + HC_3N \rightarrow C_7H_3N^+ +$ hv	1.70×10^{-09}	McEwan and Anicich (2007)
R_{cn}471b	3	$C_4H_2^+ + HC_3N \rightarrow C_7H_3N^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			3.30×10^{-26}	
R_{cn}472	2	$C_4H_2^+ + C_3H_5N \rightarrow C_7H_7N^+ +$ hv	3.60×10^{-09}	Edwards et al. (2008)
R_{cn}473	2	$C_4H_2^+ + HC_5N \rightarrow$ AdductN$^+$ + hv	$2.00\times10^{-12}T^{2.50}$	Wakelam et al. (2015)
R_{cn}474a	2	$C_4H_2^+ + C_5H_5N \rightarrow C_5H_5N^+ + C_4H_2$	1.26×10^{-09}	Jiao et al. (2006)
R_{cn}474b	2	$C_4H_2^+ + C_5H_5N \rightarrow C_5H_5NH^+ + C_4H$	4.42×10^{-10}	Jiao et al. (2006)
R_{cn}475	2	$C_4H_2^+ + C_2N_2 \rightarrow$ CXHYNZ$^+$	2.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}476	3	$C_4H_2^+ + CO \rightarrow$ Adduct$^+$	1.00×10^{-10}	Anicich and McEwan (1997)
			2.30×10^{-27}	
R_{cn}477	2	$C_4H_3^+ + H \rightarrow C_4H_4^+ +$ hv	6.00×10^{-14}	McEwan and Anicich (2007)
R_{cn}478a	2	$C_4H_3^+ + C_2H_2 \rightarrow C_6H_5^+ +$ hv	2.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}478b	3	$C_4H_3^+ + C_2H_2 \rightarrow C_6H_5^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			9.50×10^{-24}	
R_{cn}479a	2	$C_4H_3^+ + C_2H_4 \rightarrow C_6H_5^+ + H_2$	1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}479b	3	$C_4H_3^+ + C_2H_4 \rightarrow C_6H_7^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			4.30×10^{-26}	
R_{cn}480	2	$C_4H_3^+ + CH_3CCH \rightarrow C_5H_5^+ + C_2H_2$	1.40×10^{-09}	McEwan and Anicich (2007)
R_{cn}481a	2	$C_4H_3^+ + C_4H_2 \rightarrow C_6H_3^+ + C_2H_2$	7.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}481b	3	$C_4H_3^+ + C_4H_2 \rightarrow$ Adduct$^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			8.70×10^{-26}	
R_{cn}482	2	$C_4H_3^+ + C_6H_6 \rightarrow C_6H_7^+ + C_4H_2$	1.30×10^{-09}	Lifshitz and Weiss (1980b),Deakyne et al. (1987)
R_{cn}483	2	$C_4H_3^+ + NH_3 \rightarrow NH_4^+ + C_4H_2$	9.90×10^{-10}	Operti et al. (2004)
R_{cn}484a	2	$C_4H_3^+ + CH_2NH \rightarrow CH_2NH_2^+ + C_4H_2$	1.92×10^{-09}	Edwards et al. (2008)
R_{cn}484b	2	$C_4H_3^+ + CH_2NH \rightarrow C_5H_5NH^+ +$ hv	4.80×10^{-10}	Edwards et al. (2008)
R_{cn}485a	2	$C_4H_3^+ + CH_3NH_2 \rightarrow CH_3NH_3^+ + C_4H_2$	1.30×10^{-09}	Edwards et al. (2008)
R_{cn}485b	2	$C_4H_3^+ + CH_3NH_2 \rightarrow CH_2NH_2^+ + C_4H_2 + H_2$	5.00×10^{-10}	Edwards et al. (2008)

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	Type	Reaction							k	Ref.
R_{cn}485c	2	$C_4H_3^+$	+	CH_3NH_2	→	$C_5H_7NH^+$	+	hv	2.00×10^{-10}	Edwards et al. (2008)
R_{cn}486	3	$C_4H_3^+$	+	HC_3N	→	$C_7H_3NH^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.90×10^{-26}	
R_{cn}487a	2	$C_4H_3^+$	+	C_5H_5N	→	$C_5H_5NH^+$	+	C_4H_2	1.53×10^{-09}	Jiao et al. (2006)
R_{cn}487b	2	$C_4H_3^+$	+	C_5H_5N	→	$C_5H_5N^+$	+	C_4H_3	1.55×10^{-11}	Jiao et al. (2006)
R_{cn}488	2	$C_4H_3^+$	+	C_2N_2	→	$CXHYNZ^+$			1.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}489	3	$C_4H_3^+$	+	CO	→	$C_4H_3^+CO$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.00×10^{-28}	
R_{cn}490a	2	$C_4H_4^+$	+	C_2H_2	→	$C_6H_4^+$	+	H_2	1.20×10^{-11}	Anicich (1993)
R_{cn}490b	2	$C_4H_4^+$	+	C_2H_2	→	$C_6H_5^+$	+	H	9.00×10^{-11}	Anicich (1993)
R_{cn}490c	2	$C_4H_4^+$	+	C_2H_2	→	$C_6H_6^+$	+	hv	1.80×10^{-11}	Anicich (1993)
R_{cn}491a	2	$C_4H_4^+$	+	CH_3CCH	→	$C_5H_6^+$	+	C_2H_2	5.00×10^{-11}	Anicich (1993)
R_{cn}491b	2	$C_4H_4^+$	+	CH_3CCH	→	$C_7H_7^+$	+	H	9.50×10^{-10}	Anicich (1993)
R_{cn}492a	2	$C_4H_4^+$	+	C_4H_2	→	$C_6H_4^+$	+	C_2H_2	6.96×10^{-10}	Anicich (1993)
R_{cn}492b	2	$C_4H_4^+$	+	C_4H_2	→	$CXHYNZ^+$			1.04×10^{-10}	Anicich (1993)
R_{cn}493	2	$C_4H_4^+$	+	C_6H_6	→	$C_6H_6^+$	+	C_4H_4	6.60×10^{-10}	Lifshitz et al. (1981)
R_{cn}494a	2	$C_4H_4^+$	+	NH_3	→	NH_4^+	+	C_4H_3	3.20×10^{-10}	Operti et al. (2004)
R_{cn}494b	2	$C_4H_4^+$	+	NH_3	→	$CH_2NH_2^+$	+	C_3H_3	4.37×10^{-11}	Operti et al. (2004)
R_{cn}495a	2	$C_4H_4^+$	+	C_5H_5N	→	$CXHYNZ^+$	+	H	7.88×10^{-10}	Jiao et al. (2006)
R_{cn}495b	2	$C_4H_4^+$	+	C_5H_5N	→	$C_5H_5NH^+$	+	C_4H_3	4.96×10^{-10}	Jiao et al. (2006)
R_{cn}495c	2	$C_4H_4^+$	+	C_5H_5N	→	$C_5H_5N^+$	+	C_4H_4	1.75×10^{-10}	Jiao et al. (2006)
R_{cn}496a	2	$C_4H_5^+$	+	C_2H_2	→	$C_6H_5^+$	+	H_2	1.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}496b	3	$C_4H_5^+$	+	C_2H_2	→	$C_6H_7^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.50×10^{-26}	
R_{cn}497	2	$C_4H_5^+$	+	C_2H_4	→	$C_6H_7^+$	+	H_2	7.30×10^{-11}	McEwan and Anicich (2007)
R_{cn}498a	2	$C_4H_5^+$	+	CH_3CCH	→	$C_6H_5^+$	+	CH_4	5.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}498b	2	$C_4H_5^+$	+	CH_3CCH	→	$C_7H_7^+$	+	H_2	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}499	2	$C_4H_5^+$	+	C_4H_2	→	$C_6H_5^+$	+	C_2H_2	1.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}500	2	$C_4H_5^+$	+	N	→	$C_4H_3NH^+$	+	H	1.00×10^{-10}	Wakelam et al. (2015)
R_{cn}501	2	$C_4H_5^+$	+	NH_3	→	NH_4^+	+	C_4H_4	4.70×10^{-10}	Operti et al. (2004)
R_{cn}502a	2	$C_4H_6^+$	+	CH_3CCH	→	$C_6H_7^+$	+	CH_3	8.50×10^{-10}	Anicich (1993)
R_{cn}502b	2	$C_4H_6^+$	+	CH_3CCH	→	$C_7H_9^+$	+	H	1.50×10^{-10}	Anicich (1993)
R_{cn}503	3	$C_4H_7^+$	+	C_2H_4	→	$C_6H_{11}^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.40×10^{-24}	
R_{cn}504	2	$C_4H_7^+$	+	CH_3CCH	→	$C_7H_9^+$	+	H_2	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}505	2	$C_4H_7^+$	+	CH_3CN	→	$C_2H_3NH^+$	+	C_4H_6	5.20×10^{-11}	McEwan and Anicich (2007)

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	Type	Reaction	k	Ref.
R_{cn}506a	2	$C_4H_9^+ + C_2H_4 \rightarrow C_6H_9^+ + H_2 + H_2$	2.00×10^{-10}	Burt et al. (1970)
R_{cn}506b	2	$C_4H_9^+ + C_2H_4 \rightarrow C_6H_{11}^+ + H_2$	2.00×10^{-10}	Burt et al. (1970)
R_{cn}507a	2	$C_4H_9^+ + NH_3 \rightarrow NH_4^+ + C_4H_8$	1.57×10^{-09}	Anicich (1993)
R_{cn}507b	2	$C_4H_9^+ + NH_3 \rightarrow C_4H_{11}NH^+ + hv$	3.20×10^{-11}	Anicich (1993)
R_{cn}508	2	$C_4H_9^+ + CH_3NH_2 \rightarrow CH_3NH_3^+ + C_4H_8$	1.31×10^{-09}	Anicich (1993)
R_{cn}509	2	$C_4H_9^+ + HNC \rightarrow HCNH^+ + C_4H_8$	4.53×10^{-09}	Su-Chesnavich
R_{cn}510	2	$C_5H^+ + H_2 \rightarrow C_5H_2^+ + H$	1.00×10^{-17}	Wakelam et al. (2015)
R_{cn}511a	2	$C_5H^+ + C_2H_2 \rightarrow C_7H_2^+ + H$	1.50×10^{-10}	Anicich (1993)
R_{cn}511b	2	$C_5H^+ + C_2H_2 \rightarrow C_7H_3^+ + hv$	3.50×10^{-10}	Anicich (1993)
R_{cn}512	2	$C_5H^+ + C_4H_2 \rightarrow Adduct^+ + hv$	$1.00\times10^{-13}T^{2.00}$	Wakelam et al. (2015)
R_{cn}513	2	$C_5H^+ + N \rightarrow C_5N^+ + H$	2.00×10^{-10}	Wakelam et al. (2015)
R_{cn}514	2	$C_5H^+ + HCN \rightarrow HC_6NH^+ + hv$	9.10×10^{-11}	Anicich (1993)
R_{cn}515	2	$C_5H^+ + CO \rightarrow HC_6O^+ + hv$	2.30×10^{-10}	Anicich (1993)
R_{cn}516a	2	$C_5H_2^+ + CH_4 \rightarrow C_6H_5^+ + H$	8.00×10^{-10}	Wakelam et al. (2015)
R_{cn}516b	2	$C_5H_2^+ + CH_4 \rightarrow C_6H_4^+ + H_2$	2.00×10^{-10}	Wakelam et al. (2015)
R_{cn}517a	2	$C_5H_2^+ + C_2H_2 \rightarrow C_7H_3^+ + H$	7.00×10^{-10}	Wakelam et al. (2015)
R_{cn}517b	2	$C_5H_2^+ + C_2H_2 \rightarrow C_7H_2^+ + H_2$	3.00×10^{-10}	Wakelam et al. (2015)
R_{cn}518a	2	$C_5H_2^+ + C_2H_4 \rightarrow C_7H_5^+ + H$	5.00×10^{-10}	Wakelam et al. (2015)
R_{cn}518b	2	$C_5H_2^+ + C_2H_4 \rightarrow C_7H_4^+ + H_2$	5.00×10^{-10}	Wakelam et al. (2015)
R_{cn}519	2	$C_5H_2^+ + CH_3CCH \rightarrow CXHYNZ^+ + H_2$	$6.14\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
R_{cn}520a	2	$C_5H_2^+ + C_4H_2 \rightarrow C_7H_3^+ + C_2H$	6.00×10^{-10}	Wakelam et al. (2015)
R_{cn}520b	2	$C_5H_2^+ + C_4H_2 \rightarrow CXHYNZ^+ + H$	1.00×10^{-09}	Wakelam et al. (2015)
R_{cn}520c	2	$C_5H_2^+ + C_4H_2 \rightarrow Adduct^+ + hv$	$1.00\times10^{-13}T^{2.00}$	Wakelam et al. (2015)
R_{cn}521	2	$C_5H_2^+ + N \rightarrow HC_5N^+ + H$	2.00×10^{-10}	Wakelam et al. (2015)
R_{cn}522a	2	$C_5H_3^+ + CH_3CCH \rightarrow C_6H_5^+ + C_2H_2$	8.10×10^{-10}	Anicich (1993)
R_{cn}522b	2	$C_5H_3^+ + CH_3CCH \rightarrow CXHYNZ^+ + H$	1.90×10^{-10}	Anicich (1993)
R_{cn}523a	2	$C_5H_3^+ + C_4H_2 \rightarrow C_7H_3^+ + C_2H_2$	2.41×10^{-10}	Anicich (1993)
R_{cn}523b	2	$C_5H_3^+ + C_4H_2 \rightarrow Adduct^+ + hv$	3.19×10^{-10}	Anicich (1993)
R_{cn}524a	2	$C_5H_3^+ + C_6H_6 \rightarrow C_6H_5^+ + C_5H_4$	4.80×10^{-11}	Lifshitz and Weiss (1980b),Ozturk et al. (1987),Ozturk
R_{cn}524b	2	$C_5H_3^+ + C_6H_6 \rightarrow C_6H_6^+ + C_5H_3$	4.80×10^{-11}	Lifshitz and Weiss (1980b),Ozturk et al. (1987),Ozturk
R_{cn}524c	2	$C_5H_3^+ + C_6H_6 \rightarrow C_7H_7^+ + C_4H_2$	4.80×10^{-11}	Lifshitz and Weiss (1980b),Ozturk et al. (1987),Ozturk
R_{cn}524d	2	$C_5H_3^+ + C_6H_6 \rightarrow CXHYNZ^+ + C_2H_2$	4.80×10^{-11}	Lifshitz and Weiss (1980b),Ozturk et al. (1987),Ozturk
R_{cn}524e	2	$C_5H_3^+ + C_6H_6 \rightarrow Adduct^+$	4.80×10^{-11}	Lifshitz and Weiss (1980b),Ozturk et al. (1987),Ozturk
R_{cn}525	2	$C_5H_3^+ + N \rightarrow HC_5NH^+ + H$	2.00×10^{-10}	Wakelam et al. (2015)
R_{cn}526a	2	$C_5H_4^+ + CH_3CCH \rightarrow C_6H_6^+ + C_2H_2$	5.70×10^{-10}	Anicich (1993)
R_{cn}526b	2	$C_5H_4^+ + CH_3CCH \rightarrow CXHYNZ^+ + H$	4.30×10^{-10}	Anicich (1993)

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	Type	Reaction	k	Ref.
$R_{cn}527$	2	$C_5H_4^+$ + N → $C_5H_3N^+$ + H	1.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}528$	3	$C_5H_5^+$ + C_2H_4 → $C_7H_9^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			6.00×10^{-27}	
$R_{cn}529a$	2	$C_5H_5^+$ + C_4H_2 → $Adduct^+$ + hv	7.33×10^{-11}	McEwan and Anicich (2007)
$R_{cn}529b$	2	$C_5H_5^+$ + C_4H_2 → $C_7H_5^+$ + C_2H_2	7.33×10^{-11}	McEwan and Anicich (2007)
$R_{cn}529c$	2	$C_5H_5^+$ + C_4H_2 → $C_7H_7^+$ + C_2	7.33×10^{-11}	McEwan and Anicich (2007)
$R_{cn}530$	2	$C_5H_5^+$ + N → $C_5H_3N^+$ + H_2	1.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}531$	2	$C_5H_5^+$ + NH_3 → NH_4^+ + C_5H_4	3.50×10^{-11}	Operti et al. (2004)
$R_{cn}532$	2	$C_5H_5^+$ + HCN → $C_6H_5NH^+$ + hv	9.00×10^{-12}	McEwan and Anicich (2007)
$R_{cn}533$	2	$C_5H_5^+$ + CH_2NH → $CH_2NH_2^+$ + C_5H_4	3.20×10^{-10}	Edwards et al. (2008)
$R_{cn}534a$	2	$C_5H_5^+$ + CH_3NH_2 → $CH_3NH_3^+$ + C_5H_4	2.00×10^{-10}	Edwards et al. (2008)
$R_{cn}534b$	2	$C_5H_5^+$ + CH_3NH_2 → $CH_3NH_2^+$ + C_5H_4 + H_2	2.50×10^{-11}	Edwards et al. (2008)
$R_{cn}534c$	2	$C_5H_5^+$ + CH_3NH_2 → $C_6H_9NH^+$ + hv	2.50×10^{-11}	Edwards et al. (2008)
$R_{cn}535a$	2	$C_5H_7^+$ + CH_3CCH → $Adduct^+$ + hv	7.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}535b$	3	$C_5H_7^+$ + CH_3CCH → $Adduct^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			3.10×10^{-27}	
$R_{cn}536$	2	$C_5H_{11}^+$ + NH_3 → NH_4^+ + C_5H_{10}	6.50×10^{-10}	Su and Bowers (1973)
$R_{cn}537$	2	$C_5H_{11}^+$ + CH_3NH_2 → $CH_3NH_3^+$ + C_5H_{10}	9.10×10^{-10}	Su and Bowers (1973)
$R_{cn}538$	2	C_6H^+ + H_2 → $C_6H_2^+$ + H	1.30×10^{-12}	Wakelam et al. (2015)
$R_{cn}539a$	2	$C_6H_2^+$ + CH_4 → $C_7H_5^+$ + H	8.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}539b$	2	$C_6H_2^+$ + CH_4 → $C_7H_4^+$ + H_2	2.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}540$	2	$C_6H_2^+$ + C_2H_2 → $Adduct^+$ + hv	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}541$	2	$C_6H_2^+$ + C_2H_4 → $CXHYNZ^+$ + H_2	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}542$	2	$C_6H_2^+$ + CH_3CCH → $CXHYNZ^+$ + H_2	$5.94\times10^{-10}T^{0.50}$	Wakelam et al. (2015)
$R_{cn}543$	2	$C_6H_2^+$ + C_6H_6 → $C_6H_6^+$ + C_6H_2	1.26×10^{-09}	Lifshitz and Weiss (1980a)
$R_{cn}544$	2	$C_6H_2^+$ + N → C_5H^+ + HCN	1.90×10^{-10}	Scott et al. (1999)
$R_{cn}545$	2	$C_6H_3^+$ + C_2H_2 → $Adduct^+$ + hv	2.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}546$	3	$C_6H_3^+$ + C_4H_2 → $Adduct^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			5.30×10^{-26}	
$R_{cn}547$	2	$C_6H_3^+$ + C_6H_6 → $CXHYNZ^+$	4.20×10^{-10}	Lifshitz and Weiss (1980a)
$R_{cn}548$	3	$C_6H_3^+$ + HCN → $AdductN^+$	1.00×10^{-10}	McEwan and Anicich (2007)
			6.80×10^{-27}	
$R_{cn}549$	2	$C_6H_4^+$ + H → $C_6H_5^+$ + hv	3.30×10^{-11}	McEwan and Anicich (2007)
$R_{cn}550$	2	$C_6H_4^+$ + C_2H_2 → $Adduct^+$ + hv	2.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}551a$	2	$C_6H_4^+$ + C_6H_6 → $Adduct^+$ + hv	1.27×10^{-10}	Lifshitz and Reuben (1969)
$R_{cn}551b$	2	$C_6H_4^+$ + C_6H_6 → $CXHYNZ^+$ + H_2	1.41×10^{-11}	Lifshitz and Reuben (1969)

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	Type	Reaction							k	Ref.
$R_{cn}552$	2	$C_6H_5^+$	+	H_2	→	$C_6H_7^+$	+	hv	6.00×10^{-11}	McEwan and Anicich (2007)
$R_{cn}553$	2	$C_6H_5^+$	+	CH_4	→	$C_7H_7^+$	+	H_2	7.50×10^{-11}	McEwan and Anicich (2007)
$R_{cn}554a$	2	$C_6H_5^+$	+	C_2H_2	→	$CXHYNZ^+$	+	H	7.80×10^{-11}	McEwan and Anicich (2007)
$R_{cn}554b$	2	$C_6H_5^+$	+	C_2H_2	→	$Adduct^+$	+	hv	5.20×10^{-11}	McEwan and Anicich (2007)
$R_{cn}555a$	2	$C_6H_5^+$	+	C_2H_4	→	$C_6H_7^+$	+	C_2H_2	1.02×10^{-10}	McEwan and Anicich (2007)
$R_{cn}555b$	2	$C_6H_5^+$	+	C_2H_4	→	$CXHYNZ^+$	+	H_2	6.80×10^{-11}	McEwan and Anicich (2007)
$R_{cn}555c$	3	$C_6H_5^+$	+	C_2H_4	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									3.40×10^{-26}	
$R_{cn}556a$	2	$C_6H_5^+$	+	C_2H_6	→	$C_7H_7^+$	+	CH_4	3.90×10^{-12}	McEwan and Anicich (2007)
$R_{cn}556b$	2	$C_6H_5^+$	+	C_2H_6	→	$C_6H_7^+$	+	C_2H_4	1.26×10^{-10}	McEwan and Anicich (2007)
$R_{cn}557a$	2	$C_6H_5^+$	+	CH_3CCH	→	$C_7H_7^+$	+	C_2H_2	4.14×10^{-11}	McEwan and Anicich (2007)
$R_{cn}557b$	2	$C_6H_5^+$	+	CH_3CCH	→	$CXHYNZ^+$	+	H_2	1.79×10^{-10}	McEwan and Anicich (2007)
$R_{cn}557c$	2	$C_6H_5^+$	+	CH_3CCH	→	$CXHYNZ^+$	+	H	1.15×10^{-11}	McEwan and Anicich (2007)
$R_{cn}557d$	3	$C_6H_5^+$	+	CH_3CCH	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									5.20×10^{-24}	
$R_{cn}558a$	2	$C_6H_5^+$	+	CH_2CCH_2	→	$C_7H_7^+$	+	C_2H_2	1.56×10^{-10}	Anicich (1993)
$R_{cn}558b$	2	$C_6H_5^+$	+	CH_2CCH_2	→	$CXHYNZ^+$	+	H_2	3.64×10^{-10}	Anicich (1993)
$R_{cn}559a$	2	$C_6H_5^+$	+	C_4H_2	→	$CXHYNZ^+$	+	C_2H_2	1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}559b$	3	$C_6H_5^+$	+	C_4H_2	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									5.60×10^{-26}	
$R_{cn}560a$	2	$C_6H_5^+$	+	C_6H_6	→	$Adduct^+$	+	hv	8.46×10^{-11}	Lifshitz et al. (1980)
$R_{cn}560b$	2	$C_6H_5^+$	+	C_6H_6	→	$CXHYNZ^+$	+	H	5.17×10^{-11}	Lifshitz et al. (1980)
$R_{cn}560c$	2	$C_6H_5^+$	+	C_6H_6	→	$CXHYNZ^+$	+	H_2	2.30×10^{-10}	Lifshitz et al. (1980)
$R_{cn}560d$	2	$C_6H_5^+$	+	C_6H_6	→	$CXHYNZ^+$	+	C_2H_2	2.35×10^{-11}	Lifshitz et al. (1980)
$R_{cn}560e$	2	$C_6H_5^+$	+	C_6H_6	→	$CXHYNZ^+$	+	C_2H_3	1.41×10^{-11}	Lifshitz et al. (1980)
$R_{cn}560f$	2	$C_6H_5^+$	+	C_6H_6	→	$CXHYNZ^+$	+	CH_3CCH	2.82×10^{-11}	Lifshitz et al. (1980)
$R_{cn}561$	2	$C_6H_5^+$	+	N	→	$C_5H_4^+$	+	HCN	3.70×10^{-11}	McEwan and Anicich (2007)
$R_{cn}562a$	2	$C_6H_5^+$	+	NH_3	→	NH_4^+	+	C_6H_4	7.49×10^{-11}	Operti et al. (2004)
$R_{cn}562b$	2	$C_6H_5^+$	+	NH_3	→	$C_6H_7N^+$	+	H	4.78×10^{-11}	Operti et al. (2004)
$R_{cn}562c$	2	$C_6H_5^+$	+	NH_3	→	$C_6H_7NH^+$	+	hv	8.53×10^{-11}	Operti et al. (2004)
$R_{cn}563$	3	$C_6H_5^+$	+	HCN	→	$AdductN^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									9.60×10^{-26}	
$R_{cn}564a$	2	$C_6H_5^+$	+	$O(^3P)$	→	$C_5H_5^+$	+	CO	6.00×10^{-11}	Scott et al. (2000)
$R_{cn}564b$	2	$C_6H_5^+$	+	$O(^3P)$	→	$c-C_3H_3^+$	+	C_3H_2O	4.00×10^{-11}	Scott et al. (2000)
$R_{cn}565$	3	$C_6H_5^+$	+	H_2O	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									6.20×10^{-26}	

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	Type	Reaction							k	Ref.
$R_{cn}566$	2	$C_6H_6^+$	+	H	→	$C_6H_7^+$	+	hv	2.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}567$	2	$C_6H_6^+$	+	C_4H_2	→	$Adduct^+$	+	hv	5.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}568a$	2	$C_6H_6^+$	+	N	→	$C_5H_5^+$	+	HCN	1.33×10^{-10}	McEwan and Anicich (2007)
$R_{cn}568b$	2	$C_6H_6^+$	+	N	→	$c{-}C_3H_3^+$	+	C_3H_3N	7.00×10^{-12}	McEwan and Anicich (2007)
$R_{cn}569a$	2	$C_6H_7^+$	+	CH_3CCH	→	$C_7H_7^+$	+	C_2H_4	9.70×10^{-11}	McEwan and Anicich (2007)
$R_{cn}569b$	3	$C_6H_7^+$	+	CH_3CCH	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									3.00×10^{-25}	
$R_{cn}570$	2	$C_6H_7^+$	+	CH_2CCH_2	→	$C_3H_5^+$	+	C_6H_6	4.70×10^{-11}	Lias and Ausloos (1985)
$R_{cn}571$	2	$C_6H_7^+$	+	NH_3	→	NH_4^+	+	C_6H_6	2.20×10^{-10}	Operti et al. (2004)
$R_{cn}572$	2	C_7^+	+	H_2	→	C_7H^+	+	H	1.90×10^{-10}	Wakelam et al. (2015)
$R_{cn}573$	2	C_7H^+	+	H_2	→	$C_7H_2^+$	+	H	1.00×10^{-17}	Wakelam et al. (2015)
$R_{cn}574$	2	C_7H^+	+	N	→	C_7N^+	+	H	2.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}575$	2	$C_7H_2^+$	+	CH_4	→	$CXHYNZ^+$	+	H_2	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}576a$	2	$C_7H_2^+$	+	C_2H_2	→	$CXHYNZ^+$	+	H	7.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}576b$	2	$C_7H_2^+$	+	C_2H_2	→	$CXHYNZ^+$	+	H_2	3.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}577$	2	$C_7H_2^+$	+	C_2H_4	→	$CXHYNZ^+$	+	H_2	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}578$	2	$C_7H_2^+$	+	N	→	HC_7N^+	+	H	2.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}579$	2	$C_7H_3^+$	+	N	→	HC_7NH^+	+	H	2.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}580$	2	$C_7H_4^+$	+	N	→	$C_7H_3N^+$	+	H	1.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}581$	2	$C_7H_5^+$	+	N	→	$C_7H_3N^+$	+	H_2	1.00×10^{-10}	Wakelam et al. (2015)
$R_{cn}582$	2	$C_7H_7^+$	+	C_2H_4	→	$Adduct^+$	+	hv	2.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}583a$	2	$C_7H_7^+$	+	CH_3CCH	→	$Adduct^+$	+	hv	1.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}583b$	3	$C_7H_7^+$	+	CH_3CCH	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									7.90×10^{-24}	
$R_{cn}584$	2	$C_7H_7^+$	+	C_3H_6	→	$CXHYNZ^+$			7.00×10^{-11}	Ausloos et al. (1980)
$R_{cn}585$	2	$C_7H_7^+$	+	C_4H_2	→	$Adduct^+$	+	hv	1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}586$	2	$C_7H_7^+$	+	C_7H_8	→	$CXHYNZ^+$	+	C_6H_6	1.60×10^{-10}	Bartmess (1982)
$R_{cn}587$	2	$C_7H_7^+$	+	CH_2NH	→	$CH_2NH_2^+$	+	C_7H_6	3.40×10^{-11}	Edwards et al. (2008)
$R_{cn}588a$	2	$C_7H_7^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	C_7H_6	1.62×10^{-11}	Edwards et al. (2008)
$R_{cn}588b$	2	$C_7H_7^+$	+	CH_3NH_2	→	$Adduct^+$	+	hv	1.80×10^{-12}	Edwards et al. (2008)
$R_{cn}589$	2	$C_7H_8^+$	+	C_3H_6	→	$CXHYNZ^+$	+	H	1.70×10^{-10}	Pithawalla et al. (2001)
$R_{cn}590$	2	C_8H^+	+	H_2	→	$C_8H_2^+$	+	H	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}591$	2	$C_8H_2^+$	+	CH_4	→	$CXHYNZ^+$	+	H_2	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}592$	2	N^+	+	H_2	→	NH^+	+	H	$4.16\times10^{-10}e^{-41.9/T}$	Marquette et al. (1988)
$R_{cn}593a$	2	N^+	+	CH_4	→	CH_3^+	+	NH	5.00×10^{-10}	Dutuit et al. (2013)
$R_{cn}593b$	2	N^+	+	CH_4	→	$HCNH^+$	+	H_2	3.50×10^{-10}	Dutuit et al. (2013)

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	Type	Reaction	k	Ref.
$R_{cn}593c$	2	$N^+ + CH_4 \rightarrow HCN^+ + H_2 + H$	1.00×10^{-10}	Dutuit et al. (2013)
$R_{cn}593d$	2	$N^+ + CH_4 \rightarrow CH_4^+ + N$	5.00×10^{-11}	Dutuit et al. (2013)
$R_{cn}594a$	2	$N^+ + C_2H_2 \rightarrow C_2H_2^+ + N$	9.94×10^{-10}	Dutuit et al. (2013)
$R_{cn}594b$	2	$N^+ + C_2H_2 \rightarrow CNC^+ + H_2$	2.13×10^{-10}	Dutuit et al. (2013)
$R_{cn}594c$	2	$N^+ + C_2H_2 \rightarrow HC_2N^+ + H$	2.13×10^{-10}	Dutuit et al. (2013)
$R_{cn}595a$	2	$N^+ + C_2H_4 \rightarrow C_2H_2^+ + NH_2$	1.90×10^{-10}	Dutuit et al. (2013)
$R_{cn}595b$	2	$N^+ + C_2H_4 \rightarrow C_2H_3^+ + NH$	5.06×10^{-10}	Dutuit et al. (2013)
$R_{cn}595c$	2	$N^+ + C_2H_4 \rightarrow C_2H_4^+ + N$	6.00×10^{-10}	Dutuit et al. (2013)
$R_{cn}595d$	2	$N^+ + C_2H_4 \rightarrow HCN^+ + CH_3$	3.16×10^{-11}	Dutuit et al. (2013)
$R_{cn}595e$	2	$N^+ + C_2H_4 \rightarrow HCNH^+ + {}^3CH_2$	1.58×10^{-10}	Dutuit et al. (2013)
$R_{cn}595f$	2	$N^+ + C_2H_4 \rightarrow HC_2N^+ + H_2 + H$	1.58×10^{-11}	Dutuit et al. (2013)
$R_{cn}595g$	2	$N^+ + C_2H_4 \rightarrow HC_2NH^+ + H_2$	7.90×10^{-11}	Dutuit et al. (2013)
$R_{cn}596a$	2	$N^+ + C_2H_6 \rightarrow C_2H_5^+ + NH$	1.60×10^{-10}	Dutuit et al. (2013)
$R_{cn}596b$	2	$N^+ + C_2H_6 \rightarrow C_2H_4^+ + NH_2$	8.80×10^{-10}	Dutuit et al. (2013)
$R_{cn}596c$	2	$N^+ + C_2H_6 \rightarrow C_2H_3^+ + NH_3$	4.00×10^{-10}	Dutuit et al. (2013)
$R_{cn}596d$	2	$N^+ + C_2H_6 \rightarrow HCNH^+ + CH_4$	1.60×10^{-10}	Dutuit et al. (2013)
$R_{cn}597a$	2	$N^+ + CH_3CCH \rightarrow C_2H_2^+ + H_2CN$	1.20×10^{-10}	Dryahina et al. (2011)
$R_{cn}597b$	2	$N^+ + CH_3CCH \rightarrow C_2H_4^+ + CN$	1.40×10^{-10}	Dryahina et al. (2011)
$R_{cn}597c$	2	$N^+ + CH_3CCH \rightarrow C_3H_2^+ + NH_2$	6.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}597d$	2	$N^+ + CH_3CCH \rightarrow l{-}C_3H_3^+ + N + H$	4.35×10^{-10}	Dryahina et al. (2011)
$R_{cn}597e$	2	$N^+ + CH_3CCH \rightarrow c{-}C_3H_3^+ + N + H$	4.35×10^{-10}	Dryahina et al. (2011)
$R_{cn}597f$	2	$N^+ + CH_3CCH \rightarrow l{-}C_3H_3^+ + NH$	1.15×10^{-10}	Dryahina et al. (2011)
$R_{cn}597g$	2	$N^+ + CH_3CCH \rightarrow c{-}C_3H_3^+ + NH$	1.15×10^{-10}	Dryahina et al. (2011)
$R_{cn}597h$	2	$N^+ + CH_3CCH \rightarrow C_3H_4^+ + N$	7.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}597i$	2	$N^+ + CH_3CCH \rightarrow C_3H_4^+ + N(^2D)$	2.10×10^{-10}	Dryahina et al. (2011)
$R_{cn}597j$	2	$N^+ + CH_3CCH \rightarrow HC_2NH^+ + {}^3CH_2$	1.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}597k$	2	$N^+ + CH_3CCH \rightarrow C_2H_3N^+ + CH$	4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}597l$	2	$N^+ + CH_3CCH \rightarrow C_2H_3NH^+ + C$	1.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}597m$	2	$N^+ + CH_3CCH \rightarrow HC_3NH^+ + H_2$	6.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598a$	2	$N^+ + C_3H_6 \rightarrow C_2H_2^+ + NH + CH_3$	8.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598b$	2	$N^+ + C_3H_6 \rightarrow C_2H_3^+ + N + CH_3$	2.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}598c$	2	$N^+ + C_3H_6 \rightarrow C_2H_4^+ + H_2CN$	1.60×10^{-10}	Dryahina et al. (2011)
$R_{cn}598d$	2	$N^+ + C_3H_6 \rightarrow C_2H_5^+ + HCN$	4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598e$	2	$N^+ + C_3H_6 \rightarrow l{-}C_3H_3^+ + N + H_3$	2.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598f$	2	$N^+ + C_3H_6 \rightarrow c{-}C_3H_3^+ + N + H_3$	2.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598g$	2	$N^+ + C_3H_6 \rightarrow l{-}C_3H_3^+ + NH + H_2$	1.40×10^{-10}	Dryahina et al. (2011)

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	Type	Reaction									k	Ref.
$R_{cn}598h$	2	N^+	+	C_3H_6	→	$c-C_3H_3^+$	+	NH	+	H_2	1.40×10^{-10}	Dryahina et al. (2011)
$R_{cn}598i$	2	N^+	+	C_3H_6	→	$C_3H_4^+$	+	N	+	H_2	8.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598j$	2	N^+	+	C_3H_6	→	$C_3H_5^+$	+	N	+	H	2.60×10^{-10}	Dryahina et al. (2011)
$R_{cn}598k$	2	N^+	+	C_3H_6	→	$C_3H_5^+$	+	$N(^2D)$	+	H	1.60×10^{-10}	Dryahina et al. (2011)
$R_{cn}598l$	2	N^+	+	C_3H_6	→	$C_3H_5^+$	+	NH			6.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598m$	2	N^+	+	C_3H_6	→	$C_3H_6^+$	+	N			4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}598n$	2	N^+	+	C_3H_6	→	$C_3H_6^+$	+	$N(^2D)$			6.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}599a$	2	N^+	+	C_3H_8	→	$C_2H_3^+$	+	NH	+	CH_4	2.40×10^{-10}	Dryahina et al. (2011)
$R_{cn}599b$	2	N^+	+	C_3H_8	→	$C_2H_4^+$	+	N	+	CH_4	1.80×10^{-10}	Dryahina et al. (2011)
$R_{cn}599c$	2	N^+	+	C_3H_8	→	$C_2H_4^+$	+	$N(^2D)$	+	CH_4	3.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}599d$	2	N^+	+	C_3H_8	→	$C_2H_4^+$	+	NH	+	CH_3	2.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599e$	2	N^+	+	C_3H_8	→	$C_2H_5^+$	+	N	+	CH_3	7.20×10^{-10}	Dryahina et al. (2011)
$R_{cn}599f$	2	N^+	+	C_3H_8	→	$C_3H_5^+$	+	N	+	H_3	6.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599g$	2	N^+	+	C_3H_8	→	$C_3H_5^+$	+	NH	+	H_2	1.60×10^{-10}	Dryahina et al. (2011)
$R_{cn}599h$	2	N^+	+	C_3H_8	→	$C_3H_6^+$	+	N	+	H_2	6.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599i$	2	N^+	+	C_3H_8	→	$C_3H_6^+$	+	$N(^2D)$	+	H_2	4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599j$	2	N^+	+	C_3H_8	→	$C_3H_7^+$	+	N	+	H	1.00×10^{-10}	Dryahina et al. (2011)
$R_{cn}599k$	2	N^+	+	C_3H_8	→	$C_3H_7^+$	+	$N(^2D)$	+	H	4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599l$	2	N^+	+	C_3H_8	→	$C_3H_7^+$	+	NH			4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}599m$	2	N^+	+	C_3H_8	→	$C_3H_8^+$	+	$N(^2D)$			4.00×10^{-11}	Dryahina et al. (2011)
$R_{cn}600a$	2	N^+	+	C_6H_6	→	$C_6H_6^+$	+	N			1.85×10^{-09}	Stavish et al. (2009)
$R_{cn}600b$	2	N^+	+	C_6H_6	→	$C_5H_4^+$	+	HCN	+	H	1.82×10^{-10}	Stavish et al. (2009)
$R_{cn}600c$	2	N^+	+	C_6H_6	→	$c-C_3H_3^+$	+	C_3H_3N			5.72×10^{-10}	Stavish et al. (2009)
$R_{cn}601a$	2	N^+	+	C_7H_8	→	$C_7H_7^+$	+	NH			1.80×10^{-09}	Arnold et al. (2000)
$R_{cn}601b$	2	N^+	+	C_7H_8	→	$C_6H_6^+$	+	H_2CN			1.54×10^{-10}	Arnold et al. (2000)
$R_{cn}601c$	2	N^+	+	C_7H_8	→	$C_5H_5^+$	+	CH_3CN			1.10×10^{-10}	Arnold et al. (2000)
$R_{cn}601d$	2	N^+	+	C_7H_8	→	$C_4H_4^+$	+	C_3H_4N			4.40×10^{-11}	Arnold et al. (2000)
$R_{cn}601e$	2	N^+	+	C_7H_8	→	$c-C_3H_3^+$	+	C_4H_5N			8.80×10^{-11}	Arnold et al. (2000)
$R_{cn}602a$	2	N^+	+	NH_3	→	NH_2^+	+	NH			4.70×10^{-10}	Anicich (1993)
$R_{cn}602b$	2	N^+	+	NH_3	→	NH_3^+	+	N			1.67×10^{-09}	Anicich (1993)
$R_{cn}602c$	2	N^+	+	NH_3	→	N_2H^+	+	H_2			2.12×10^{-10}	Anicich (1993)
$R_{cn}603a$	2	N^+	+	HCN	→	HCN^+	+	N			2.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}603b$	2	N^+	+	HCN	→	CH^+	+	N_2			1.29×10^{-09}	McEwan and Anicich (2007)
$R_{cn}604a$	2	N^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	N			1.54×10^{-10}	Jackson et al. (2005)
$R_{cn}604b$	2	N^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	N	+	H	1.59×10^{-09}	Jackson et al. (2005)
$R_{cn}604c$	2	N^+	+	CH_3NH_2	→	CH_2NH^+	+	N	+	H_2	1.79×10^{-10}	Jackson et al. (2005)

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	Type	Reaction	k	Ref.
R_{cn}604d	2	$N^+ + CH_3NH_2 \rightarrow HCNH^+ + N + H_3$	4.61×10^{-10}	Jackson et al. (2005)
R_{cn}604e	2	$N^+ + CH_3NH_2 \rightarrow CH_3^+ + NH_2 + N$	1.79×10^{-10}	Jackson et al. (2005)
R_{cn}605a	2	$N^+ + CH_3CN \rightarrow C_2H_3N^+ + N$	5.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}605b	2	$N^+ + CH_3CN \rightarrow HC_2NH^+ + NH$	3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}605c	2	$N^+ + CH_3CN \rightarrow C_2H_2^+ + N_2 + H$	1.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}605d	2	$N^+ + CH_3CN \rightarrow CN^+ + CH_2NH$	1.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}606a	2	$N^+ + HC_3N \rightarrow C_3H^+ + N_2$	1.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}606b	2	$N^+ + HC_3N \rightarrow HC_3N^+ + N$	2.65×10^{-09}	McEwan and Anicich (2007)
R_{cn}607a	2	$N^+ + C_3H_3N \rightarrow C_3H_3N^+ + N$	3.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}607b	2	$N^+ + C_3H_3N \rightarrow HC_3NH^+ + NH$	1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}607c	2	$N^+ + C_3H_3N \rightarrow HC_2N^+ + H_2CN$	1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}607d	2	$N^+ + C_3H_3N \rightarrow c-C_3H_3^+ + N_2$	1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}607e	2	$N^+ + C_3H_3N \rightarrow CN^+ + CH_3CN$	1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}607f	2	$N^+ + C_3H_3N \rightarrow C_2H_2^+ + N_2 + CH$	1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}608a	2	$N^+ + C_3H_5N \rightarrow N_2^+ + C_3H_5$	2.31×10^{-09}	Edwards et al. (2008)
R_{cn}608b	2	$N^+ + C_3H_5N \rightarrow l-C_3H_3^+ + N_2 + H_2$	4.20×10^{-10}	Edwards et al. (2008)
R_{cn}608c	2	$N^+ + C_3H_5N \rightarrow c-C_3H_3^+ + N_2 + H_2$	4.20×10^{-10}	Edwards et al. (2008)
R_{cn}608d	2	$N^+ + C_3H_5N \rightarrow C_3H_3NH^+ + NH$	1.05×10^{-09}	Edwards et al. (2008)
R_{cn}609a	2	$N^+ + C_4H_5N \rightarrow l-C_3H_3^+ + H_2CN + N$	1.23×10^{-10}	Stavish et al. (2009)
R_{cn}609b	2	$N^+ + C_4H_5N \rightarrow c-C_3H_3^+ + H_2CN + N$	1.23×10^{-10}	Stavish et al. (2009)
R_{cn}609c	2	$N^+ + C_4H_5N \rightarrow HC_2N^+ + N + C_2H_4$	2.45×10^{-10}	Stavish et al. (2009)
R_{cn}609d	2	$N^+ + C_4H_5N \rightarrow C_3H_4^+ + HCN + N$	2.10×10^{-10}	Stavish et al. (2009)
R_{cn}609e	2	$N^+ + C_4H_5N \rightarrow HC_2NH^+ + CH_3CN$	2.10×10^{-10}	Stavish et al. (2009)
R_{cn}609f	2	$N^+ + C_4H_5N \rightarrow C_3H_5^+ + CN + N$	1.40×10^{-10}	Stavish et al. (2009)
R_{cn}609g	2	$N^+ + C_4H_5N \rightarrow C_2H_3N^+ + C_2H_2 + N$	1.40×10^{-10}	Stavish et al. (2009)
R_{cn}609h	2	$N^+ + C_4H_5N \rightarrow C_4H_4^+ + NH + N$	2.63×10^{-10}	Stavish et al. (2009)
R_{cn}609i	2	$N^+ + C_4H_5N \rightarrow HC_3NH^+ + CH_2NH$	2.63×10^{-10}	Stavish et al. (2009)
R_{cn}609j	2	$N^+ + C_4H_5N \rightarrow C_4H_5^+ + N_2$	2.63×10^{-10}	Stavish et al. (2009)
R_{cn}609k	2	$N^+ + C_4H_5N \rightarrow C_3H_3N^+ + H_2CN$	2.63×10^{-10}	Stavish et al. (2009)
R_{cn}609l	2	$N^+ + C_4H_5N \rightarrow C_3H_3NH^+ + HCN$	5.60×10^{-10}	Stavish et al. (2009)
R_{cn}609m	2	$N^+ + C_4H_5N \rightarrow C_4H_3NH^+ + NH$	2.80×10^{-10}	Stavish et al. (2009)
R_{cn}609n	2	$N^+ + C_4H_5N \rightarrow C_4H_5N^+ + N$	4.20×10^{-10}	Stavish et al. (2009)
R_{cn}610a	2	$N^+ + HC_5N \rightarrow HC_5N^+ + N$	3.15×10^{-09}	Edwards et al. (2009)
R_{cn}610b	2	$N^+ + HC_5N \rightarrow C_5H^+ + N_2$	3.15×10^{-09}	Edwards et al. (2009)
R_{cn}611a	2	$N^+ + C_5H_5N \rightarrow C_4H_4^+ + HCN + N$	1.84×10^{-09}	Fondren et al. (2007)
R_{cn}611b	2	$N^+ + C_5H_5N \rightarrow C_5H_5N^+ + N$	1.56×10^{-09}	Fondren et al. (2007)

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	Type	Reaction									k	Ref.
$R_{cn}612$	3	N^+	+	N_2	→	N_3^+					1.00×10^{-10} $4.00\times10^{-29}T^{1.84}$	Anicich et al. (2000),McEwan and Anicich (2007)
$R_{cn}613a$	2	N^+	+	C_2N_2	→	$C_2N_2^+$	+	N			3.40×10^{-10}	McEwan and Anicich (2007)
$R_{cn}613b$	2	N^+	+	C_2N_2	→	C_2N^+	+	N_2			1.36×10^{-09}	McEwan and Anicich (2007)
$R_{cn}614$	2	N^+	+	$O(^3P)$	→	O^+	+	N			4.50×10^{-12}	Rutherford et al. (1978)
$R_{cn}615$	2	N^+	+	H_2O	→	H_2O^+	+	N			2.70×10^{-09}	McEwan and Anicich (2007)
$R_{cn}616a$	2	N^+	+	CO	→	C^+	+	NO			5.60×10^{-12}	McEwan and Anicich (2007)
$R_{cn}616b$	2	N^+	+	CO	→	CO^+	+	N			4.93×10^{-10}	McEwan and Anicich (2007)
$R_{cn}616c$	2	N^+	+	CO	→	NO^+	+	C			6.16×10^{-11}	McEwan and Anicich (2007)
$R_{cn}617a$	2	N^+	+	H_2CO	→	HCO^+	+	NH			7.25×10^{-10}	Anicich (1993)
$R_{cn}617b$	2	N^+	+	H_2CO	→	CH_2O^+	+	N			1.89×10^{-09}	Anicich (1993)
$R_{cn}617c$	2	N^+	+	H_2CO	→	NO^+	+	$^3CH_2$			2.90×10^{-10}	Anicich (1993)
$R_{cn}618a$	2	N^+	+	CO_2	→	CO^+	+	NO			2.02×10^{-10}	Anicich (1993)
$R_{cn}618b$	2	N^+	+	CO_2	→	CO_2^+	+	N			9.18×10^{-10}	Anicich (1993)
$R_{cn}619a$	2	NH^+	+	H_2	→	H_3^+	+	N			1.85×10^{-10}	McEwan and Anicich (2007)
$R_{cn}619b$	2	NH^+	+	H_2	→	NH_2^+	+	H			1.05×10^{-09}	McEwan and Anicich (2007)
$R_{cn}620a$	2	NH^+	+	CH_4	→	CH_5^+	+	N			9.60×10^{-11}	McEwan and Anicich (2007)
$R_{cn}620b$	2	NH^+	+	CH_4	→	NH_2^+	+	CH_3			1.92×10^{-10}	McEwan and Anicich (2007)
$R_{cn}620c$	2	NH^+	+	CH_4	→	$HCNH^+$	+	H_2	+	H	6.72×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621a$	2	NH^+	+	C_2H_4	→	$C_2H_2^+$	+	NH_3			1.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621b$	2	NH^+	+	C_2H_4	→	$C_2H_3^+$	+	NH_2			3.75×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621c$	2	NH^+	+	C_2H_4	→	$C_2H_4^+$	+	NH			3.75×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621d$	2	NH^+	+	C_2H_4	→	$HCNH^+$	+	CH_3			3.00×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621e$	2	NH^+	+	C_2H_4	→	CH_2NH^+	+	$^3CH_2$			1.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}621f$	2	NH^+	+	C_2H_4	→	$C_2H_3N^+$	+	H_2			1.50×10^{-10}	McEwan and Anicich (2007)
$R_{cn}622a$	2	NH^+	+	CH_3CCH	→	CH_2NH^+	+	C_2H_2			1.09×10^{-10}	Operti et al. (2004)
$R_{cn}622b$	2	NH^+	+	CH_3CCH	→	$CH_2NH_2^+$	+	C_2H			9.07×10^{-11}	Operti et al. (2004)
$R_{cn}622c$	2	NH^+	+	CH_3CCH	→	$c-C_3H_3^+$	+	NH_2			1.59×10^{-10}	Operti et al. (2004)
$R_{cn}622d$	2	NH^+	+	CH_3CCH	→	HC_2N^+	+	CH_4			1.59×10^{-10}	Operti et al. (2004)
$R_{cn}622e$	2	NH^+	+	CH_3CCH	→	$C_3H_4^+$	+	NH			1.27×10^{-10}	Operti et al. (2004)
$R_{cn}622f$	2	NH^+	+	CH_3CCH	→	HC_2NH^+	+	CH_3			1.27×10^{-10}	Operti et al. (2004)
$R_{cn}622g$	2	NH^+	+	CH_3CCH	→	$C_3H_5^+$	+	N			6.35×10^{-11}	Operti et al. (2004)
$R_{cn}622h$	2	NH^+	+	CH_3CCH	→	$C_2H_3N^+$	+	$^3CH_2$			6.35×10^{-11}	Operti et al. (2004)
$R_{cn}623$	2	NH^+	+	N	→	N_2^+	+	H			1.30×10^{-09}	Wakelam et al. (2015)
$R_{cn}624a$	2	NH^+	+	NH_3	→	NH_3^+	+	NH			1.80×10^{-09}	Anicich (1993)
$R_{cn}624b$	2	NH^+	+	NH_3	→	NH_4^+	+	N			6.00×10^{-10}	Anicich (1993)

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	Type	Reaction									k	Ref.
R_{cn}625	2	NH^+	+	HCN	→	$HCNH^+$	+	N			6.04×10^{-09}	Su-Chesnavich
R_{cn}626a	2	NH^+	+	CH_3NH_2	→	$HCNH^+$	+	NH_3	+	H	4.20×10^{-10}	Anicich (1993)
R_{cn}626b	2	NH^+	+	CH_3NH_2	→	CH_2NH^+	+	NH_3			1.05×10^{-10}	Anicich (1993)
R_{cn}626c	2	NH^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	NH_2			9.45×10^{-10}	Anicich (1993)
R_{cn}626d	2	NH^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	NH			4.20×10^{-10}	Anicich (1993)
R_{cn}626e	2	NH^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	N			4.20×10^{-10}	Anicich (1993)
R_{cn}627	2	NH^+	+	N_2	→	N_2H^+	+	N			6.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}628a	2	NH^+	+	H_2O	→	H_3O^+	+	N			1.05×10^{-09}	McEwan and Anicich (2007)
R_{cn}628b	2	NH^+	+	H_2O	→	H_2O^+	+	NH			1.05×10^{-09}	McEwan and Anicich (2007)
R_{cn}628c	2	NH^+	+	H_2O	→	NH_2^+	+	OH			8.75×10^{-10}	McEwan and Anicich (2007)
R_{cn}628d	2	NH^+	+	H_2O	→	NH_3^+	+	$O(^3P)$			1.75×10^{-10}	McEwan and Anicich (2007)
R_{cn}628e	2	NH^+	+	H_2O	→	HNO^+	+	H_2			3.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}629a	2	NH^+	+	CO	→	NCO^+	+	H			5.39×10^{-10}	McEwan and Anicich (2007)
R_{cn}629b	2	NH^+	+	CO	→	HCO^+	+	N			4.41×10^{-10}	McEwan and Anicich (2007)
R_{cn}630a	2	NH^+	+	H_2CO	→	HCO^+	+	NH_2			1.82×10^{-09}	Anicich (1993)
R_{cn}630b	2	NH^+	+	H_2CO	→	CH_2O^+	+	NH			9.90×10^{-10}	Anicich (1993)
R_{cn}630c	2	NH^+	+	H_2CO	→	CH_2OH^+	+	N			4.95×10^{-10}	Anicich (1993)
R_{cn}631a	2	NH^+	+	CO_2	→	$OCOH^+$	+	N			3.85×10^{-10}	Adams et al. (1980),Smith et al. (1978a)
R_{cn}631b	2	NH^+	+	CO_2	→	NO^+	+	HCO			3.30×10^{-10}	Adams et al. (1980),Smith et al. (1978a)
R_{cn}631c	2	NH^+	+	CO_2	→	HNO^+	+	CO			3.85×10^{-10}	Adams et al. (1980),Smith et al. (1978a)
R_{cn}632	2	NH_2^+	+	H_2	→	NH_3^+	+	H			1.95×10^{-10}	McEwan and Anicich (2007)
R_{cn}633	2	NH_2^+	+	CH_4	→	NH_3^+	+	CH_3			9.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}634a	2	NH_2^+	+	C_2H_4	→	$C_2H_4^+$	+	NH_2			4.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}634b	2	NH_2^+	+	C_2H_4	→	$C_2H_5^+$	+	NH			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}634c	2	NH_2^+	+	C_2H_4	→	$CH_2NH_2^+$	+	$^3CH_2$			4.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}634d	2	NH_2^+	+	C_2H_4	→	$C_2H_5N^+$	+	H			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}635a	2	NH_2^+	+	CH_3CCH	→	$C_3H_4^+$	+	NH_2			1.44×10^{-10}	Operti et al. (2004)
R_{cn}635b	2	NH_2^+	+	CH_3CCH	→	HC_2NH^+	+	CH_4			1.44×10^{-10}	Operti et al. (2004)
R_{cn}635c	2	NH_2^+	+	CH_3CCH	→	$C_3H_5^+$	+	NH			1.44×10^{-10}	Operti et al. (2004)
R_{cn}635d	2	NH_2^+	+	CH_3CCH	→	$C_2H_3N^+$	+	$^3CH_2$	+	H	1.44×10^{-10}	Operti et al. (2004)
R_{cn}635e	2	NH_2^+	+	CH_3CCH	→	$C_3H_3NH^+$	+	H_2			2.03×10^{-10}	Operti et al. (2004)
R_{cn}636	2	NH_2^+	+	N	→	N_2H^+	+	H			9.10×10^{-11}	Wakelam et al. (2015)
R_{cn}637a	2	NH_2^+	+	NH_3	→	NH_3^+	+	NH_2			1.15×10^{-09}	Anicich (1993)
R_{cn}637b	2	NH_2^+	+	NH_3	→	NH_4^+	+	NH			1.15×10^{-09}	Anicich (1993)
R_{cn}638	2	NH_2^+	+	HCN	→	$HCNH^+$	+	NH			5.94×10^{-09}	Su-Chesnavich
R_{cn}639a	2	NH_2^+	+	CH_3NH_2	→	NH_4^+	+	CH_2NH			1.52×10^{-10}	Anicich (1993)

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	Type	Reaction									k	Ref.
R_{cn}639b	2	NH_2^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	NH_3			3.80×10^{-10}	Anicich (1993)
R_{cn}639c	2	NH_2^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	NH_2			1.01×10^{-09}	Anicich (1993)
R_{cn}639d	2	NH_2^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	NH			3.80×10^{-10}	Anicich (1993)
R_{cn}640a	2	NH_2^+	+	H_2O	→	NH_3^+	+	OH			8.70×10^{-11}	McEwan and Anicich (2007)
R_{cn}640b	2	NH_2^+	+	H_2O	→	NH_4^+	+	$O(^3P)$			1.16×10^{-10}	McEwan and Anicich (2007)
R_{cn}640c	2	NH_2^+	+	H_2O	→	H_3O^+	+	NH			2.73×10^{-09}	McEwan and Anicich (2007)
R_{cn}641a	2	NH_2^+	+	H_2CO	→	NH_3^+	+	HCO			5.60×10^{-10}	Anicich (1993)
R_{cn}641b	2	NH_2^+	+	H_2CO	→	CH_2OH^+	+	NH			2.24×10^{-09}	Anicich (1993)
R_{cn}642	2	NH_3^+	+	H_2	→	NH_4^+	+	H			2.00×10^{-13}	Wakelam et al. (2015)
R_{cn}643	2	NH_3^+	+	CH_4	→	NH_4^+	+	CH_3			4.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}644	2	NH_3^+	+	C_2H_4	→	NH_4^+	+	C_2H_3			1.40×10^{-09}	McEwan and Anicich (2007)
R_{cn}645	2	NH_3^+	+	NH_3	→	NH_4^+	+	NH_2			2.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}646a	2	NH_3^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	NH_3			9.00×10^{-10}	Anicich (1993)
R_{cn}646b	2	NH_3^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	NH_2			6.30×10^{-10}	Anicich (1993)
R_{cn}646c	2	NH_3^+	+	CH_3NH_2	→	NH_4^+	+	CH_2NH_2			2.70×10^{-10}	Anicich (1993)
R_{cn}647	2	NH_3^+	+	C_5H_5N	→	$C_5H_5N^+$	+	NH_3			3.60×10^{-09}	Fondren et al. (2007)
R_{cn}648	2	NH_3^+	+	H_2O	→	NH_4^+	+	OH			2.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}649	2	NH_3^+	+	H_2CO	→	NH_4^+	+	HCO			8.00×10^{-10}	Anicich (1993)
R_{cn}650	2	NH_4^+	+	NH_3	→	$AdductN^+$	+	hv			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}651	2	NH_4^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	NH_3			2.00×10^{-09}	Anicich (1993)
R_{cn}652	2	NH_4^+	+	C_5H_5N	→	$C_5H_5NH^+$	+	NH_3			3.50×10^{-09}	Fondren et al. (2007)
R_{cn}653	2	CN^+	+	H	→	H^+	+	CN			6.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}654a	2	CN^+	+	H_2	→	HCN^+	+	H			8.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}654b	2	CN^+	+	H_2	→	HNC^+	+	H			8.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}655a	2	CN^+	+	CH_4	→	CH_3^+	+	HCN			5.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}655b	2	CN^+	+	CH_4	→	CH_4^+	+	CN			1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}655c	2	CN^+	+	CH_4	→	HCN^+	+	CH_3			1.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}655d	2	CN^+	+	CH_4	→	$HCNH^+$	+	$^3CH_2$			1.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}655e	2	CN^+	+	CH_4	→	HC_2NH^+	+	H_2			1.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}656a	2	CN^+	+	C_2H_2	→	$C_2H_2^+$	+	CN			8.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}656b	2	CN^+	+	C_2H_2	→	HC_3N^+	+	H			2.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}657a	2	CN^+	+	C_2H_4	→	$C_2H_4^+$	+	CN			9.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}657b	2	CN^+	+	C_2H_4	→	HCN^+	+	C_2H_3			3.25×10^{-10}	McEwan and Anicich (2007)
R_{cn}657c	2	CN^+	+	C_2H_4	→	HC_3NH^+	+	H_2			6.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}658a	2	CN^+	+	C_2H_6	→	$C_2H_3^+$	+	HCN	+	H_2	2.85×10^{-10}	McEwan and Anicich (2007)
R_{cn}658b	2	CN^+	+	C_2H_6	→	$C_2H_4^+$	+	HCN	+	H	1.23×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}658c	2	CN^+	+	C_2H_6	→	$C_2H_5^+$	+	HCN			3.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}659a	2	CN^+	+	C_4H_2	→	$C_4H_2^+$	+	CN			7.27×10^{-10}	McEwan and Anicich (2007)
R_{cn}659b	2	CN^+	+	C_4H_2	→	HC_5N^+	+	H			2.42×10^{-10}	McEwan and Anicich (2007)
R_{cn}660	2	CN^+	+	N	→	N_2^+	+	C			6.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}661a	2	CN^+	+	NH_3	→	NH_2^+	+	HCN			1.00×10^{-10}	Anicich (1993)
R_{cn}661b	2	CN^+	+	NH_3	→	NH_3^+	+	CN			1.20×10^{-09}	Anicich (1993)
R_{cn}661c	2	CN^+	+	NH_3	→	HCN^+	+	NH_2			4.00×10^{-10}	Anicich (1993)
R_{cn}661d	2	CN^+	+	NH_3	→	$HCNH^+$	+	NH			3.00×10^{-10}	Anicich (1993)
R_{cn}662a	2	CN^+	+	HCN	→	HCN^+	+	CN			2.24×10^{-09}	McEwan and Anicich (2007)
R_{cn}662b	2	CN^+	+	HCN	→	$C_2N_2^+$	+	H			4.59×10^{-10}	McEwan and Anicich (2007)
R_{cn}663a	2	CN^+	+	CH_3CN	→	$C_2H_3N^+$	+	CN			1.70×10^{-09}	McEwan and Anicich (2007)
R_{cn}663b	2	CN^+	+	CH_3CN	→	HC_2NH^+	+	HCN			6.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}663c	2	CN^+	+	CH_3CN	→	CH_3^+	+	C_2N_2			6.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}663d	2	CN^+	+	CH_3CN	→	$C_2H_3^+$	+	CN_2			3.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}664a	2	CN^+	+	HC_3N	→	C_3N^+	+	HCN			9.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}664b	2	CN^+	+	HC_3N	→	HC_3N^+	+	CN			3.68×10^{-09}	McEwan and Anicich (2007)
R_{cn}665a	2	CN^+	+	C_3H_3N	→	$c-C_3H_3^+$	+	N_2	+	C	7.20×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}665b	2	CN^+	+	C_3H_3N	→	$C_3H_3N^+$	+	CN			1.69×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}665c	2	CN^+	+	C_3H_3N	→	$C_2N_2H^+$	+	C_2H_2			1.69×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}665d	2	CN^+	+	C_3H_3N	→	$AdductN^+$	+	hv			4.05×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}666a	2	CN^+	+	C_2N_2	→	C_2N^+	+	CN_2			5.25×10^{-11}	McEwan and Anicich (2007)
R_{cn}666b	2	CN^+	+	C_2N_2	→	$C_2N_2^+$	+	CN			1.63×10^{-09}	McEwan and Anicich (2007)
R_{cn}666c	2	CN^+	+	C_2N_2	→	C_3N^+	+	N_2			8.75×10^{-11}	McEwan and Anicich (2007)
R_{cn}667a	2	CN^+	+	H_2O	→	H_2O^+	+	CN			3.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}667b	2	CN^+	+	H_2O	→	HCN^+	+	OH			1.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}667c	2	CN^+	+	H_2O	→	$HCNH^+$	+	$O(^3P)$			4.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}667d	2	CN^+	+	H_2O	→	HCO^+	+	NH			1.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}667e	2	CN^+	+	H_2O	→	$HNCO^+$	+	H			6.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}668	2	CN^+	+	CO	→	CO^+	+	CN			4.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}669a	2	CN^+	+	H_2CO	→	CH_2O^+	+	CN			2.07×10^{-09}	Su-Chesnavich
R_{cn}669b	2	CN^+	+	H_2CO	→	HCO^+	+	HCN			2.07×10^{-09}	Su-Chesnavich
R_{cn}670	2	HCN^+	+	H	→	H^+	+	HCN			3.70×10^{-11}	McEwan and Anicich (2007)
R_{cn}671	2	HCN^+	+	H_2	→	$HCNH^+$	+	H			8.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}672a	2	HCN^+	+	CH_4	→	$C_2H_3^+$	+	NH_2			1.27×10^{-10}	McEwan and Anicich (2007)
R_{cn}672b	2	HCN^+	+	CH_4	→	$HCNH^+$	+	CH_3			1.14×10^{-09}	McEwan and Anicich (2007)
R_{cn}673a	2	HCN^+	+	C_2H_2	→	$C_2H_2^+$	+	HCN			1.15×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
R_{cn}673b	2	HCN^+	+	C_2H_2	→	$C_2H_3^+$	+	CN	2.03×10^{-10}	McEwan and Anicich (2007)
R_{cn}673c	2	HCN^+	+	C_2H_2	→	HC_3NH^+	+	H	1.35×10^{-10}	McEwan and Anicich (2007)
R_{cn}674	2	HCN^+	+	N	→	CH^+	+	N_2	2.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}675a	2	HCN^+	+	NH_3	→	NH_3^+	+	HCN	1.68×10^{-09}	Anicich (1993)
R_{cn}675b	2	HCN^+	+	NH_3	→	NH_4^+	+	CN	1.40×10^{-10}	Anicich (1993)
R_{cn}675c	2	HCN^+	+	NH_3	→	$HCNH^+$	+	NH_2	8.40×10^{-10}	Anicich (1993)
R_{cn}676	2	HCN^+	+	HCN	→	$HCNH^+$	+	CN	1.45×10^{-09}	McEwan and Anicich (2007)
R_{cn}677a	2	HCN^+	+	HC_3N	→	HC_3N^+	+	HCN	2.39×10^{-09}	McEwan and Anicich (2007)
R_{cn}677b	2	HCN^+	+	HC_3N	→	HC_3NH^+	+	CN	2.21×10^{-09}	McEwan and Anicich (2007)
R_{cn}678a	2	HCN^+	+	C_3H_3N	→	$C_3H_3N^+$	+	HCN	2.76×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}678b	2	HCN^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	CN	1.84×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}679	2	HCN^+	+	C_2N_2	→	$C_2N_2H^+$	+	CN	1.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}680a	2	HCN^+	+	H_2O	→	H_3O^+	+	CN	1.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}680b	2	HCN^+	+	H_2O	→	H_2O^+	+	HCN	1.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}680c	2	HCN^+	+	H_2O	→	$HCNH^+$	+	OH	1.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}681a	2	HCN^+	+	CO	→	HCO^+	+	CN	1.38×10^{-10}	McEwan and Anicich (2007)
R_{cn}681b	2	HCN^+	+	CO	→	HNC^+	+	CO	3.22×10^{-10}	McEwan and Anicich (2007)
R_{cn}682	2	HCN^+	+	H_2CO	→	CH_2OH^+	+	CN	4.09×10^{-09}	Su-Chesnavich
R_{cn}683a	2	HCN^+	+	CO_2	→	$OCOH^+$	+	CN	2.10×10^{-10}	Anicich (1993)
R_{cn}683b	2	HCN^+	+	CO_2	→	HNC^+	+	CO_2	2.90×10^{-10}	Anicich (1993)
R_{cn}684	2	HNC^+	+	H_2	→	$HCNH^+$	+	H	7.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}685	2	HNC^+	+	CH_4	→	$HCNH^+$	+	CH_3	1.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}686a	2	HNC^+	+	C_2H_2	→	$C_2H_2^+$	+	HCN	6.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}686b	2	HNC^+	+	C_2H_2	→	HC_3NH^+	+	H	9.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}687	2	HNC^+	+	NH_3	→	NH_3^+	+	HNC	3.23×10^{-09}	Su-Chesnavich
R_{cn}688	2	HNC^+	+	HCN	→	$HCNH^+$	+	CN	5.13×10^{-09}	Su-Chesnavich
R_{cn}689a	2	HNC^+	+	C_3H_3N	→	$C_3H_3N^+$	+	HCN	2.76×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}689b	2	HNC^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	CN	1.84×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}690	2	HNC^+	+	H_2O	→	H_3O^+	+	CN	3.61×10^{-09}	Su-Chesnavich
R_{cn}691	2	HNC^+	+	H_2CO	→	CH_2OH^+	+	CN	4.09×10^{-09}	Su-Chesnavich
R_{cn}692	2	$HCNH^+$	+	CH_3	→	$C_2H_3NH^+$	+	H	$1.05\times10^{-10}T^{2.02}e^{-84.3/T}$	ThisWork
R_{cn}693	3	$HCNH^+$	+	CH_4	→	$HCNH^+CH_4$			1.00×10^{-10} $1.00\times10^{-27}T^{3.00}$	Capone et al. (1981)
R_{cn}694a	2	$HCNH^+$	+	C_2H_2	→	$C_3H_3NH^+$	+	hv	1.50×10^{-15}	Herbst et al. (1989),Demarais et al. (2013)
R_{cn}694b	3	$HCNH^+$	+	C_2H_2	→	$C_3H_3NH^+$			1.00×10^{-10} $4.00\times10^{-28}T^{3.00}$	Anicich et al. (2000),Milligan et al. (2001)

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	Type	Reaction							k	Ref.
$R_{cn}695b$	3	$HCNH^+$	+	C_2H_4	→	$C_3H_5NH^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									7.00×10^{-27}	
$R_{cn}696$	3	$HCNH^+$	+	C_2H_6	→	$AdductN^+$			1.00×10^{-10}	Molina-Cuberos et al. (2002)
									$5.00\times10^{-29}T^{3.00}$	
$R_{cn}697$	2	$HCNH^+$	+	CH_3CCH	→	$C_3H_5^+$	+	HCN	1.90×10^{-09}	Su-Chesnavich
$R_{cn}698$	2	$HCNH^+$	+	CH_2CCH_2	→	$C_3H_5^+$	+	HCN	1.40×10^{-09}	Langevin
$R_{cn}699$	2	$HCNH^+$	+	C_3H_6	→	$C_3H_7^+$	+	HCN	1.60×10^{-09}	Su-Chesnavich
$R_{cn}700$	2	$HCNH^+$	+	C_4H_2	→	$C_4H_3^+$	+	HCN	1.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}701$	2	$HCNH^+$	+	C_5H_4	→	$C_5H_5^+$	+	HCN	2.50×10^{-09}	Su-Chesnavich
$R_{cn}702$	2	$HCNH^+$	+	C_6H_2	→	$C_6H_3^+$	+	HCN	1.80×10^{-09}	Langevin
$R_{cn}703$	2	$HCNH^+$	+	C_6H_6	→	$C_6H_7^+$	+	HCN	1.70×10^{-09}	Langevin
$R_{cn}704$	2	$HCNH^+$	+	C_7H_4	→	$C_7H_5^+$	+	HCN	2.90×10^{-09}	Su-Chesnavich
$R_{cn}705$	2	$HCNH^+$	+	C_7H_8	→	$C_7H_9^+$	+	HCN	1.90×10^{-09}	Su-Chesnavich
$R_{cn}706$	2	$HCNH^+$	+	C_8H_2	→	$C_8H_3^+$	+	HCN	2.20×10^{-09}	Langevin
$R_{cn}707$	2	$HCNH^+$	+	NH_3	→	NH_4^+	+	HCN	2.30×10^{-09}	Anicich (1993)
$R_{cn}708$	2	$HCNH^+$	+	N_2H_4	→	$N_2H_5^+$	+	HCN	1.20×10^{-09}	Su-Chesnavich
$R_{cn}709$	2	$HCNH^+$	+	CH_2NH	→	$CH_2NH_2^+$	+	HCN	2.70×10^{-09}	Edwards et al. (2008)
$R_{cn}710$	2	$HCNH^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	HCN	2.00×10^{-09}	Edwards et al. (2008)
$R_{cn}711$	3	$HCNH^+$	+	HCN	→	$AdductN^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.00×10^{-25}	
$R_{cn}712$	2	$HCNH^+$	+	HNC	→	$HCNH^+$	+	HCN	5.20×10^{-09}	Su-Chesnavich
$R_{cn}713$	2	$HCNH^+$	+	CH_3CN	→	$C_2H_3NH^+$	+	HCN	3.80×10^{-09}	McEwan and Anicich (2007)
$R_{cn}714$	2	$HCNH^+$	+	HC_3N	→	HC_3NH^+	+	HCN	3.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}715$	2	$HCNH^+$	+	C_3H_3N	→	$C_3H_3NH^+$	+	HCN	4.50×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}716$	2	$HCNH^+$	+	C_3H_5N	→	$C_3H_5NH^+$	+	HCN	4.20×10^{-09}	Edwards et al. (2008)
$R_{cn}717$	2	$HCNH^+$	+	C_4H_3N	→	$C_4H_3NH^+$	+	HCN	6.80×10^{-09}	Su-Chesnavich
$R_{cn}718$	2	$HCNH^+$	+	C_4H_5N	→	$C_4H_5NH^+$	+	HCN	5.50×10^{-09}	Su-Chesnavich
$R_{cn}719$	2	$HCNH^+$	+	HC_5N	→	HC_5NH^+	+	HCN	4.80×10^{-09}	Edwards et al. (2009)
$R_{cn}720$	2	$HCNH^+$	+	C_5H_5N	→	$C_5H_5NH^+$	+	HCN	3.60×10^{-09}	Su-Chesnavich
$R_{cn}721$	2	$HCNH^+$	+	C_6H_3N	→	$C_6H_3NH^+$	+	HCN	8.20×10^{-09}	Su-Chesnavich
$R_{cn}722$	2	$HCNH^+$	+	C_6H_7N	→	$C_6H_7NH^+$	+	HCN	2.40×10^{-09}	Su-Chesnavich
$R_{cn}723$	3	$HCNH^+$	+	N_2	→	$HCNH^+N_2$			1.00×10^{-10}	Capone et al. (1981)
									$1.00\times10^{-27}T^{3.00}$	
$R_{cn}724$	2	$HCNH^+$	+	H_2O	→	H_3O^+	+	HCN	8.80×10^{-13}	McEwan and Anicich (2007)
$R_{cn}725$	2	$HCNH^+$	+	H_2CO	→	CH_2OH^+	+	HCN	2.10×10^{-09}	Anicich (1993)
$R_{cn}726$	2	$HCNH^+CH_4$	+	C_2H_2	→	$C_3H_3NH^+$	+	CH_4	1.00×10^{-09}	Capone et al. (1981)

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	Type	Reaction									k	Ref.
R_{cn}727	2	$HCNH^+CH_4$	+	N_2	→	$HCNH^+$	+	CH_4	+	N_2	9.10×10^{-14}	Vacher et al. (1999)
R_{cn}728	2	$HCNH^+N_2$	+	C_2H_2	→	$C_3H_3NH^+$	+	N_2			1.00×10^{-09}	Capone et al. (1981)
R_{cn}729	2	$HCNH^+N_2$	+	C_2H_6	→	$C_3H_7NH^+$	+	N_2			1.00×10^{-09}	Vacher et al. (2000)
R_{cn}730	2	$HCNH^+N_2$	+	N_2	→	$HCNH^+$	+	N_2	+	N_2	2.80×10^{-14}	Vacher et al. (1999)
R_{cn}731a	2	CH_2NH^+	+	C_2H_4	→	$HCNH^+$	+	C_2H_5			2.40×10^{-10}	Chamot-Rooke et al. (2003)
R_{cn}731b	2	CH_2NH^+	+	C_2H_4	→	$C_3H_5^+$	+	NH_2			2.40×10^{-10}	Chamot-Rooke et al. (2003)
R_{cn}731c	2	CH_2NH^+	+	C_2H_4	→	$C_3H_5NH^+$	+	H			7.20×10^{-10}	Chamot-Rooke et al. (2003)
R_{cn}732	2	CH_2NH^+	+	C_3H_6	→	$C_3H_5NH^+$	+	CH_3			1.20×10^{-09}	Chamot-Rooke et al. (2003)
R_{cn}733a	2	CH_2NH^+	+	C_6H_6	→	$C_6H_7^+$	+	H_2CN			4.80×10^{-10}	Chamot-Rooke et al. (2003)
R_{cn}733b	2	CH_2NH^+	+	C_6H_6	→	$CXHYNZ^+$	+	H			7.20×10^{-10}	Chamot-Rooke et al. (2003)
R_{cn}734	2	CH_2NH^+	+	NH_3	→	$CXHYNZ^+$					1.20×10^{-09}	Zielinska and Wincel (1970)
R_{cn}735	2	CH_2NH^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	H_2CN			1.20×10^{-09}	Zielinska and Wincel (1970)
R_{cn}736	2	CH_2NH^+	+	H_2CO	→	$HCNH^+$	+	CH_3O			1.00×10^{-09}	Chamot-Rooke et al. (2003)
R_{cn}737	2	$CH_2NH_2^+$	+	NH_3	→	NH_4^+	+	CH_2NH			1.10×10^{-10}	Operti et al. (2004)
R_{cn}738	2	$CH_2NH_2^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	HCN	+	H_2	1.80×10^{-09}	Anicich (1993)
R_{cn}739	2	$CH_3NH_2^+$	+	NH_3	→	NH_4^+	+	CH_2NH_2			2.30×10^{-09}	Iraqi et al. (1991)
R_{cn}740	2	$CH_3NH_2^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	CH_2NH_2			1.90×10^{-09}	Anicich (1993)
R_{cn}741a	2	C_2N^+	+	H_2	→	$HCNH^+$	+	C			8.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}741b	2	C_2N^+	+	H_2	→	HC_2NH^+	+	hv			9.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}742a	2	C_2N^+	+	CH_4	→	$C_2H_3^+$	+	HCN			4.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}742b	2	C_2N^+	+	CH_4	→	$HCNH^+$	+	C_2H_2			7.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}742c	2	C_2N^+	+	CH_4	→	HC_3NH^+	+	H_2			2.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}743a	2	C_2N^+	+	C_2H_2	→	C_3H^+	+	HCN			1.47×10^{-09}	McEwan and Anicich (2007)
R_{cn}743b	2	C_2N^+	+	C_2H_2	→	$HCNH^+$	+	C_3			1.28×10^{-10}	McEwan and Anicich (2007)
R_{cn}744a	2	C_2N^+	+	C_2H_4	→	$C_2H_4^+$	+	C_2N			1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}744b	2	C_2N^+	+	C_2H_4	→	HC_2NH^+	+	C_2H_2			6.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}744c	2	C_2N^+	+	C_2H_4	→	$c-C_3H_3^+$	+	HCN			3.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}744d	2	C_2N^+	+	C_2H_4	→	HC_4NH^+	+	H_2			1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}745a	2	C_2N^+	+	C_2H_6	→	$C_2H_3^+$	+	CH_3CN			1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}745b	2	C_2N^+	+	C_2H_6	→	$C_2H_5^+$	+	HC_2N			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}745c	2	C_2N^+	+	C_2H_6	→	$c-C_3H_3^+$	+	HCN	+	H_2	3.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}745d	2	C_2N^+	+	C_2H_6	→	$C_3H_5^+$	+	HCN			1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}745e	2	C_2N^+	+	C_2H_6	→	HC_2NH^+	+	C_2H_4			3.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}746a	2	C_2N^+	+	C_4H_2	→	C_5H^+	+	HCN			7.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}746b	2	C_2N^+	+	C_4H_2	→	$C_4H_2^+$	+	C_2N			2.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}746c	2	C_2N^+	+	C_4H_2	→	C_2N^+	+	C_4H_2			2.60×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}747	2	C_2N^+	+	NH_3	→	$HCNH^+$	+	HCN			1.90×10^{-09}	Anicich (1993)
R_{cn}748	3	C_2N^+	+	HCN	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											4.30×10^{-26}	
R_{cn}749	2	C_2N^+	+	CH_3CN	→	$C_2H_3^+$	+	C_2N_2			4.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}750a	2	C_2N^+	+	C_3H_3N	→	$c{-}C_3H_3^+$	+	C_2N_2			1.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}750b	2	C_2N^+	+	C_3H_3N	→	$l{-}C_3H_3^+$	+	C_2N_2			1.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}751	2	C_2N^+	+	C_3H_5N	→	$CXHYNZ^+$					2.05×10^{-09}	Franklin et al. (1966)
R_{cn}752a	2	C_2N^+	+	H_2O	→	$HCNH^+$	+	CO			1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}752b	2	C_2N^+	+	H_2O	→	HCO^+	+	HCN			1.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}753a	2	CNC^+	+	CH_4	→	$C_2H_3^+$	+	HCN			2.10×10^{-12}	Anicich (1993)
R_{cn}753b	2	CNC^+	+	CH_4	→	HC_3NH^+	+	H_2			2.10×10^{-12}	Anicich (1993)
R_{cn}754a	2	CNC^+	+	C_2H_2	→	C_3H^+	+	HCN			7.36×10^{-10}	Anicich (1993)
R_{cn}754b	2	CNC^+	+	C_2H_2	→	$HCNH^+$	+	C_3			6.40×10^{-11}	Anicich (1993)
R_{cn}755a	2	CNC^+	+	C_2H_4	→	$C_2H_4^+$	+	C_2N			1.30×10^{-10}	Anicich (1993)
R_{cn}755b	2	CNC^+	+	C_2H_4	→	$c{-}C_3H_3^+$	+	HCN			1.95×10^{-10}	Anicich (1993)
R_{cn}755c	2	CNC^+	+	C_2H_4	→	$l{-}C_3H_3^+$	+	HCN			1.95×10^{-10}	Anicich (1993)
R_{cn}755d	2	CNC^+	+	C_2H_4	→	HC_2NH^+	+	C_2H_2			6.50×10^{-10}	Anicich (1993)
R_{cn}755e	2	CNC^+	+	C_2H_4	→	HC_4NH^+	+	H_2			1.30×10^{-10}	Anicich (1993)
R_{cn}756a	2	CNC^+	+	C_2H_6	→	$C_2H_3^+$	+	CH_3CN			1.20×10^{-10}	Anicich (1993)
R_{cn}756b	2	CNC^+	+	C_2H_6	→	$C_2H_5^+$	+	HC_2N			3.00×10^{-10}	Anicich (1993)
R_{cn}756c	2	CNC^+	+	C_2H_6	→	$c{-}C_3H_3^+$	+	HCN	+	H_2	1.80×10^{-10}	Anicich (1993)
R_{cn}756d	2	CNC^+	+	C_2H_6	→	$l{-}C_3H_3^+$	+	HCN	+	H_2	1.80×10^{-10}	Anicich (1993)
R_{cn}756e	2	CNC^+	+	C_2H_6	→	$C_3H_5^+$	+	HCN			1.20×10^{-10}	Anicich (1993)
R_{cn}756f	2	CNC^+	+	C_2H_6	→	HC_2NH^+	+	C_2H_4			3.00×10^{-10}	Anicich (1993)
R_{cn}757a	2	CNC^+	+	C_4H_2	→	C_5H^+	+	HCN			7.80×10^{-10}	Dheandhanoo et al. (1986)
R_{cn}757b	2	CNC^+	+	C_4H_2	→	$C_4H_2^+$	+	C_2N			2.60×10^{-10}	Dheandhanoo et al. (1986)
R_{cn}757c	2	CNC^+	+	C_4H_2	→	$CXHYNZ^+$					2.60×10^{-10}	Dheandhanoo et al. (1986)
R_{cn}758a	2	CNC^+	+	NH_3	→	$HCNH^+$	+	HCN			1.76×10^{-09}	Anicich (1993)
R_{cn}758b	2	CNC^+	+	NH_3	→	N_2H^+	+	C_2H_2			9.25×10^{-11}	Anicich (1993)
R_{cn}759	3	CNC^+	+	HCN	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											4.30×10^{-26}	
R_{cn}760	2	CNC^+	+	CH_3CN	→	$C_2H_3^+$	+	C_2N_2			4.10×10^{-09}	Anicich (1993)
R_{cn}761	2	CNC^+	+	HC_3N	→	C_3H^+	+	C_2N_2			3.30×10^{-09}	McEwan and Anicich (2007)
R_{cn}762a	2	CNC^+	+	C_3H_3N	→	$c{-}C_3H_3^+$	+	C_2N_2			1.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}762b	2	CNC^+	+	C_3H_3N	→	$l{-}C_3H_3^+$	+	C_2N_2			1.80×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}763a	2	CNC^+	+	H_2O	→	HC_2N^+	+	OH			1.75×10^{-11}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
R_{cn}763b	2	CNC^+	+	H_2O	→	HCO^+	+	HCN	5.25×10^{-11}	McEwan and Anicich (2007)
R_{cn}764a	2	HC_2N^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	C_2N	2.03×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}764b	2	HC_2N^+	+	C_3H_3N	→	$C_4H_3N^+$	+	HCN	2.18×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}764c	2	HC_2N^+	+	C_3H_3N	→	$CXHYNZ^+$	+	C_2H_3	2.18×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}764d	2	HC_2N^+	+	C_3H_3N	→	$AdductN^+$	+	hv	4.35×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}765	2	HC_2NH^+	+	CH_3CN	→	$CXHYNZ^+$			1.78×10^{-09}	Franklin et al. (1966)
R_{cn}766	2	HC_2NH^+	+	C_3H_5N	→	$CXHYNZ^+$			9.50×10^{-10}	Franklin et al. (1966)
R_{cn}767	2	$C_2H_3N^+$	+	H_2	→	$C_2H_3NH^+$	+	H	5.70×10^{-10}	Martin and Melton (1960)
R_{cn}768	2	$C_2H_3N^+$	+	CH_4	→	$C_2H_3NH^+$	+	CH_3	1.70×10^{-09}	Martin and Melton (1960)
R_{cn}769a	2	$C_2H_3N^+$	+	CH_3CN	→	$CXHYNZ^+$	+	hv	8.00×10^{-13}	Fisher and McMahon (1990)
R_{cn}769b	2	$C_2H_3N^+$	+	CH_3CN	→	$C_2H_3NH^+$	+	CH_2CN	1.96×10^{-09}	Gupta et al. (1967)
R_{cn}770a	2	$C_2H_3N^+$	+	CO	→	$C_3H_3NO^+$	+	hv	8.40×10^{-14}	Wincel et al. (1988)
R_{cn}770b	2	$C_2H_3N^+$	+	CO	→	CH_3CO^+	+	CN	1.26×10^{-13}	Wincel et al. (1988)
R_{cn}771	2	$C_2H_3NH^+$	+	NH_3	→	NH_4^+	+	CH_3CN	2.90×10^{-09}	Su-Chesnavich
R_{cn}772	2	$C_2H_3NH^+$	+	CH_2NH	→	$CH_2NH_2^+$	+	CH_3CN	2.50×10^{-09}	Edwards et al. (2008)
R_{cn}773	2	$C_2H_3NH^+$	+	CH_3NH_2	→	$CH_3NH_3^+$	+	CH_3CN	1.80×10^{-09}	Edwards et al. (2008)
R_{cn}774	2	$C_2H_3NH^+$	+	CH_3CN	→	$AdductN^+$	+	hv	8.00×10^{-13}	Anicich (1993)
R_{cn}775	2	$C_2H_3NH^+$	+	C_3H_3N	→	$C_3H_3NH^+$	+	CH_3CN	5.20×10^{-09}	Su-Chesnavich
R_{cn}776a	2	$C_2H_3NH^+$	+	C_3H_5N	→	$C_3H_5NH^+$	+	CH_3CN	4.09×10^{-09}	Edwards et al. (2008)
R_{cn}776b	2	$C_2H_3NH^+$	+	C_3H_5N	→	$AdductN^+$	+	hv	2.15×10^{-10}	Edwards et al. (2008)
R_{cn}777a	2	C_3N^+	+	H_2	→	HC_3N^+	+	H	8.19×10^{-10}	McEwan and Anicich (2007)
R_{cn}777b	2	C_3N^+	+	H_2	→	HC_3NH^+	+	hv	9.10×10^{-11}	McEwan and Anicich (2007)
R_{cn}778a	2	HC_3N^+	+	H_2	→	$C_2H_2^+$	+	HCN	1.65×10^{-12}	McEwan and Anicich (2007)
R_{cn}778b	2	HC_3N^+	+	H_2	→	HC_3NH^+	+	H	2.80×10^{-12}	McEwan and Anicich (2007)
R_{cn}779a	2	HC_3N^+	+	CH_4	→	$C_2H_3N^+$	+	C_2H_2	2.28×10^{-10}	McEwan and Anicich (2007)
R_{cn}779b	2	HC_3N^+	+	CH_4	→	$C_3H_5^+$	+	CN	2.28×10^{-10}	McEwan and Anicich (2007)
R_{cn}779c	2	HC_3N^+	+	CH_4	→	HC_3NH^+	+	CH_3	2.91×10^{-10}	McEwan and Anicich (2007)
R_{cn}779d	2	HC_3N^+	+	CH_4	→	$C_3H_4^+$	+	HCN	8.30×10^{-11}	McEwan and Anicich (2007)
R_{cn}780a	2	HC_3N^+	+	C_2H_2	→	$C_4H_2^+$	+	HCN	5.12×10^{-10}	McEwan and Anicich (2007)
R_{cn}780b	2	HC_3N^+	+	C_2H_2	→	$C_2H_2^+$	+	HC_3N	1.28×10^{-10}	McEwan and Anicich (2007)
R_{cn}781a	2	HC_3N^+	+	C_2H_4	→	$C_2H_4^+$	+	HC_3N	5.36×10^{-10}	McEwan and Anicich (2007)
R_{cn}781b	2	HC_3N^+	+	C_2H_4	→	HC_3NH^+	+	C_2H_3	1.34×10^{-10}	McEwan and Anicich (2007)
R_{cn}782	2	HC_3N^+	+	C_4H_2	→	$C_4H_2^+$	+	HC_3N	8.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}783a	2	HC_3N^+	+	N	→	C_2N^+	+	HCN	1.44×10^{-10}	McEwan and Anicich (2007)
R_{cn}783b	2	HC_3N^+	+	N	→	C_3H^+	+	N_2	9.60×10^{-11}	McEwan and Anicich (2007)
R_{cn}784	2	HC_3N^+	+	NH_3	→	NH_3^+	+	HC_3N	1.70×10^{-09}	Petrie et al. (1992)

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	Type	Reaction									k	Ref.
R_{cn}785a	2	HC_3N^+	+	HCN	→	$HCNH^+$	+	C_3N			3.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}785b	2	HC_3N^+	+	HCN	→	$C_4N_2H^+$	+	H			2.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}785c	2	HC_3N^+	+	HCN	→	$AdductN^+$	+	hv			6.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}786a	2	HC_3N^+	+	HC_3N	→	HC_5N^+	+	HCN			1.17×10^{-09}	McEwan and Anicich (2007)
R_{cn}786b	2	HC_3N^+	+	HC_3N	→	$CXHYNZ^+$	+	H			6.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}786c	2	HC_3N^+	+	HC_3N	→	$AdductN^+$	+	hv			6.50×10^{-11}	McEwan and Anicich (2007)
R_{cn}786d	3	HC_3N^+	+	HC_3N	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											1.20×10^{-22}	
R_{cn}787	2	HC_3N^+	+	C_3H_5N	→	$CXHYNZ^+$					3.70×10^{-09}	Franklin et al. (1966)
R_{cn}788	2	HC_3N^+	+	H_2O	→	HC_3NH^+	+	OH			6.70×10^{-10}	McEwan and Anicich (2007)
R_{cn}789	3	HC_3N^+	+	CO	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											5.50×10^{-27}	
R_{cn}790	2	HC_3NH^+	+	C_2H_4	→	$C_5H_5N^+$	+	H			1.00×10^{-10}	McEwan and Anicich (2007),Molina-Cuberos et al. (19
R_{cn}791	2	HC_3NH^+	+	C_4H_2	→	$C_7H_3NH^+$	+	hv			8.70×10^{-10}	McEwan and Anicich (2007)
R_{cn}792	2	HC_3NH^+	+	NH_3	→	NH_4^+	+	HC_3N			2.00×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}793	2	HC_3NH^+	+	HCN	→	$AdductN^+$	+	hv			6.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}794	2	HC_3NH^+	+	HNC	→	$HCNH^+$	+	HC_3N			4.60×10^{-09}	Su-Chesnavich
R_{cn}795	2	HC_3NH^+	+	CH_2NH	→	$CH_2NH_2^+$	+	HC_3N			2.40×10^{-09}	Edwards et al. (2008)
R_{cn}796	2	HC_3NH^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	HC_3N			1.60×10^{-09}	Edwards et al. (2008)
R_{cn}797	2	HC_3NH^+	+	CH_3CN	→	$C_2H_3NH^+$	+	HC_3N			5.10×10^{-09}	Su-Chesnavich
R_{cn}798a	2	HC_3NH^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	HC_3N			1.28×10^{-09}	McEwan and Anicich (2007)
R_{cn}798b	2	HC_3NH^+	+	C_3H_3N	→	$C_5H_3NH^+$	+	HCN			3.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}799a	2	HC_3NH^+	+	C_3H_5N	→	$C_3H_5NH^+$	+	HC_3N			5.00×10^{-09}	Su-Chesnavich
R_{cn}799b	2	HC_3NH^+	+	C_3H_5N	→	$CXHYNZ^+$					1.90×10^{-09}	Franklin et al. (1966)
R_{cn}800	2	HC_3NH^+	+	HC_5N	→	HC_5NH^+	+	HC_3N			3.90×10^{-09}	Edwards et al. (2009)
R_{cn}801	2	$C_3H_3N^+$	+	H_2	→	$C_3H_3NH^+$	+	H			1.20×10^{-12}	McEwan and Anicich (2007)
R_{cn}802a	2	$C_3H_3N^+$	+	CH_4	→	$C_2H_3N^+$	+	C_2H_4			1.82×10^{-11}	McEwan and Anicich (2007)
R_{cn}802b	2	$C_3H_3N^+$	+	CH_4	→	$C_3H_3NH^+$	+	CH_3			6.50×10^{-12}	McEwan and Anicich (2007)
R_{cn}802c	2	$C_3H_3N^+$	+	CH_4	→	$C_4H_5NH^+$	+	H			1.30×10^{-12}	McEwan and Anicich (2007)
R_{cn}803a	2	$C_3H_3N^+$	+	C_2H_2	→	$c-C_3H_3^+$	+	CH_2CN			7.44×10^{-11}	McEwan and Anicich (2007)
R_{cn}803b	2	$C_3H_3N^+$	+	C_2H_2	→	$C_4H_4^+$	+	HCN			2.56×10^{-10}	McEwan and Anicich (2007)
R_{cn}803c	2	$C_3H_3N^+$	+	C_2H_2	→	HC_3NH^+	+	C_2H_3			2.56×10^{-10}	McEwan and Anicich (2007)
R_{cn}803d	2	$C_3H_3N^+$	+	C_2H_2	→	HC_5NH^+	+	H_2	+	H	1.95×10^{-10}	McEwan and Anicich (2007)
R_{cn}803e	2	$C_3H_3N^+$	+	C_2H_2	→	$C_5H_3NH^+$	+	H			1.49×10^{-10}	McEwan and Anicich (2007)
R_{cn}804a	2	$C_3H_3N^+$	+	NH_3	→	NH_3^+	+	C_3H_3N			1.25×10^{-10}	Anicich (1993)
R_{cn}804b	2	$C_3H_3N^+$	+	NH_3	→	NH_4^+	+	C_3H_2N			6.46×10^{-11}	Anicich (1993)

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	Type	Reaction	k	Ref.
$R_{cn}805a$	2	$C_3H_3N^+ + HCN \rightarrow C_4N_2H^+ + H_2 + H$	1.71×10^{-11}	McEwan and Anicich (2007)
$R_{cn}805b$	2	$C_3H_3N^+ + HCN \rightarrow CXHYNZ^+ + H_2$	7.22×10^{-11}	McEwan and Anicich (2007)
$R_{cn}805c$	2	$C_3H_3N^+ + HCN \rightarrow CXHYNZ^+ + H$	3.80×10^{-11}	McEwan and Anicich (2007)
$R_{cn}805d$	2	$C_3H_3N^+ + HCN \rightarrow AdductN^+ + hv$	6.27×10^{-11}	McEwan and Anicich (2007)
$R_{cn}806a$	2	$C_3H_3N^+ + C_3H_3N \rightarrow C_3H_3NH^+ + C_3H_2N$	1.81×10^{-09}	Anicich and McEwan (1997)
$R_{cn}806b$	2	$C_3H_3N^+ + C_3H_3N \rightarrow C_5H_5N^+ + HCN$	9.50×10^{-11}	Anicich and McEwan (1997)
$R_{cn}807a$	2	$C_3H_3N^+ + H_2O \rightarrow CH_3COH^+ + HCN$	1.43×10^{-10}	McEwan and Anicich (2007)
$R_{cn}807b$	2	$C_3H_3N^+ + H_2O \rightarrow C_3H_4NO^+ + H$	6.51×10^{-11}	McEwan and Anicich (2007)
$R_{cn}807c$	2	$C_3H_3N^+ + H_2O \rightarrow C_3H_5NO^+ + hv$	2.10×10^{-12}	McEwan and Anicich (2007)
$R_{cn}808$	2	$C_3H_3N^+ + CO \rightarrow CO^+ + C_3H_3N$	7.00×10^{-12}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}809a$	2	$C_3H_3NH^+ + C_7H_8 \rightarrow C_7H_9^+ + C_3H_3N$	1.10×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}809b$	2	$C_3H_3NH^+ + C_7H_8 \rightarrow AdductN^+$	9.90×10^{-11}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}810$	2	$C_3H_3NH^+ + NH_3 \rightarrow NH_4^+ + C_3H_3N$	1.70×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}811$	2	$C_3H_3NH^+ + HCN \rightarrow AdductN^+ + hv$	3.40×10^{-11}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}812$	2	$C_3H_3NH^+ + CH_2NH \rightarrow CH_2NH_2^+ + C_3H_3N$	2.40×10^{-09}	Edwards et al. (2008)
$R_{cn}813$	2	$C_3H_3NH^+ + CH_3NH_2 \rightarrow CH_3NH_3^+ + C_3H_3N$	1.70×10^{-09}	Edwards et al. (2008)
$R_{cn}814a$	2	$C_3H_3NH^+ + CH_3CN \rightarrow C_2H_3NH^+ + C_3H_3N$	1.00×10^{-10}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}814b$	2	$C_3H_3NH^+ + CH_3CN \rightarrow AdductN^+ + hv$	9.00×10^{-11}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}815$	3	$C_3H_3NH^+ + C_3H_3N \rightarrow AdductN^+$	1.00×10^{-10}	Anicich and McEwan (1997)
			1.25×10^{-23}	
$R_{cn}816a$	2	$C_3H_3NH^+ + C_3H_5N \rightarrow C_3H_5NH^+ + C_3H_3N$	5.00×10^{-09}	Su-Chesnavich
$R_{cn}816b$	2	$C_3H_3NH^+ + C_3H_5N \rightarrow AdductN^+ + hv$	1.20×10^{-09}	Franklin et al. (1966)
$R_{cn}817$	2	$C_3H_3NH^+ + H_2O \rightarrow CXHYNZ^+ + H$	1.80×10^{-11}	Petrie et al. (1991a),Petrie et al. (1992)
$R_{cn}818$	2	$C_3H_5NH^+ + NH_3 \rightarrow NH_4^+ + C_3H_5N$	3.10×10^{-09}	Su-Chesnavich
$R_{cn}819$	2	$C_3H_5NH^+ + CH_2NH \rightarrow CH_2NH_2^+ + C_3H_5N$	2.80×10^{-09}	Su-Chesnavich
$R_{cn}820$	2	$HC_4N^+ + H_2 \rightarrow HC_4NH^+ + H$	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}821$	2	$HC_4NH^+ + H_2 \rightarrow C_4H_3N^+ + H$	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}822$	2	$C_4H_3N^+ + H_2 \rightarrow C_4H_3NH^+ + H$	1.00×10^{-09}	Wakelam et al. (2015)
$R_{cn}823$	2	$C_5N^+ + H_2 \rightarrow HC_5N^+ + H$	1.50×10^{-09}	Wakelam et al. (2015)
$R_{cn}824a$	2	$C_5N^+ + CH_4 \rightarrow HC_6NH^+ + H_2$	3.00×10^{-11}	Parent (1989),Parent (1990)
$R_{cn}824b$	2	$C_5N^+ + CH_4 \rightarrow HC_4NH^+ + C_2H_2$	6.75×10^{-11}	Parent (1989),Parent (1990)
$R_{cn}824c$	2	$C_5N^+ + CH_4 \rightarrow HCNH^+ + C_5H_2$	6.00×10^{-11}	Parent (1989),Parent (1990)
$R_{cn}824d$	2	$C_5N^+ + CH_4 \rightarrow HC_5N^+ + CH_3$	2.77×10^{-10}	Parent (1989),Parent (1990)
$R_{cn}824e$	2	$C_5N^+ + CH_4 \rightarrow C_5H_3^+ + HCN$	3.75×10^{-11}	Parent (1989),Parent (1990)
$R_{cn}824f$	2	$C_5N^+ + CH_4 \rightarrow c{-}C_3H_3^+ + HC_3N$	5.25×10^{-11}	Parent (1989),Parent (1990)
$R_{cn}824g$	2	$C_5N^+ + CH_4 \rightarrow CH_3^+ + HC_5N$	1.73×10^{-10}	Parent (1989),Parent (1990)

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	Type	Reaction	k	Ref.
R_{cn}824h	2	$C_5N^+ + CH_4 \rightarrow C_2H_3^+ + HC_4N$	5.25×10^{-11}	Parent (1989),Parent (1990)
R_{cn}825a	2	$C_5N^+ + HCN \rightarrow HC_5N^+ + CN$	2.54×10^{-10}	Parent and McElvany (1989)
R_{cn}825b	2	$C_5N^+ + HCN \rightarrow C_6N_2^+ + H$	5.36×10^{-10}	Parent and McElvany (1989)
R_{cn}825c	2	$C_5N^+ + HCN \rightarrow C_6N_2H^+ + hv$	1.50×10^{-10}	Parent and McElvany (1989)
R_{cn}826	2	$HC_5N^+ + H_2 \rightarrow HC_5NH^+ + H$	5.00×10^{-12}	Wakelam et al. (2015)
R_{cn}827a	2	$HC_5N^+ + C_2H_4 \rightarrow HC_5NH^+ + C_2H_3$	9.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}827b	2	$HC_5N^+ + C_2H_4 \rightarrow C_7H_3N^+ + H_2$	6.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}827c	2	$HC_5N^+ + C_2H_4 \rightarrow AdductN^+ + hv$	2.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}828	2	$HC_5N^+ + C_4H_2 \rightarrow AdductN^+ + hv$	1.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}829	2	$HC_5N^+ + HC_3N \rightarrow AdductN^+ + hv$	5.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}830	2	$C_5H_5N^+ + H \rightarrow C_5H_5NH^+ + hv$	2.50×10^{-10}	est.(C6H6P+H)
R_{cn}831	2	$C_5H_5N^+ + N \rightarrow C_4H_3NH^+ + HCN$	1.33×10^{-10}	est.(C6H6P+N)
R_{cn}832	2	$C_7N^+ + H_2 \rightarrow HC_7N^+ + H$	1.50×10^{-09}	Wakelam et al. (2015)
R_{cn}833	2	$HC_7N^+ + H_2 \rightarrow HC_7NH^+ + H$	5.00×10^{-12}	Wakelam et al. (2015)
R_{cn}834	2	$N_2^+ + H \rightarrow H^+ + N_2$	1.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}835a	2	$N_2^+ + H_2 \rightarrow N_2H^+ + H$	1.29×10^{-09}	Dutuit et al. (2013)
R_{cn}835b	2	$N_2^+ + H_2 \rightarrow H_2^+ + N_2$	1.30×10^{-11}	Dutuit et al. (2013)
R_{cn}836a	2	$N_2^+ + CH_4 \rightarrow CH_3^+ + N_2 + H$	8.16×10^{-10}	Dutuit et al. (2013),Xu et al. (2013)
R_{cn}836b	2	$N_2^+ + CH_4 \rightarrow CH_2^+ + N_2 + H_2$	3.12×10^{-10}	Dutuit et al. (2013),Xu et al. (2013)
R_{cn}836c	2	$N_2^+ + CH_4 \rightarrow N_2H^+ + CH_3$	7.20×10^{-11}	Dutuit et al. (2013),Xu et al. (2013)
R_{cn}837a	2	$N_2^+ + C_2H_2 \rightarrow C_2H_2^+ + N_2$	9.40×10^{-10}	Dutuit et al. (2013)
R_{cn}837b	2	$N_2^+ + C_2H_2 \rightarrow N_2H^+ + C_2H$	6.00×10^{-11}	Dutuit et al. (2013)
R_{cn}838a	2	$N_2^+ + C_2H_4 \rightarrow C_2H_3^+ + N_2 + H$	8.71×10^{-10}	Dutuit et al. (2013)
R_{cn}838b	2	$N_2^+ + C_2H_4 \rightarrow C_2H_2^+ + N_2 + H_2$	2.99×10^{-10}	Dutuit et al. (2013)
R_{cn}838c	2	$N_2^+ + C_2H_4 \rightarrow N_2H^+ + C_2H_3$	1.30×10^{-10}	Dutuit et al. (2013)
R_{cn}839a	2	$N_2^+ + C_2H_6 \rightarrow C_2H_5^+ + N_2 + H$	1.82×10^{-10}	Dutuit et al. (2013)
R_{cn}839b	2	$N_2^+ + C_2H_6 \rightarrow C_2H_4^+ + N_2 + H_2$	3.51×10^{-10}	Dutuit et al. (2013)
R_{cn}839c	2	$N_2^+ + C_2H_6 \rightarrow C_2H_3^+ + N_2 + H_3$	4.16×10^{-10}	Dutuit et al. (2013)
R_{cn}839d	2	$N_2^+ + C_2H_6 \rightarrow C_2H_2^+ + N_2 + H_4$	2.34×10^{-10}	Dutuit et al. (2013)
R_{cn}839e	2	$N_2^+ + C_2H_6 \rightarrow CH_3^+ + N_2 + CH_3$	1.04×10^{-10}	Dutuit et al. (2013)
R_{cn}839f	2	$N_2^+ + C_2H_6 \rightarrow CH_4^+ + N_2 + {}^3CH_2$	1.30×10^{-11}	Dutuit et al. (2013)
R_{cn}840a	2	$N_2^+ + C_3H_8 \rightarrow C_3H_5^+ + N_2 + H_3$	1.69×10^{-10}	Dutuit et al. (2013)
R_{cn}840b	2	$N_2^+ + C_3H_8 \rightarrow C_2H_5^+ + N_2 + CH_3$	3.90×10^{-10}	Dutuit et al. (2013)
R_{cn}840c	2	$N_2^+ + C_3H_8 \rightarrow C_2H_4^+ + N_2 + CH_4$	2.21×10^{-10}	Dutuit et al. (2013)
R_{cn}840d	2	$N_2^+ + C_3H_8 \rightarrow C_2H_3^+ + N_2 + CH_5$	5.20×10^{-10}	Dutuit et al. (2013)
R_{cn}841a	2	$N_2^+ + C_6H_6 \rightarrow C_6H_6^+ + N_2$	1.92×10^{-10}	Arnold et al. (1999)

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	Type	Reaction									k	Ref.
R_{cn}841b	2	N_2^+	+	C_6H_6	→	$C_6H_5^+$	+	N_2	+	H	3.84×10^{-10}	Arnold et al. (1999)
R_{cn}841c	2	N_2^+	+	C_6H_6	→	$C_6H_4^+$	+	N_2	+	H_2	6.40×10^{-11}	Arnold et al. (1999)
R_{cn}841d	2	N_2^+	+	C_6H_6	→	$C_5H_3^+$	+	N_2	+	CH_3	3.20×10^{-11}	Arnold et al. (1999)
R_{cn}841e	2	N_2^+	+	C_6H_6	→	$C_4H_4^+$	+	N_2	+	C_2H_2	6.56×10^{-10}	Arnold et al. (1999)
R_{cn}841f	2	N_2^+	+	C_6H_6	→	$c-C_3H_3^+$	+	N_2	+	C_3H_3	2.72×10^{-10}	Arnold et al. (1999)
R_{cn}842a	2	N_2^+	+	C_7H_8	→	$C_7H_7^+$	+	N_2	+	H	1.62×10^{-09}	Arnold et al. (2000)
R_{cn}842b	2	N_2^+	+	C_7H_8	→	$C_6H_5^+$	+	N_2	+	CH_3	9.50×10^{-11}	Arnold et al. (2000)
R_{cn}842c	2	N_2^+	+	C_7H_8	→	$C_5H_6^+$	+	N_2	+	C_2H_2	3.80×10^{-11}	Arnold et al. (2000)
R_{cn}842d	2	N_2^+	+	C_7H_8	→	$C_4H_4^+$	+	N_2	+	CH_3CCH	9.50×10^{-11}	Arnold et al. (2000)
R_{cn}842e	2	N_2^+	+	C_7H_8	→	$c-C_3H_3^+$	+	N_2	+	C_4H_5	5.70×10^{-11}	Arnold et al. (2000)
R_{cn}843	2	N_2^+	+	N	→	N^+	+	N_2			1.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}844	2	N_2^+	+	NH_3	→	NH_3^+	+	N_2			1.95×10^{-09}	Anicich (1993)
R_{cn}845	2	N_2^+	+	HCN	→	HCN^+	+	N_2			3.90×10^{-10}	McEwan and Anicich (2007)
R_{cn}846a	2	N_2^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	N_2			6.10×10^{-11}	Jackson et al. (2005)
R_{cn}846b	2	N_2^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	N_2	+	H	8.17×10^{-10}	Jackson et al. (2005)
R_{cn}846c	2	N_2^+	+	CH_3NH_2	→	CH_2NH^+	+	N_2	+	H_2	2.56×10^{-10}	Jackson et al. (2005)
R_{cn}846d	2	N_2^+	+	CH_3NH_2	→	CH_3^+	+	N_2	+	NH_2	8.54×10^{-11}	Jackson et al. (2005)
R_{cn}847a	2	N_2^+	+	CH_3CN	→	$C_2H_3N^+$	+	N_2			3.15×10^{-10}	McEwan and Anicich (2007)
R_{cn}847b	2	N_2^+	+	CH_3CN	→	HC_2NH^+	+	N_2	+	H	1.36×10^{-09}	McEwan and Anicich (2007)
R_{cn}847c	2	N_2^+	+	CH_3CN	→	HC_2N^+	+	N_2	+	H_2	4.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}848	2	N_2^+	+	HC_3N	→	HC_3N^+	+	N_2			3.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}849a	2	N_2^+	+	C_3H_3N	→	$C_2H_3^+$	+	N_2	+	CN	1.00×10^{-10}	McEwan et al. (1998)
R_{cn}849b	2	N_2^+	+	C_3H_3N	→	$C_2H_2^+$	+	N_2	+	HCN	3.00×10^{-10}	McEwan et al. (1998)
R_{cn}849c	2	N_2^+	+	C_3H_3N	→	HC_3NH^+	+	N_2	+	H	3.50×10^{-10}	McEwan et al. (1998)
R_{cn}849d	2	N_2^+	+	C_3H_3N	→	HC_3N^+	+	N_2	+	H_2	5.00×10^{-11}	McEwan et al. (1998)
R_{cn}849e	2	N_2^+	+	C_3H_3N	→	N_2H^+	+	C_3H_2N			2.00×10^{-10}	McEwan et al. (1998)
R_{cn}850a	2	N_2^+	+	C_3H_5N	→	$C_3H_3NH^+$	+	N_2	+	H	2.21×10^{-09}	Edwards et al. (2008)
R_{cn}850b	2	N_2^+	+	C_3H_5N	→	CH_3^+	+	CH_2CN	+	N_2	6.80×10^{-10}	Edwards et al. (2008)
R_{cn}850c	2	N_2^+	+	C_3H_5N	→	$C_2H_2^+$	+	CH_2NH	+	N_2	5.10×10^{-10}	Edwards et al. (2008)
R_{cn}851a	2	N_2^+	+	C_4H_5N	→	$l-C_3H_3^+$	+	N_2	+	H_2CN	2.85×10^{-10}	Stavish et al. (2009)
R_{cn}851b	2	N_2^+	+	C_4H_5N	→	$c-C_3H_3^+$	+	N_2	+	H_2CN	2.85×10^{-10}	Stavish et al. (2009)
R_{cn}851c	2	N_2^+	+	C_4H_5N	→	HC_2N^+	+	N_2	+	C_2H_4	5.70×10^{-10}	Stavish et al. (2009)
R_{cn}851d	2	N_2^+	+	C_4H_5N	→	$C_3H_4^+$	+	N_2	+	HCN	1.95×10^{-10}	Stavish et al. (2009)
R_{cn}851e	2	N_2^+	+	C_4H_5N	→	HC_2NH^+	+	N_2	+	C_2H_3	1.95×10^{-10}	Stavish et al. (2009)
R_{cn}851f	2	N_2^+	+	C_4H_5N	→	$C_3H_5^+$	+	N_2	+	CN	4.05×10^{-10}	Stavish et al. (2009)
R_{cn}851g	2	N_2^+	+	C_4H_5N	→	$C_2H_3N^+$	+	N_2	+	C_2H_2	4.05×10^{-10}	Stavish et al. (2009)

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	Type	Reaction									k	Ref.
$R_{cn}851h$	2	N_2^+	+	C_4H_5N	→	$C_4H_3NH^+$	+	N_2	+	H	3.75×10^{-11}	Stavish et al. (2009)
$R_{cn}851i$	2	N_2^+	+	C_4H_5N	→	$C_4H_5N^+$	+	N_2			1.28×10^{-10}	Stavish et al. (2009)
$R_{cn}852$	2	N_2^+	+	HC_5N	→	HC_5N^+	+	N_2			4.80×10^{-09}	Edwards et al. (2009)
$R_{cn}853a$	2	N_2^+	+	C_5H_5N	→	$C_4H_4^+$	+	HCN	+	N_2	2.35×10^{-09}	Fondren et al. (2007)
$R_{cn}853b$	2	N_2^+	+	C_5H_5N	→	$C_4H_5^+$	+	CN	+	N_2	1.76×10^{-10}	Fondren et al. (2007)
$R_{cn}853c$	2	N_2^+	+	C_5H_5N	→	$C_3H_3N^+$	+	C_2H_2	+	N_2	1.76×10^{-10}	Fondren et al. (2007)
$R_{cn}854$	3	N_2^+	+	N_2	→	N_4^+					1.00×10^{-10}	Anicich et al. (2000),McEwan and Anicich (2007)
											$8.00\times10^{-29}T^{1.84}$	
$R_{cn}855$	2	N_2^+	+	C_2N_2	→	$C_2N_2^+$	+	N_2			9.30×10^{-10}	McEwan and Anicich (2007)
$R_{cn}856a$	2	N_2^+	+	$O(^3P)$	→	O^+	+	N_2			9.80×10^{-12}	Anicich (1993)
$R_{cn}856b$	2	N_2^+	+	$O(^3P)$	→	NO^+	+	N			1.30×10^{-10}	Anicich (1993)
$R_{cn}857a$	2	N_2^+	+	H_2O	→	H_2O^+	+	N_2			1.90×10^{-09}	McEwan and Anicich (2007)
$R_{cn}857b$	2	N_2^+	+	H_2O	→	N_2H^+	+	OH			5.04×10^{-10}	McEwan and Anicich (2007)
$R_{cn}858$	2	N_2^+	+	CO	→	CO^+	+	N_2			7.30×10^{-11}	McEwan and Anicich (2007)
$R_{cn}859a$	2	N_2^+	+	H_2CO	→	HCO^+	+	N_2H			2.52×10^{-09}	Anicich (1993)
$R_{cn}859b$	2	N_2^+	+	H_2CO	→	CH_2O^+	+	N_2			3.77×10^{-10}	Anicich (1993)
$R_{cn}860$	2	N_2^+	+	CO_2	→	CO_2^+	+	N_2			8.00×10^{-10}	Anicich (1993)
$R_{cn}861a$	2	N_2H^+	+	H_2	→	H_3^+	+	N_2			5.10×10^{-18}	McEwan and Anicich (2007)
$R_{cn}861b$	3	N_2H^+	+	H_2	→	$AdductN^+$					1.00×10^{-10}	Anicich and McEwan (1997)
											4.00×10^{-30}	
$R_{cn}862$	2	N_2H^+	+	CH_4	→	CH_5^+	+	N_2			8.90×10^{-10}	McEwan and Anicich (2007)
$R_{cn}863$	2	N_2H^+	+	C_2H_2	→	$C_2H_3^+$	+	N_2			1.40×10^{-09}	McEwan and Anicich (2007)
$R_{cn}864$	2	N_2H^+	+	C_2H_4	→	$C_2H_5^+$	+	N_2			1.00×10^{-09}	McEwan and Anicich (2007)
$R_{cn}865a$	2	N_2H^+	+	C_2H_6	→	$C_2H_5^+$	+	N_2	+	H_2	1.13×10^{-09}	McEwan and Anicich (2007)
$R_{cn}865b$	2	N_2H^+	+	C_2H_6	→	$C_2H_7^+$	+	N_2			1.69×10^{-10}	McEwan and Anicich (2007)
$R_{cn}866$	2	N_2H^+	+	CH_3CCH	→	$C_3H_5^+$	+	N_2			1.50×10^{-09}	McEwan and Anicich (2007)
$R_{cn}867$	2	N_2H^+	+	CH_2CCH_2	→	$C_3H_5^+$	+	N_2			1.40×10^{-09}	Milligan et al. (2002)
$R_{cn}868a$	2	N_2H^+	+	C_3H_6	→	$C_3H_5^+$	+	N_2	+	H_2	7.70×10^{-10}	Milligan et al. (2002)
$R_{cn}868b$	2	N_2H^+	+	C_3H_6	→	$C_3H_7^+$	+	N_2			6.30×10^{-10}	Milligan et al. (2002)
$R_{cn}869$	2	N_2H^+	+	C_4H_2	→	$C_4H_3^+$	+	N_2			1.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}870$	2	N_2H^+	+	C_6H_6	→	$C_6H_7^+$	+	N_2			1.50×10^{-09}	Milligan et al. (2002)
$R_{cn}871$	2	N_2H^+	+	C_7H_8	→	$C_7H_9^+$	+	N_2			1.30×10^{-09}	Milligan et al. (2002)
$R_{cn}872$	2	N_2H^+	+	NH_3	→	NH_4^+	+	N_2			2.30×10^{-09}	Anicich (1993)
$R_{cn}873$	2	N_2H^+	+	HCN	→	$HCNH^+$	+	N_2			3.20×10^{-09}	McEwan and Anicich (2007)
$R_{cn}874$	2	N_2H^+	+	CH_3CN	→	$C_2H_3NH^+$	+	N_2			4.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}875$	2	N_2H^+	+	HC_3N	→	HC_3NH^+	+	N_2			4.20×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}876	2	N_2H^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	N_2			1.50×10^{-09}	Milligan et al. (2002)
R_{cn}877	3	N_2H^+	+	N_2	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											4.00×10^{-30}	
R_{cn}878	2	N_2H^+	+	C_2N_2	→	$C_2N_2H^+$	+	N_2			1.20×10^{-09}	McEwan and Anicich (2007)
R_{cn}879	2	N_2H^+	+	$O(^3P)$	→	OH^+	+	N_2			1.40×10^{-10}	Anicich (1993)
R_{cn}880	2	N_2H^+	+	H_2O	→	H_3O^+	+	N_2			2.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}881	2	N_2H^+	+	CO	→	HCO^+	+	N_2			8.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}882	2	N_2H^+	+	H_2CO	→	CH_2OH^+	+	N_2			3.30×10^{-09}	Anicich (1993)
R_{cn}883	2	N_2H^+	+	CO_2	→	$OCOH^+$	+	N_2			1.07×10^{-09}	Anicich (1993)
R_{cn}884a	2	$C_2N_2^+$	+	H	→	HNC^+	+	CN			4.96×10^{-10}	McEwan and Anicich (2007)
R_{cn}884b	2	$C_2N_2^+$	+	H	→	C_2H^+	+	N_2			1.24×10^{-10}	McEwan and Anicich (2007)
R_{cn}885	2	$C_2N_2^+$	+	H_2	→	$C_2N_2H^+$	+	H			8.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}886a	2	$C_2N_2^+$	+	C_2H_2	→	$C_2H_2^+$	+	C_2N_2			1.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}886b	2	$C_2N_2^+$	+	C_2H_2	→	$C_4N_2H^+$	+	H			7.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}886c	2	$C_2N_2^+$	+	C_2H_2	→	$C_4N_2^+$	+	H_2			3.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}887a	2	$C_2N_2^+$	+	C_4H_2	→	$C_4H_2^+$	+	C_2N_2			1.08×10^{-09}	McEwan and Anicich (2007)
R_{cn}887b	2	$C_2N_2^+$	+	C_4H_2	→	HC_5N^+	+	HCN			1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}888a	2	$C_2N_2^+$	+	HCN	→	HNC^+	+	C_2N_2			5.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}888b	2	$C_2N_2^+$	+	HCN	→	$C_2N_2H^+$	+	CN			2.02×10^{-09}	McEwan and Anicich (2007)
R_{cn}888c	2	$C_2N_2^+$	+	HCN	→	$HC_3N_3^+$	+	hv			1.35×10^{-10}	McEwan and Anicich (2007)
R_{cn}889	2	$C_2N_2^+$	+	HC_3N	→	HC_3N^+	+	C_2N_2			1.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}890	3	$C_2N_2^+$	+	C_2N_2	→	$AdductN^+$					1.00×10^{-10}	McEwan and Anicich (1995)
											2.20×10^{-24}	
R_{cn}891a	2	$C_2N_2^+$	+	H_2O	→	H_2O^+	+	C_2N_2			2.34×10^{-10}	McEwan and Anicich (2007)
R_{cn}891b	2	$C_2N_2^+$	+	H_2O	→	$C_2N_2H^+$	+	OH			2.37×10^{-09}	McEwan and Anicich (2007)
R_{cn}892a	2	$C_2N_2H^+$	+	C_2H_2	→	$C_2H_3^+$	+	C_2N_2			7.20×10^{-11}	Milligan et al. (1998)
R_{cn}892b	2	$C_2N_2H^+$	+	C_2H_2	→	$AdductN^+$	+	hv			4.08×10^{-10}	Milligan et al. (1998)
R_{cn}893	2	$C_2N_2H^+$	+	C_2H_4	→	$C_2H_5^+$	+	C_2N_2			8.00×10^{-10}	Anicich (1993)
R_{cn}894	2	$C_2N_2H^+$	+	H_2O	→	H_3O^+	+	C_2N_2			5.10×10^{-10}	Anicich (1993)
R_{cn}895a	2	N_3^+	+	CH_4	→	$HCNH^+$	+	N_2	+	H_2	5.51×10^{-11}	Anicich et al. (2000)
R_{cn}895b	2	N_3^+	+	CH_4	→	$CH_2NH_2^+$	+	N_2			2.90×10^{-12}	Anicich et al. (2000)
R_{cn}896a	2	N_3^+	+	C_2H_2	→	CH_2CN^+	+	N_2			1.08×10^{-09}	Anicich et al. (2000)
R_{cn}896b	2	N_3^+	+	C_2H_2	→	C_2N^+	+	N_2	+	H_2	6.00×10^{-11}	Anicich et al. (2000)
R_{cn}896c	2	N_3^+	+	C_2H_2	→	$HCNH^+$	+	N_2	+	C	6.00×10^{-11}	Anicich et al. (2000)
R_{cn}897	2	N_3^+	+	C_2H_4	→	$C_2H_4^+$	+	N_2	+	N	1.10×10^{-09}	Anicich et al. (2000)
R_{cn}898	2	N_3^+	+	HCN	→	$CXHYNZ^+$	+	N_2			6.70×10^{-10}	Anicich et al. (2000)

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	Type	Reaction									k	Ref.
$R_{cn}899$	3	N_3^+	+	CO	→	AdductN^+					1.00×10^{-10} 7.00×10^{-29}	Smith et al. (1978a)
$R_{cn}900$	2	N_4^+	+	H_2	→	N_2H^+	+	N_2	+	H	1.00×10^{-12}	McEwan and Anicich (2007)
$R_{cn}901$	2	N_4^+	+	CH_4	→	CH_4^+	+	N_2	+	N_2	1.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}902$	2	N_4^+	+	C_2H_2	→	$C_2H_2^+$	+	N_2	+	N_2	9.20×10^{-10}	McEwan and Anicich (2007)
$R_{cn}903$	2	N_4^+	+	C_2H_4	→	$C_2H_4^+$	+	N_2	+	N_2	1.10×10^{-09}	McEwan and Anicich (2007)
$R_{cn}904a$	2	N_4^+	+	C_2H_6	→	$C_2H_5^+$	+	$N_2^+N_2$	+	H	1.74×10^{-10}	McEwan and Anicich (2007)
$R_{cn}904b$	2	N_4^+	+	C_2H_6	→	$C_2H_4^+$	+	$N_2^+N_2$	+	H_2	1.07×10^{-09}	McEwan and Anicich (2007)
$R_{cn}905a$	2	N_4^+	+	C_3H_8	→	$C_3H_7^+$	+	$N_2^+N_2$	+	H	1.22×10^{-10}	McEwan and Anicich (2007)
$R_{cn}905b$	2	N_4^+	+	C_3H_8	→	$C_2H_5^+$	+	$N_2^+N_2$	+	CH_3	6.71×10^{-10}	McEwan and Anicich (2007)
$R_{cn}905c$	2	N_4^+	+	C_3H_8	→	$C_2H_4^+$	+	$N_2^+N_2$	+	CH_4	4.27×10^{-10}	McEwan and Anicich (2007)
$R_{cn}906$	2	N_4^+	+	HCN	→	HCN^+	+	N_2	+	N_2	2.60×10^{-09}	McEwan and Anicich (2007)
$R_{cn}907$	2	N_4^+	+	CO	→	CO^+	+	N_2	+	N_2	5.00×10^{-10}	Smith et al. (1978a)
$R_{cn}908$	2	O^+	+	H	→	H^+	+	$O(^3P)$			6.40×10^{-10}	Anicich (1993)
$R_{cn}909$	2	O^+	+	H_2	→	OH^+	+	H			1.62×10^{-09}	Anicich (1993)
$R_{cn}910a$	2	O^+	+	CH_4	→	CH_4^+	+	$O(^3P)$			8.80×10^{-10}	Smith et al. (1992)
$R_{cn}910b$	2	O^+	+	CH_4	→	CH_3^+	+	OH			2.20×10^{-10}	Smith et al. (1992)
$R_{cn}911a$	2	O^+	+	C_2H_4	→	$C_2H_4^+$	+	$O(^3P)$			7.00×10^{-11}	Smith et al. (1992)
$R_{cn}911b$	2	O^+	+	C_2H_4	→	$C_2H_3^+$	+	OH			2.10×10^{-10}	Smith et al. (1992)
$R_{cn}911c$	2	O^+	+	C_2H_4	→	$C_2H_2^+$	+	H_2O			1.12×10^{-09}	Smith et al. (1992)
$R_{cn}912$	2	O^+	+	C_2H_2	→	$C_2H_2^+$	+	$O(^3P)$			6.20×10^{-11}	Fukuzawa et al. (2001)
$R_{cn}913a$	2	O^+	+	C_2H_6	→	$C_2H_4^+$	+	H_2O			1.19×10^{-09}	Smith et al. (1992)
$R_{cn}913b$	2	O^+	+	C_2H_6	→	$C_2H_5^+$	+	OH			5.10×10^{-10}	Smith et al. (1992)
$R_{cn}914$	2	O^+	+	C_6H_6	→	$C_6H_6^+$	+	$O(^3P)$			1.90×10^{-09}	Arnold et al. (1999)
$R_{cn}915a$	2	O^+	+	C_7H_8	→	$C_7H_8^+$	+	$O(^3P)$			1.10×10^{-10}	Arnold et al. (2000)
$R_{cn}915b$	2	O^+	+	C_7H_8	→	$C_7H_7^+$	+	OH			2.05×10^{-09}	Arnold et al. (2000)
$R_{cn}915c$	2	O^+	+	C_7H_8	→	$C_6H_6^+$	+	H_2CO			4.40×10^{-11}	Arnold et al. (2000)
$R_{cn}916$	2	O^+	+	NH_3	→	NH_3^+	+	$O(^3P)$			1.10×10^{-09}	Smith et al. (1992)
$R_{cn}917a$	2	O^+	+	HCN	→	HCN^+	+	$O(^3P)$			5.00×10^{-11}	Bastian et al. (1996)
$R_{cn}917b$	2	O^+	+	HCN	→	HCO^+	+	N			1.13×10^{-09}	Bastian et al. (1996)
$R_{cn}917c$	2	O^+	+	HCN	→	NO^+	+	CH			1.33×10^{-09}	Bastian et al. (1996)
$R_{cn}918a$	2	O^+	+	CH_3NH_2	→	$CH_3NH_2^+$	+	$O(^3P)$			1.26×10^{-10}	Smith et al. (1978a)
$R_{cn}918b$	2	O^+	+	CH_3NH_2	→	$CH_2NH_2^+$	+	OH			1.66×10^{-09}	Smith et al. (1978a)
$R_{cn}918c$	2	O^+	+	CH_3NH_2	→	CH_2NH^+	+	H_2O			3.15×10^{-10}	Smith et al. (1978a)
$R_{cn}919a$	2	O^+	+	CH_3CN	→	$C_2H_3N^+$	+	$O(^3P)$			2.94×10^{-09}	Smith et al. (1992)
$R_{cn}919b$	2	O^+	+	CH_3CN	→	$C_2H_3^+$	+	NO			1.26×10^{-09}	Smith et al. (1992)

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	Type	Reaction									k	Ref.
R_{cn}920	2	O^+	+	N_2	→	NO^+	+	N			$1.85\times10^{-12}T^{1.37}e^{-28.6/T}$	Le Garrec et al. (2003),Anicich (1993)
R_{cn}921	2	O^+	+	H_2O	→	H_2O^+	+	$O(^3P)$			2.60×10^{-09}	Anicich (1993)
R_{cn}922a	2	O^+	+	H_2CO	→	CH_2O^+	+	$O(^3P)$			2.10×10^{-09}	Smith et al. (1978a)
R_{cn}922b	2	O^+	+	H_2CO	→	HCO^+	+	OH			1.40×10^{-09}	Smith et al. (1978a)
R_{cn}923	2	O^+	+	NO	→	NO^+	+	$O(^3P)$			$1.65\times10^{-12}T^{1.37}e^{-12.1/T}$	LeGarrec et al. (1997),Anicich (1993)
R_{cn}924	2	OH^+	+	H_2	→	H_2O^+	+	H			9.70×10^{-10}	Anicich (1993)
R_{cn}925a	2	OH^+	+	CH_4	→	CH_5^+	+	$O(^3P)$			1.89×10^{-10}	Anicich (1993)
R_{cn}925b	2	OH^+	+	CH_4	→	H_3O^+	+	$^3CH_2$			1.26×10^{-09}	Anicich (1993)
R_{cn}926a	2	OH^+	+	C_2H_6	→	H_3O^+	+	C_2H_4			1.60×10^{-10}	Mackay et al. (1981)
R_{cn}926b	2	OH^+	+	C_2H_6	→	$C_2H_4^+$	+	OH	+	H_2	1.04×10^{-09}	Mackay et al. (1981)
R_{cn}926c	2	OH^+	+	C_2H_6	→	$C_2H_5^+$	+	H_2O			3.20×10^{-10}	Mackay et al. (1981)
R_{cn}926d	2	OH^+	+	C_2H_6	→	$C_2H_6^+$	+	OH			4.80×10^{-11}	Mackay et al. (1981)
R_{cn}926e	2	OH^+	+	C_2H_6	→	$C_2H_7^+$	+	$O(^3P)$			3.20×10^{-11}	Mackay et al. (1981)
R_{cn}927a	2	OH^+	+	NH_3	→	NH_3^+	+	OH			9.20×10^{-10}	Anicich (1993)
R_{cn}927b	2	OH^+	+	NH_3	→	NH_4^+	+	$O(^3P)$			9.20×10^{-10}	Anicich (1993)
R_{cn}928	2	OH^+	+	N_2	→	N_2H^+	+	$O(^3P)$			2.40×10^{-10}	Anicich (1993)
R_{cn}929a	2	OH^+	+	H_2O	→	H_2O^+	+	OH			1.59×10^{-09}	Huntress and Pinizzotto (1973)
R_{cn}929b	2	OH^+	+	H_2O	→	H_3O^+	+	$O(^3P)$			1.30×10^{-09}	Huntress and Pinizzotto (1973)
R_{cn}930	2	OH^+	+	CO	→	HCO^+	+	$O(^3P)$			8.40×10^{-10}	Anicich (1993)
R_{cn}931a	2	OH^+	+	H_2CO	→	CH_2O^+	+	OH			7.44×10^{-10}	Karpas and Huntress (1978)
R_{cn}931b	2	OH^+	+	H_2CO	→	CH_2OH^+	+	$O(^3P)$			1.12×10^{-09}	Karpas and Huntress (1978)
R_{cn}932	2	OH^+	+	NO	→	NO^+	+	OH			8.15×10^{-10}	Anicich (1993)
R_{cn}933	2	H_2O^+	+	H_2	→	H_3O^+	+	H			7.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}934	2	H_2O^+	+	CH_4	→	H_3O^+	+	CH_3			1.12×10^{-09}	McEwan and Anicich (2007)
R_{cn}935	2	H_2O^+	+	C_2H_2	→	$C_2H_2^+$	+	H_2O			1.90×10^{-09}	McEwan and Anicich (2007)
R_{cn}936	2	H_2O^+	+	C_2H_4	→	$C_2H_4^+$	+	H_2O			1.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}937a	2	H_2O^+	+	C_2H_6	→	H_3O^+	+	C_2H_5			1.33×10^{-09}	McEwan and Anicich (2007)
R_{cn}937b	2	H_2O^+	+	C_2H_6	→	$C_2H_4^+$	+	H_2O	+	H_2	1.92×10^{-10}	McEwan and Anicich (2007)
R_{cn}937c	2	H_2O^+	+	C_2H_6	→	$C_2H_5^+$	+	H_2O	+	H	1.60×10^{-11}	McEwan and Anicich (2007)
R_{cn}937d	2	H_2O^+	+	C_2H_6	→	$C_2H_6^+$	+	H_2O			6.40×10^{-11}	McEwan and Anicich (2007)
R_{cn}938a	2	H_2O^+	+	N	→	HNO^+	+	H			1.12×10^{-10}	McEwan and Anicich (2007)
R_{cn}938b	2	H_2O^+	+	N	→	NO^+	+	H_2			2.80×10^{-11}	McEwan and Anicich (2007)
R_{cn}939a	2	H_2O^+	+	NH_3	→	NH_3^+	+	H_2O			2.21×10^{-09}	Anicich (1993)
R_{cn}939b	2	H_2O^+	+	NH_3	→	NH_4^+	+	OH			9.45×10^{-10}	Anicich (1993)
R_{cn}940a	2	H_2O^+	+	HCN	→	$HCNH^+$	+	OH			1.05×10^{-09}	McEwan and Anicich (2007)
R_{cn}940b	2	H_2O^+	+	HCN	→	H_3O^+	+	CN			1.05×10^{-09}	McEwan and Anicich (2007)

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	Type	Reaction							k	Ref.
R_{cn}941	3	H_2O^+	+	N_2	→	$AdductN^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									1.13×10^{-28}	
R_{cn}942	2	H_2O^+	+	C_2N_2	→	$C_2N_2H^+$	+	OH	1.00×10^{-09}	McEwan and Anicich (2007)
R_{cn}943	2	H_2O^+	+	H_2O	→	H_3O^+	+	OH	1.85×10^{-09}	McEwan and Anicich (2007)
R_{cn}944	2	H_2O^+	+	CO	→	HCO^+	+	OH	4.25×10^{-10}	McEwan and Anicich (2007)
R_{cn}945a	2	H_2O^+	+	H_2CO	→	CH_2O^+	+	H_2O	1.41×10^{-09}	Anicich (1993)
R_{cn}945b	2	H_2O^+	+	H_2CO	→	CH_2OH^+	+	OH	6.62×10^{-10}	Anicich (1993)
R_{cn}946	3	H_3O^+	+	C_2H_2	→	CH_3CHOH^+			1.00×10^{-10}	McEwan and Anicich (2007)
									8.00×10^{-28}	
R_{cn}947	3	H_3O^+	+	C_2H_4	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									2.00×10^{-27}	
R_{cn}948	2	H_3O^+	+	CH_3CCH	→	$C_3H_5^+$	+	H_2O	1.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}949	2	H_3O^+	+	CH_2CCH_2	→	$C_3H_5^+$	+	H_2O	1.40×10^{-09}	Milligan et al. (2002)
R_{cn}950	2	H_3O^+	+	C_3H_6	→	$C_3H_7^+$	+	H_2O	1.70×10^{-09}	Milligan et al. (2002)
R_{cn}951	2	H_3O^+	+	C_4H_2	→	$C_4H_3^+$	+	H_2O	1.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}952	2	H_3O^+	+	NH_3	→	NH_4^+	+	H_2O	2.23×10^{-09}	Anicich (1993)
R_{cn}953	2	H_3O^+	+	CH_2NH	→	$CH_2NH_2^+$	+	H_2O	3.00×10^{-09}	Edwards et al. (2008)
R_{cn}954	2	H_3O^+	+	CH_3NH_2	→	$CH_3NH_3^+$	+	H_2O	2.10×10^{-09}	Edwards et al. (2008)
R_{cn}955	2	H_3O^+	+	HCN	→	$HCNH^+$	+	H_2O	3.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}956	2	H_3O^+	+	CH_3CN	→	$C_2H_3NH^+$	+	H_2O	4.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}957	2	H_3O^+	+	HC_3N	→	HC_3NH^+	+	H_2O	3.90×10^{-09}	McEwan and Anicich (2007)
R_{cn}958	2	H_3O^+	+	C_3H_3N	→	$C_3H_3NH^+$	+	H_2O	5.10×10^{-09}	Milligan et al. (2002)
R_{cn}959	2	H_3O^+	+	C_3H_5N	→	$C_3H_5NH^+$	+	H_2O	4.60×10^{-09}	Edwards et al. (2008)
R_{cn}960	2	H_3O^+	+	HC_5N	→	HC_5NH^+	+	H_2O	5.60×10^{-09}	Edwards et al. (2009)
R_{cn}961	3	H_3O^+	+	H_2O	→	$Adduct^+$			1.00×10^{-10}	McEwan and Anicich (2007)
									3.40×10^{-27}	
R_{cn}962	2	H_3O^+	+	H_2CO	→	CH_2OH^+	+	H_2O	3.00×10^{-09}	Anicich (1993)
R_{cn}963	2	CO^+	+	H	→	H^+	+	CO	4.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}964a	2	CO^+	+	H_2	→	HCO^+	+	H	7.28×10^{-10}	McEwan and Anicich (2007)
R_{cn}964b	2	CO^+	+	H_2	→	HOC^+	+	H	6.72×10^{-10}	McEwan and Anicich (2007)
R_{cn}965a	2	CO^+	+	CH_4	→	HCO^+	+	CH_3	6.36×10^{-10}	Melko et al. (2014)
R_{cn}965b	2	CO^+	+	CH_4	→	CH_4^+	+	CO	5.16×10^{-10}	Melko et al. (2014)
R_{cn}965c	2	CO^+	+	CH_4	→	CH_3CO^+	+	H	4.80×10^{-11}	Melko et al. (2014)
R_{cn}966	2	CO^+	+	C_2H_2	→	$C_2H_2^+$	+	CO	4.10×10^{-10}	McEwan and Anicich (2007)
R_{cn}967a	2	CO^+	+	C_2H_6	→	$C_2H_5^+$	+	HCO	5.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}967b	2	CO^+	+	C_2H_6	→	$C_2H_4^+$	+	H_2CO	8.62×10^{-10}	McEwan and Anicich (2007)

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	Type	Reaction									k	Ref.
R_{cn}967c	2	CO^+	+	C_2H_6	→	CH_3^+	+	CO	+	CH_3	2.78×10^{-11}	McEwan and Anicich (2007)
R_{cn}968a	2	CO^+	+	C_3H_8	→	$C_3H_7^+$	+	HCO			1.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}968b	2	CO^+	+	C_3H_8	→	$C_3H_6^+$	+	H_2CO			3.00×10^{-11}	McEwan and Anicich (2007)
R_{cn}968c	2	CO^+	+	C_3H_8	→	$C_2H_5^+$	+	CO	+	CH_3	6.60×10^{-10}	McEwan and Anicich (2007)
R_{cn}968d	2	CO^+	+	C_3H_8	→	$C_2H_4^+$	+	CO	+	CH_4	1.80×10^{-10}	McEwan and Anicich (2007)
R_{cn}969	2	CO^+	+	N	→	NO^+	+	C			8.20×10^{-11}	McEwan and Anicich (2007)
R_{cn}970	2	CO^+	+	NH_3	→	NH_3^+	+	CO			1.85×10^{-09}	Anicich (1993)
R_{cn}971a	2	CO^+	+	HCN	→	HCN^+	+	CO			3.06×10^{-09}	McEwan and Anicich (2007)
R_{cn}971b	2	CO^+	+	HCN	→	HCO^+	+	CN			3.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}972a	2	CO^+	+	CH_3CN	→	$C_2H_3N^+$	+	CO			2.25×10^{-09}	McEwan and Anicich (2007)
R_{cn}972b	2	CO^+	+	CH_3CN	→	HC_2NH^+	+	HCO			7.50×10^{-10}	McEwan and Anicich (2007)
R_{cn}973	2	CO^+	+	HC_3N	→	HC_3N^+	+	CO			3.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}974a	2	CO^+	+	C_3H_3N	→	$C_2H_2^+$	+	HCN	+	CO	2.86×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}974b	2	CO^+	+	C_3H_3N	→	$C_3H_3N^+$	+	CO			1.54×10^{-09}	Petrie et al. (1991a),Petrie et al. (1992)
R_{cn}975	3	CO^+	+	N_2	→	CO^+N_2					1.00×10^{-10}	McEwan and Anicich (2007),Molina-Cuberos et al. (19
											2.10×10^{-29}	
R_{cn}976a	2	CO^+	+	H_2O	→	H_2O^+	+	CO			1.56×10^{-09}	McEwan and Anicich (2007)
R_{cn}976b	2	CO^+	+	H_2O	→	HCO^+	+	OH			8.40×10^{-10}	McEwan and Anicich (2007)
R_{cn}977	3	CO^+	+	CO	→	$Adduct^+$					1.00×10^{-10}	McEwan and Anicich (2007)
											1.40×10^{-28}	
R_{cn}978a	2	CO^+	+	H_2CO	→	HCO^+	+	HCO			1.65×10^{-09}	Anicich (1993)
R_{cn}978b	2	CO^+	+	H_2CO	→	CH_2O^+	+	CO			1.35×10^{-09}	Anicich (1993)
R_{cn}979	3	HCO^+	+	H_2	→	HCO^+H_2					1.00×10^{-10}	McEwan and Anicich (2007),Molina-Cuberos et al. (19
											8.30×10^{-31}	
R_{cn}980	2	HCO^+	+	C_2H_2	→	$C_2H_3^+$	+	CO			1.36×10^{-09}	McEwan and Anicich (2007)
R_{cn}981	2	HCO^+	+	C_2H_6	→	$C_2H_7^+$	+	CO			1.20×10^{-10}	McEwan and Anicich (2007)
R_{cn}982	2	HCO^+	+	NH_3	→	NH_4^+	+	CO			2.25×10^{-09}	Anicich (1993)
R_{cn}983	2	HCO^+	+	HCN	→	$HCNH^+$	+	CO			3.50×10^{-09}	McEwan and Anicich (2007)
R_{cn}984	2	HCO^+	+	CH_3CN	→	$C_2H_3NH^+$	+	CO			4.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}985	2	HCO^+	+	HC_3N	→	HC_3NH^+	+	CO			3.80×10^{-09}	McEwan and Anicich (2007)
R_{cn}986a	2	HCO^+	+	OH	→	H_2O^+	+	CO			1.61×10^{-09}	Su-Chesnavich
R_{cn}986b	2	HCO^+	+	OH	→	$OCOH^+$	+	H			1.61×10^{-09}	Su-Chesnavich
R_{cn}987	2	HCO^+	+	H_2O	→	H_3O^+	+	CO			2.60×10^{-09}	McEwan and Anicich (2007)
R_{cn}988	3	HCO^+	+	CO	→	HCO^+CO					1.00×10^{-10}	McEwan and Anicich (2007)
											2.40×10^{-30}	
R_{cn}989	2	HCO^+	+	H_2CO	→	CH_2OH^+	+	CO			3.30×10^{-09}	Anicich (1993)

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	Type	Reaction	k	Ref.
R_{cn}990a	2	$HOC^+ + H_2 \rightarrow H_3^+ + CO$	2.68×10^{-10}	McEwan and Anicich (2007)
R_{cn}990b	2	$HOC^+ + H_2 \rightarrow HCO^+ + H_2$	2.02×10^{-10}	McEwan and Anicich (2007)
R_{cn}991	2	$HOC^+ + CH_4 \rightarrow CH_5^+ + CO$	1.10×10^{-09}	McEwan and Anicich (2007)
R_{cn}992	2	$HOC^+ + N_2 \rightarrow N_2H^+ + CO$	6.70×10^{-10}	Anicich (1993)
R_{cn}993	2	$HOC^+ + CO \rightarrow HCO^+ + CO$	6.00×10^{-10}	McEwan and Anicich (2007)
R_{cn}994a	2	$CH_2O^+ + CH_4 \rightarrow CH_2OH^+ + CH_3$	9.35×10^{-11}	Anicich (1993)
R_{cn}994b	2	$CH_2O^+ + CH_4 \rightarrow CH_3CHOH^+ + H$	1.65×10^{-11}	Anicich (1993)
R_{cn}995a	2	$CH_2O^+ + NH_3 \rightarrow NH_3^+ + H_2CO$	7.40×10^{-10}	Anicich (1993)
R_{cn}995b	2	$CH_2O^+ + NH_3 \rightarrow NH_4^+ + HCO$	1.26×10^{-09}	Anicich (1993)
R_{cn}996	2	$CH_2O^+ + HCN \rightarrow HCNH^+ + HCO$	1.40×10^{-09}	Anicich (1993)
R_{cn}997	2	$CH_2O^+ + H_2O \rightarrow H_3O^+ + HCO$	2.10×10^{-09}	Anicich (1993)
R_{cn}998	2	$CH_2O^+ + H_2CO \rightarrow CH_2OH^+ + HCO$	3.20×10^{-09}	Anicich (1993)
R_{cn}999	2	$CH_2OH^+ + C_4H_2 \rightarrow C_4H_3^+ + H_2CO$	9.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}1000	2	$CH_2OH^+ + NH_3 \rightarrow NH_4^+ + H_2CO$	2.05×10^{-09}	Anicich (1993)
R_{cn}1001	2	$CH_2OH^+ + HCN \rightarrow HCNH^+ + H_2CO$	1.30×10^{-09}	McEwan and Anicich (2007)
R_{cn}1002	2	$CH_2OH^+ + H_2O \rightarrow H_3O^+ + H_2CO$	2.30×10^{-10}	McEwan and Anicich (2007)
R_{cn}1003a	2	$CH_2CO^+ + NH_3 \rightarrow CH_3NH_2^+ + CO$	4.40×10^{-10}	Iraqi et al. (1991)
R_{cn}1003b	2	$CH_2CO^+ + NH_3 \rightarrow NH_4^+ + ONEUT$	4.40×10^{-10}	Iraqi et al. (1991)
R_{cn}1004	2	$CH_3CHOH^+ + NH_3 \rightarrow NH_4^+ + CH_3CHO$	1.80×10^{-09}	Wilson et al. (1994a)
R_{cn}1005a	2	$CH_3CHOH^+ + CH_3CN \rightarrow C_2H_3NH^+ + CH_3CHO$	3.01×10^{-09}	Wilson et al. (1994a)
R_{cn}1005b	2	$CH_3CHOH^+ + CH_3CN \rightarrow C_4H_8NO^+ + hv$	1.92×10^{-10}	Wilson et al. (1994a)
R_{cn}1006a	2	$CO_2^+ + H \rightarrow H^+ + CO_2$	5.53×10^{-11}	Anicich (1993)
R_{cn}1006b	2	$CO_2^+ + H \rightarrow HCO^+ + O$	2.70×10^{-10}	Anicich (1993)
R_{cn}1007	2	$CO_2^+ + H_2 \rightarrow OCOH^+ + H$	6.20×10^{-10}	Anicich (1993)
R_{cn}1008a	2	$CO_2^+ + CH_4 \rightarrow CH_4^+ + CO_2$	2.63×10^{-10}	Anicich (1993)
R_{cn}1008b	2	$CO_2^+ + CH_4 \rightarrow OCOH^+ + CH_3$	7.88×10^{-10}	Anicich (1993)
R_{cn}1009	2	$CO_2^+ + C_2H_2 \rightarrow C_2H_2^+ + CO_2$	5.60×10^{-10}	Tsuji et al. (1994)
R_{cn}1010a	2	$CO_2^+ + C_2H_4 \rightarrow C_2H_4^+ + CO_2$	3.07×10^{-10}	Tsuji et al. (1994)
R_{cn}1010b	2	$CO_2^+ + C_2H_4 \rightarrow C_2H_3^+ + CO_2 + H$	1.88×10^{-10}	Tsuji et al. (1994)
R_{cn}1010c	2	$CO_2^+ + C_2H_4 \rightarrow C_2H_2^+ + CO_2 + H_2$	4.95×10^{-10}	Tsuji et al. (1994)
R_{cn}1011a	2	$CO_2^+ + C_2H_6 \rightarrow C_2H_5^+ + CO_2 + H$	2.50×10^{-10}	Tsuji et al. (1994)
R_{cn}1011b	2	$CO_2^+ + C_2H_6 \rightarrow C_2H_4^+ + CO_2 + H_2$	5.30×10^{-10}	Tsuji et al. (1994)
R_{cn}1012a	2	$CO_2^+ + C_3H_6 \rightarrow C_3H_6^+ + CO_2$	6.51×10^{-11}	Tsuji et al. (1994)
R_{cn}1012b	2	$CO_2^+ + C_3H_6 \rightarrow C_3H_5^+ + CO_2 + H$	6.32×10^{-10}	Tsuji et al. (1994)
R_{cn}1012c	2	$CO_2^+ + C_3H_6 \rightarrow C_3H_4^+ + CO_2 + H_2$	1.77×10^{-10}	Tsuji et al. (1994)
R_{cn}1012d	2	$CO_2^+ + C_3H_6 \rightarrow c-C_3H_3^+ + CO_2 + H_2 + H$	2.79×10^{-11}	Tsuji et al. (1994)

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	Type	Reaction	k	Ref.
$R_{cn}1012e$	2	$CO_2^+ + C_3H_6 \rightarrow l{-}C_3H_3^+ + CO_2 + H_2 + H$	2.79×10^{-11}	Tsuji et al. (1994)
$R_{cn}1013a$	2	$CO_2^+ + C_3H_8 \rightarrow C_3H_7^+ + CO_2 + H$	9.36×10^{-11}	Tsuji et al. (1994)
$R_{cn}1013b$	2	$CO_2^+ + C_3H_8 \rightarrow C_3H_6^+ + CO_2 + H_2$	2.34×10^{-11}	Tsuji et al. (1994)
$R_{cn}1013c$	2	$CO_2^+ + C_3H_8 \rightarrow C_3H_5^+ + CO_2 + H_2 + H$	2.34×10^{-11}	Tsuji et al. (1994)
$R_{cn}1013d$	2	$CO_2^+ + C_3H_8 \rightarrow C_2H_5^+ + CO_2 + CH_3$	5.46×10^{-10}	Tsuji et al. (1994)
$R_{cn}1013e$	2	$CO_2^+ + C_3H_8 \rightarrow C_2H_4^+ + CO_2 + CH_4$	9.36×10^{-11}	Tsuji et al. (1994)
$R_{cn}1014a$	2	$CO_2^+ + C_4H_{10} \rightarrow C_4H_9^+ + CO_2 + H$	7.00×10^{-11}	Tsuji et al. (1993)
$R_{cn}1014b$	2	$CO_2^+ + C_4H_{10} \rightarrow C_3H_7^+ + CO_2 + CH_3$	5.30×10^{-10}	Tsuji et al. (1993)
$R_{cn}1014c$	2	$CO_2^+ + C_4H_{10} \rightarrow C_3H_6^+ + CO_2 + CH_4$	9.00×10^{-11}	Tsuji et al. (1993)
$R_{cn}1014d$	2	$CO_2^+ + C_4H_{10} \rightarrow C_3H_5^+ + CO_2 + CH_4 + H$	3.10×10^{-10}	Tsuji et al. (1993)
$R_{cn}1015$	2	$CO_2^+ + N \rightarrow CO^+ + NO$	3.40×10^{-10}	Scott et al. (1998)
$R_{cn}1016$	2	$CO_2^+ + NH_3 \rightarrow NH_3^+ + CO_2$	1.90×10^{-09}	Anicich (1993)
$R_{cn}1017a$	2	$CO_2^+ + HCN \rightarrow HCN^+ + CO_2$	8.10×10^{-10}	McEwan et al. (1981)
$R_{cn}1017b$	2	$CO_2^+ + HCN \rightarrow OCOH^+ + CN$	9.00×10^{-11}	McEwan et al. (1981)
$R_{cn}1018$	2	$CO_2^+ + CO \rightarrow CO^+ + CO_2$	1.90×10^{-12}	Shul et al. (1988)
$R_{cn}1019$	2	$CO_2^+ + NO \rightarrow NO^+ + CO_2$	1.23×10^{-10}	Anicich (1993)
$R_{cn}1020$	2	$OCOH^+ + CH_4 \rightarrow CH_5^+ + CO_2$	7.20×10^{-10}	Anicich (1993)
$R_{cn}1021$	2	$OCOH^+ + C_2H_2 \rightarrow C_2H_3^+ + CO_2$	1.37×10^{-09}	Mackay et al. (1977)
$R_{cn}1022$	2	$OCOH^+ + CH_3CN \rightarrow C_2H_3NH^+ + CO_2$	4.10×10^{-09}	Mackay et al. (1976)
$R_{cn}1023$	2	$OCOH^+ + H_2O \rightarrow H_3O^+ + CO_2$	2.65×10^{-09}	Anicich (1993)
$R_{cn}1024$	2	$OCOH^+ + NO \rightarrow HNO^+ + CO_2$	1.00×10^{-10}	Roche et al. (1971)
$R_{cn}1025$	2	$NO^+ + C_6H_6 \rightarrow C_6H_6^+ + NO$	1.43×10^{-09}	Anicich (1993)
$R_{cn}1026$	2	$NO^+ + CH_3NH_2 \rightarrow CH_3NH_2^+ + NO$	8.20×10^{-10}	Anicich (1993)

Table B.17: Thermal electron reaction list (electron recombination)

	Type	Reaction									k	Ref.
$R_{er}1$	4	H^+	+	e	→	H					$3.50\times10^{-12}T^{0.70}$	Wakelam et al. (2015)
$R_{er}2$	4	C^+	+	e	→	C					$4.67\times10^{-12}T^{0.60}$	Nahar and Pradhan (1997)
$R_{er}3$	4	N^+	+	e	→	N					$3.50\times10^{-12}T^{0.70}$	Dutuit et al. (2013)
$R_{er}4$	4	O^+	+	e	→	$O(^3P)$					$3.40\times10^{-12}T^{0.63}$	Wakelam et al. (2015)
$R_{er}5$	4	H_2^+	+	e	→	H	+	H			$1.60\times10^{-08}T^{0.43}$	Mitchell (1990)
$R_{er}6a$	4	H_3^+	+	e	→	H	+	H	+	H	$4.36\times10^{-08}T^{0.52}$	Wakelam et al. (2015)
$R_{er}6b$	4	H_3^+	+	e	→	H_2	+	H			$2.34\times10^{-08}T^{0.52}$	Wakelam et al. (2015)
$R_{er}7$	4	H_5^+	+	e	→	H_2	+	H_2	+	H	$4.00\times10^{-06}T^{0.70}$	Johnsen and Biondi (1974)
$R_{er}8$	4	CH^+	+	e	→	H	+	C			$1.00\times10^{-07}T^{0.37}$	Amitay et al. (1996)
$R_{er}9a$	4	CH_2^+	+	e	→	C	+	H	+	H	$4.03\times10^{-07}T^{0.60}$	Larson et al. (1998)
$R_{er}9b$	4	CH_2^+	+	e	→	CH	+	H			$1.60\times10^{-07}T^{0.60}$	Larson et al. (1998)
$R_{er}9c$	4	CH_2^+	+	e	→	C	+	H_2			$7.68\times10^{-08}T^{0.60}$	Larson et al. (1998)
$R_{er}10$	4	$CH_2^+N_2$	+	e	→	$^3CH_2$	+	N_2			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}11a$	4	CH_3^+	+	e	→	$^3CH_2$	+	H			$1.28\times10^{-07}T^{0.53}$	Sheehan and St.-Maurice (2004b),Vejby-Christensen et al. (1997)
$R_{er}11b$	4	CH_3^+	+	e	→	C	+	H_2	+	H	$9.60\times10^{-08}T^{0.53}$	Sheehan and St.-Maurice (2004b),Vejby-Christensen et al. (1997)
$R_{er}11c$	4	CH_3^+	+	e	→	CH	+	H	+	H	$5.12\times10^{-08}T^{0.53}$	Sheehan and St.-Maurice (2004b),Vejby-Christensen et al. (1997)
$R_{er}11d$	4	CH_3^+	+	e	→	CH	+	H_2			$4.48\times10^{-08}T^{0.53}$	Sheehan and St.-Maurice (2004b),Vejby-Christensen et al. (1997)
$R_{er}12$	4	$CH_3^+N_2$	+	e	→	CH_3	+	N_2			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}13a$	4	CH_4^+	+	e	→	$^3CH_2$	+	H	+	H	$8.72\times10^{-07}T^{0.66}$	Thomas et al. (2013)
$R_{er}13b$	4	CH_4^+	+	e	→	CH	+	H_2	+	H	$3.93\times10^{-07}T^{0.66}$	Thomas et al. (2013)
$R_{er}13c$	4	CH_4^+	+	e	→	CH_3	+	H			$3.08\times10^{-07}T^{0.66}$	Thomas et al. (2013)
$R_{er}13d$	4	CH_4^+	+	e	→	$^3CH_2$	+	H_2			$1.03\times10^{-07}T^{0.66}$	Thomas et al. (2013)
$R_{er}13e$	4	CH_4^+	+	e	→	C	+	H_2	+	H_2	$3.42\times10^{-08}T^{0.66}$	Thomas et al. (2013)
$R_{er}14a$	4	CH_5^+	+	e	→	CH_3	+	H	+	H	$7.61\times10^{-07}T^{0.72}$	Kamińska et al. (2010),Semaniak et al. (1998)
$R_{er}14b$	4	CH_5^+	+	e	→	$^3CH_2$	+	H_2	+	H	$1.87\times10^{-07}T^{0.72}$	Kamińska et al. (2010),Semaniak et al. (1998)
$R_{er}14c$	4	CH_5^+	+	e	→	CH_4	+	H			$5.34\times10^{-08}T^{0.72}$	Kamińska et al. (2010),Semaniak et al. (1998)
$R_{er}14d$	4	CH_5^+	+	e	→	CH_3	+	H_2			$5.23\times10^{-08}T^{0.72}$	Kamińska et al. (2010),Semaniak et al. (1998)
$R_{er}14e$	4	CH_5^+	+	e	→	CH	+	H_2	+	H_2	$3.60\times10^{-08}T^{0.72}$	Kamińska et al. (2010),Semaniak et al. (1998)
$R_{er}15$	4	$CH_5^+CH_4$	+	e	→	CH_4	+	CH_4	+	H	$4.00\times10^{-06}T^{0.70}$	Capone et al. (1976)
$R_{er}16$	4	CH_5^+HNC	+	e	→	HNC	+	CH_4	+	H	$4.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}17a$	4	C_2H^+	+	e	→	C_2	+	H			$1.16\times10^{-07}T^{0.76}$	Ehlerding et al. (2004)
$R_{er}17b$	4	C_2H^+	+	e	→	CH	+	C			$1.05\times10^{-07}T^{0.76}$	Ehlerding et al. (2004)
$R_{er}17c$	4	C_2H^+	+	e	→	C	+	C	+	H	$4.86\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
$R_{er}18a$	4	$C_2H_2^+$	+	e	→	C_2H	+	H			$1.35\times10^{-07}T^{0.50}$	Mitchell (1990),Derkatch et al. (1999)

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	Type	Reaction									k	Ref.
R_{er}18b	4	$C_2H_2^+$	+	e	→	C_2	+	H	+	H	$8.10\times10^{-08}T^{0.50}$	Mitchell (1990),Derkatch et al. (1999)
R_{er}18c	4	$C_2H_2^+$	+	e	→	CH	+	CH			$3.51\times10^{-08}T^{0.50}$	Mitchell (1990),Derkatch et al. (1999)
R_{er}18d	4	$C_2H_2^+$	+	e	→	$^3CH_2$	+	C			$1.35\times10^{-08}T^{0.50}$	Mitchell (1990),Derkatch et al. (1999)
R_{er}18e	4	$C_2H_2^+$	+	e	→	C_2	+	H_2			$5.40\times10^{-09}T^{0.50}$	Mitchell (1990),Derkatch et al. (1999)
R_{er}19a	4	$C_2H_3^+$	+	e	→	C_2H	+	H	+	H	$2.95\times10^{-07}T^{0.84}$	Kalhori et al. (2002)
R_{er}19b	4	$C_2H_3^+$	+	e	→	C_2H_2	+	H			$1.45\times10^{-07}T^{0.84}$	Kalhori et al. (2002)
R_{er}19c	4	$C_2H_3^+$	+	e	→	C_2H	+	H_2			$3.00\times10^{-08}T^{0.84}$	Kalhori et al. (2002)
R_{er}19d	4	$C_2H_3^+$	+	e	→	C_2	+	H_2	+	H	$1.50\times10^{-08}T^{0.84}$	Kalhori et al. (2002)
R_{er}19e	4	$C_2H_3^+$	+	e	→	$^3CH_2$	+	CH			$1.50\times10^{-08}T^{0.84}$	Kalhori et al. (2002)
R_{er}19f	4	$C_2H_3^+$	+	e	→	CH_3	+	C			$3.00\times10^{-09}T^{0.84}$	Kalhori et al. (2002)
R_{er}20a	4	$C_2H_4^+$	+	e	→	C_2H_2	+	H	+	H	$3.70\times10^{-07}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20b	4	$C_2H_4^+$	+	e	→	C_2H_3	+	H			$6.16\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20c	4	$C_2H_4^+$	+	e	→	C_2H	+	H_2	+	H	$5.60\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20d	4	$C_2H_4^+$	+	e	→	C_2H_2	+	H_2			$3.36\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20e	4	$C_2H_4^+$	+	e	→	$^3CH_2$	+	$^3CH_2$			$2.24\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20f	4	$C_2H_4^+$	+	e	→	CH_3	+	CH			$1.12\times10^{-08}T^{0.76}$	Ehlerding et al. (2004)
R_{er}20g	4	$C_2H_4^+$	+	e	→	CH_4	+	C			$5.60\times10^{-09}T^{0.76}$	Ehlerding et al. (2004)
R_{er}21a	4	$C_2H_5^+$	+	e	→	C_2H_2	+	H_2	+	H	$3.55\times10^{-07}T^{1.20}$	McLain et al. (2004),Geppert et al. (2004a)
R_{er}21b	4	$C_2H_5^+$	+	e	→	C_2H_3	+	H	+	H	$3.33\times10^{-07}T^{1.20}$	McLain et al. (2004),Geppert et al. (2004a)
R_{er}21c	4	$C_2H_5^+$	+	e	→	CH_3	+	$^3CH_2$			$2.08\times10^{-07}T^{1.20}$	McLain et al. (2004),Geppert et al. (2004a)
R_{er}21d	4	$C_2H_5^+$	+	e	→	C_2H_2	+	H_2	+	H	$1.59\times10^{-07}T^{1.20}$	McLain et al. (2004),Geppert et al. (2004a)
R_{er}21e	4	$C_2H_5^+$	+	e	→	C_2H_4	+	H			$1.47\times10^{-07}T^{1.20}$	McLain et al. (2004),Geppert et al. (2004a)
R_{er}22	4	$C_2H_5^+CH_4$	+	e	→	C_2H_4	+	CH_4	+	H	$4.00\times10^{-06}T^{0.70}$	Capone et al. (1976)
R_{er}23a	4	$C_2H_6^+$	+	e	→	C_2H_4	+	H	+	H	$4.60\times10^{-07}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}23b	4	$C_2H_6^+$	+	e	→	C_2H_5	+	H			$3.00\times10^{-07}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}23c	4	$C_2H_6^+$	+	e	→	C_2H_4	+	H_2			$8.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}23d	4	$C_2H_6^+$	+	e	→	CH_3	+	CH_3			$8.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}23e	4	$C_2H_6^+$	+	e	→	CH_4	+	$^3CH_2$			$4.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}23f	4	$C_2H_6^+$	+	e	→	C_2H_3	+	H_2	+	H	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}24a	4	$C_2H_7^+$	+	e	→	C_2H_6	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}24b	4	$C_2H_7^+$	+	e	→	CH_4	+	CH_3			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}25	4	$C_2H_7^+CH_4$	+	e	→	C_2H_6	+	CH_4	+	H	$4.00\times10^{-06}T^{0.70}$	Capone et al. (1976)
R_{er}26	4	C_3^+	+	e	→	C_2	+	C			$4.00\times10^{-07}T^{0.70}$	eq.(E23),Heber et al. (2006)
R_{er}27a	4	C_3H^+	+	e	→	C_3	+	H			$3.97\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}27b	4	C_3H^+	+	e	→	C_2H	+	C			$1.87\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}27c	4	C_3H^+	+	e	→	C_2	+	CH			$1.56\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)

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	Type	Reaction	k	Ref.
R_{er}28a	4	$C_3H_2^+$ + e → C_3H + H	$3.66\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}28b	4	$C_3H_2^+$ + e → C_3 + H_2	$1.94\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}28c	4	$C_3H_2^+$ + e → C_3 + H + H	$1.40\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}28d	4	$C_3H_2^+$ + e → C_2H_2 + C	$7.71\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}28e	4	$C_3H_2^+$ + e → C_2H + CH	$1.43\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}28f	4	$C_3H_2^+$ + e → C_2 + $^3CH_2$	$8.56\times10^{-09}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Chabot et al. (2013)
R_{er}29a	4	$c-C_3H_3^+$ + e → C_3H + H + H	$4.00\times10^{-07}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}29b	4	$c-C_3H_3^+$ + e → C_3H_2 + H	$2.88\times10^{-07}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}29c	4	$c-C_3H_3^+$ + e → C_3H + H_2	$4.80\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}29d	4	$c-C_3H_3^+$ + e → C_2H_2 + CH	$2.40\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}29e	4	$c-C_3H_3^+$ + e → C_2H + $^3CH_2$	$2.40\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}29f	4	$c-C_3H_3^+$ + e → C_2 + CH_3	$1.60\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30a	4	$l-C_3H_3^+$ + e → C_3H + H + H	$5.75\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30b	4	$l-C_3H_3^+$ + e → C_3H_2 + H	$4.15\times10^{-08}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30c	4	$l-C_3H_3^+$ + e → C_3H + H_2	$6.90\times10^{-09}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30d	4	$l-C_3H_3^+$ + e → C_2H_2 + CH	$3.45\times10^{-09}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30e	4	$l-C_3H_3^+$ + e → C_2H + $^3CH_2$	$3.45\times10^{-09}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}30f	4	$l-C_3H_3^+$ + e → C_2 + CH_3	$2.30\times10^{-09}T^{1.00}$	McLain et al. (2005),Janev and Reiter (2004)
R_{er}31a	4	$C_3H_4^+$ + e → C_3H_3 + H	$2.57\times10^{-06}T^{0.67}$	Geppert et al. (2004c)
R_{er}31b	4	$C_3H_4^+$ + e → C_2H_2 + $^3CH_2$	$1.77\times10^{-07}T^{0.67}$	Geppert et al. (2004c)
R_{er}31c	4	$C_3H_4^+$ + e → C_2H_3 + CH	$2.95\times10^{-08}T^{0.67}$	Geppert et al. (2004c)
R_{er}31d	4	$C_3H_4^+$ + e → C_2H + CH_3	$2.95\times10^{-08}T^{0.67}$	Geppert et al. (2004c)
R_{er}32a	4	$C_3H_5^+$ + e → C_3H_3 + H + H	$5.60\times10^{-07}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32b	4	$C_3H_5^+$ + e → CH_3CCH + H	$2.70\times10^{-07}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32c	4	$C_3H_5^+$ + e → C_3H_3 + H_2	$4.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32d	4	$C_3H_5^+$ + e → C_3H_2 + H_2 + H	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32e	4	$C_3H_5^+$ + e → C_2H + CH_4	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32f	4	$C_3H_5^+$ + e → C_2H_2 + CH_3	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32g	4	$C_3H_5^+$ + e → C_2H_4 + CH	$2.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}32h	4	$C_3H_5^+$ + e → C_2H_3 + $^3CH_2$	$2.00\times10^{-08}T^{0.70}$	eq.(E23),Janev and Reiter (2004)
R_{er}33a	4	$C_3H_6^+$ + e → CH_3CCH + H + H	$4.40\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}33b	4	$C_3H_6^+$ + e → C_3H_5 + H	$2.00\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}33c	4	$C_3H_6^+$ + e → C_2H_4 + $^3CH_2$	$1.20\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}33d	4	$C_3H_6^+$ + e → C_2H_3 + CH_3	$1.20\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}33e	4	$C_3H_6^+$ + e → C_2H_5 + CH	$8.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}33f	4	$C_3H_6^+$ + e → C_3H_3 + H_2 + H	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)

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	Type	Reaction									k	Ref.
R_{er}33g	4	$C_3H_6^+$	+	e	→	CH_3CCH	+	H_2			$3.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}34a	4	$C_3H_7^+$	+	e	→	C_3H_6	+	H			$8.36\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34b	4	$C_3H_7^+$	+	e	→	C_2H_3	+	CH_3	+	H	$3.80\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34c	4	$C_3H_7^+$	+	e	→	C_3H_5	+	H_2			$1.14\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34d	4	$C_3H_7^+$	+	e	→	C_3H_5	+	H	+	H	$1.14\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34e	4	$C_3H_7^+$	+	e	→	C_2H_2	+	CH_4	+	H	$1.05\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34f	4	$C_3H_7^+$	+	e	→	C_2H_2	+	CH_3	+	H_2	$1.05\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34g	4	$C_3H_7^+$	+	e	→	CH_3CCH	+	H_2	+	H	$1.71\times10^{-07}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34h	4	$C_3H_7^+$	+	e	→	C_2H_4	+	CH_3			$3.80\times10^{-08}T^{0.68}$	Ehlerding et al. (2003)
R_{er}34i	4	$C_3H_7^+$	+	e	→	C_2H_4	+	$^3CH_2$	+	H	$3.80\times10^{-08}T^{0.68}$	Ehlerding et al. (2003)
R_{er}35a	4	$C_3H_8^+$	+	e	→	C_3H_6	+	H	+	H	$4.00\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}35b	4	$C_3H_8^+$	+	e	→	C_3H_7	+	H			$2.00\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}35c	4	$C_3H_8^+$	+	e	→	C_2H_6	+	$^3CH_2$			$1.60\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}35d	4	$C_3H_8^+$	+	e	→	C_2H_5	+	CH_3			$1.60\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}35e	4	$C_3H_8^+$	+	e	→	C_3H_6	+	H_2			$4.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}35f	4	$C_3H_8^+$	+	e	→	C_3H_5	+	H_2	+	H	$3.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004b),Janev and Reiter (2004)
R_{er}36a	4	$C_3H_9^+$	+	e	→	C_3H_8	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}36b	4	$C_3H_9^+$	+	e	→	C_2H_6	+	CH_3			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}37a	4	C_4H^+	+	e	→	C_4	+	H			$3.50\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a),Chabot et al. (2013)
R_{er}37b	4	C_4H^+	+	e	→	C_2H	+	C_2			$2.23\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a),Chabot et al. (2013)
R_{er}37c	4	C_4H^+	+	e	→	C_3	+	C	+	H	$1.53\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a),Chabot et al. (2013)
R_{er}37d	4	C_4H^+	+	e	→	C_3H	+	C			$7.26\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004a),Chabot et al. (2013)
R_{er}38a	4	$C_4H_2^+$	+	e	→	C_4H	+	H			$8.62\times10^{-07}T^{0.79}$	Danielsson et al. (2008),Angelova et al. (2004a)
R_{er}38b	4	$C_4H_2^+$	+	e	→	C_2H	+	C_2H			$1.95\times10^{-07}T^{0.79}$	Danielsson et al. (2008),Angelova et al. (2004a)
R_{er}38c	4	$C_4H_2^+$	+	e	→	C_3H	+	CH			$4.40\times10^{-08}T^{0.79}$	Danielsson et al. (2008),Angelova et al. (2004a)
R_{er}39a	4	$C_4H_3^+$	+	e	→	C_4H_2	+	H			$4.75\times10^{-07}T^{0.70}$	Adams and Smith (1988a),Angelova et al. (2004a)
R_{er}39b	4	$C_4H_3^+$	+	e	→	C_2H_2	+	C_2H			$1.10\times10^{-07}T^{0.70}$	Adams and Smith (1988a),Angelova et al. (2004a)
R_{er}39c	4	$C_4H_3^+$	+	e	→	C_3H_2	+	CH			$3.91\times10^{-08}T^{0.70}$	Adams and Smith (1988a),Angelova et al. (2004a)
R_{er}40	4	$C_4H_3^+CO$	+	e	→	C_4H_3	+	CO			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
R_{er}41a	4	$C_4H_4^+$	+	e	→	C_4H_3	+	H			$9.96\times10^{-07}T^{1.10}$	Fournier et al. (2013),Angelova et al. (2004a)
R_{er}41b	4	$C_4H_4^+$	+	e	→	C_2H_2	+	C_2H_2			$2.22\times10^{-07}T^{1.10}$	Fournier et al. (2013),Angelova et al. (2004a)
R_{er}41c	4	$C_4H_4^+$	+	e	→	C_3H_3	+	CH			$8.19\times10^{-08}T^{1.10}$	Fournier et al. (2013),Angelova et al. (2004a)
R_{er}42a	4	$C_4H_5^+$	+	e	→	C_4H_2	+	H_2	+	H	$3.77\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),Angelova et al. (2004a)
R_{er}42b	4	$C_4H_5^+$	+	e	→	C_2H_3	+	C_2H_2			$3.67\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),Angelova et al. (2004a)
R_{er}42c	4	$C_4H_5^+$	+	e	→	CH_3CCH	+	CH			$7.64\times10^{-08}T^{0.70}$	Rebrion-Rowe et al. (1998),Angelova et al. (2004a)
R_{er}43a	4	$C_4H_6^+$	+	e	→	C_4H_4	+	H_2			$5.89\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)

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	Type	Reaction	k	Ref.
R_{er}43b	4	$C_4H_6^+ + e \rightarrow C_2H_4 + C_2H_2$	$3.21\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}43c	4	$C_4H_6^+ + e \rightarrow CH_3CCH + {}^3CH_2$	$9.00\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}44a	4	$C_4H_7^+ + e \rightarrow CH_3CCH + CH_3$	$6.56\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}44b	4	$C_4H_7^+ + e \rightarrow C_4H_2 + H_2 + H_3$	$1.98\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}44c	4	$C_4H_7^+ + e \rightarrow C_2H_4 + C_2H_3$	$1.47\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}45a	4	$C_4H_8^+ + e \rightarrow CH_3CCH + CH_4$	$6.36\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}45b	4	$C_4H_8^+ + e \rightarrow C_4H_6 + H_2$	$3.05\times10^{-07}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}45c	4	$C_4H_8^+ + e \rightarrow C_2H_4 + C_2H_4$	$6.10\times10^{-08}T^{0.70}$	eq.(E23),Angelova et al. (2004a)
R_{er}46a	4	$C_4H_9^+ + e \rightarrow C_4H_8 + H$	$3.34\times10^{-07}T^{0.59}$	Larsson et al. (2005),Angelova et al. (2004a)
R_{er}46b	4	$C_4H_9^+ + e \rightarrow C_3H_6 + CH_3$	$2.38\times10^{-07}T^{0.59}$	Larsson et al. (2005),Angelova et al. (2004a)
R_{er}46c	4	$C_4H_9^+ + e \rightarrow C_2H_6 + C_2H_3$	$8.70\times10^{-09}T^{0.59}$	Larsson et al. (2005),Angelova et al. (2004a)
R_{er}47a	4	$C_5H^+ + e \rightarrow C_5 + H$	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}47b	4	$C_5H^+ + e \rightarrow C_4H + C$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}47c	4	$C_5H^+ + e \rightarrow C_3 + C_2H$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}48	4	$C_5H_2^+ + e \rightarrow C_5H + H$	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
R_{er}49	4	$C_5H_3^+ + e \rightarrow C_5H_2 + H$	$9.00\times10^{-07}T^{0.70}$	Abouelaziz et al. (1993),est.(products)
R_{er}50	4	$C_5H_4^+ + e \rightarrow C_5H_3 + H$	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
R_{er}51a	4	$C_5H_5^+ + e \rightarrow C_5H_4 + H$	$5.00\times10^{-07}T^{0.70}$	eq.(E23),Wakelam et al. (2015)
R_{er}51b	4	$C_5H_5^+ + e \rightarrow C_3H_3 + C_2H_2$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),Wakelam et al. (2015)
R_{er}51c	4	$C_5H_5^+ + e \rightarrow C_4H_2 + CH_3$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),Wakelam et al. (2015)
R_{er}52a	4	$C_5H_6^+ + e \rightarrow C_5H_5 + H$	$4.50\times10^{-07}T^{0.70}$	Fournier et al. (2013),est.(products)
R_{er}52b	4	$C_5H_6^+ + e \rightarrow C_4H_3 + CH_3$	$2.25\times10^{-07}T^{0.70}$	Fournier et al. (2013),est.(products)
R_{er}52c	4	$C_5H_6^+ + e \rightarrow C_3H_5 + C_2H$	$2.25\times10^{-07}T^{0.70}$	Fournier et al. (2013),est.(products)
R_{er}53a	4	$C_5H_7^+ + e \rightarrow C_5H_6 + H$	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}53b	4	$C_5H_7^+ + e \rightarrow C_4H_5 + {}^3CH_2$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}53c	4	$C_5H_7^+ + e \rightarrow CH_3CCH + C_2H_3$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}54a	4	$C_5H_8^+ + e \rightarrow C_5H_7 + H$	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}54b	4	$C_5H_8^+ + e \rightarrow C_4H_5 + CH_3$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}54c	4	$C_5H_8^+ + e \rightarrow C_3H_5 + C_2H_3$	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}55a	4	$C_5H_9^+ + e \rightarrow C_5H_8 + H$	$4.75\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}55b	4	$C_5H_9^+ + e \rightarrow C_4H_6 + CH_3$	$1.58\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}55c	4	$C_5H_9^+ + e \rightarrow C_3H_6 + C_2H_3$	$1.58\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}55d	4	$C_5H_9^+ + e \rightarrow CH_3CCH + C_2H_5$	$1.58\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}56a	4	$C_5H_{10}^+ + e \rightarrow C_5H_9 + H$	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}56b	4	$C_5H_{10}^+ + e \rightarrow C_4H_7 + CH_3$	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}56c	4	$C_5H_{10}^+ + e \rightarrow C_3H_7 + C_2H_3$	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction							k	Ref.
R_{er}56d	4	$C_5H_{10}^+$	+	e	→	C_3H_5	+	C_2H_5	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}57a	4	$C_5H_{11}^+$	+	e	→	C_5H_{10}	+	H	$3.60\times10^{-07}T^{0.70}$	Lehfaoui et al. (1997),est.(products)
R_{er}57b	4	$C_5H_{11}^+$	+	e	→	C_4H_9	+	$^3CH_2$	$9.00\times10^{-08}T^{0.70}$	Lehfaoui et al. (1997),est.(products)
R_{er}57c	4	$C_5H_{11}^+$	+	e	→	C_4H_8	+	CH_3	$9.00\times10^{-08}T^{0.70}$	Lehfaoui et al. (1997),est.(products)
R_{er}57d	4	$C_5H_{11}^+$	+	e	→	C_3H_7	+	C_2H_4	$9.00\times10^{-08}T^{0.70}$	Lehfaoui et al. (1997),est.(products)
R_{er}57e	4	$C_5H_{11}^+$	+	e	→	C_3H_6	+	C_2H_5	$9.00\times10^{-08}T^{0.70}$	Lehfaoui et al. (1997),est.(products)
R_{er}58a	4	C_6H^+	+	e	→	C_6	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}58b	4	C_6H^+	+	e	→	C_4H	+	C_2	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}58c	4	C_6H^+	+	e	→	C_4	+	C_2H	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}59a	4	$C_6H_2^+$	+	e	→	C_6H	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}59b	4	$C_6H_2^+$	+	e	→	C_4H	+	C_2H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}60a	4	$C_6H_3^+$	+	e	→	C_6H_2	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}60b	4	$C_6H_3^+$	+	e	→	C_4H_2	+	C_2H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}61	4	$C_6H_4^+$	+	e	→	C_6H_3	+	H	$1.10\times10^{-06}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}62	4	$C_6H_5^+$	+	e	→	C_6H_4	+	H	$1.10\times10^{-06}T^{0.70}$	Rebrion-Rowe et al. (1998),est.(products)
R_{er}63	4	$C_6H_6^+$	+	e	→	C_6H_5	+	H	$1.30\times10^{-06}T^{0.69}$	Hamberg et al. (2011)
R_{er}64	4	$C_6H_7^+$	+	e	→	C_6H_6	+	H	$2.00\times10^{-06}T^{0.83}$	Hamberg et al. (2011)
R_{er}65a	4	$C_6H_9^+$	+	e	→	C_6H_8	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}65b	4	$C_6H_9^+$	+	e	→	C_5H_6	+	CH_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}65c	4	$C_6H_9^+$	+	e	→	C_4H_6	+	C_2H_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}65d	4	$C_6H_9^+$	+	e	→	C_4H_5	+	C_2H_4	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}66a	4	$C_6H_{11}^+$	+	e	→	C_6H_{10}	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}66b	4	$C_6H_{11}^+$	+	e	→	C_5H_8	+	CH_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}66c	4	$C_6H_{11}^+$	+	e	→	C_4H_8	+	C_2H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}66d	4	$C_6H_{11}^+$	+	e	→	C_4H_6	+	C_2H_5	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}66e	4	$C_6H_{11}^+$	+	e	→	C_3H_7	+	CH_3CCH	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}67a	4	$C_6H_{13}^+$	+	e	→	C_6H_{12}	+	H	$6.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}67b	4	$C_6H_{13}^+$	+	e	→	C_5H_{11}	+	$^3CH_2$	$1.63\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}67c	4	$C_6H_{13}^+$	+	e	→	C_5H_{10}	+	CH_3	$1.63\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}67d	4	$C_6H_{13}^+$	+	e	→	C_4H_9	+	C_2H_4	$1.63\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}67e	4	$C_6H_{13}^+$	+	e	→	C_3H_7	+	C_3H_6	$1.63\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}68a	4	C_7^+	+	e	→	C_4	+	C_3	$1.60\times10^{-06}T^{0.30}$	Wakelam et al. (2015)
R_{er}68b	4	C_7^+	+	e	→	C_5	+	C_2	$4.00\times10^{-07}T^{0.30}$	Wakelam et al. (2015)
R_{er}69a	4	C_7H^+	+	e	→	C_7	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}69b	4	C_7H^+	+	e	→	C_6H	+	C	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}69c	4	C_7H^+	+	e	→	C_4H	+	C_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction									k	Ref.
R_{er}69d	4	C_7H^+	+	e	→	C_5	+	C_2H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}70a	4	$C_7H_2^+$	+	e	→	C_7H	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}70b	4	$C_7H_2^+$	+	e	→	C_6	+	$^3CH_2$			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}70c	4	$C_7H_2^+$	+	e	→	C_5H_2	+	C_2			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}70d	4	$C_7H_2^+$	+	e	→	C_3H_2	+	C_4			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}71a	4	$C_7H_3^+$	+	e	→	C_7H_2	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}71b	4	$C_7H_3^+$	+	e	→	C_6H	+	$^3CH_2$			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}71c	4	$C_7H_3^+$	+	e	→	C_5H_2	+	C_2H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}71d	4	$C_7H_3^+$	+	e	→	C_4H	+	C_3H_2			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}72	4	$C_7H_4^+$	+	e	→	C_7H_3	+	H			$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
R_{er}73	4	$C_7H_5^+$	+	e	→	C_7H_4	+	H			$7.00\times10^{-07}T^{0.70}$	Abouelaziz et al. (1993),est.(products)
R_{er}74a	4	$C_7H_6^+$	+	e	→	C_7H_5	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}74b	4	$C_7H_6^+$	+	e	→	C_6H_3	+	CH_3			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}74c	4	$C_7H_6^+$	+	e	→	C_5H_5	+	C_2H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}74d	4	$C_7H_6^+$	+	e	→	C_4H_3	+	C_3H_3			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}75a	4	$C_7H_7^+$	+	e	→	C_7H_6	+	H			$1.60\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (2000),est.(products)
R_{er}75b	4	$C_7H_7^+$	+	e	→	C_6H_5	+	$^3CH_2$			$1.60\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (2000),est.(products)
R_{er}76a	4	$C_7H_8^+$	+	e	→	C_7H_7	+	H			$3.00\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (2000),est.(products)
R_{er}76b	4	$C_7H_8^+$	+	e	→	C_6H_5	+	CH_3			$3.00\times10^{-07}T^{0.70}$	Rebrion-Rowe et al. (2000),est.(products)
R_{er}77a	4	$C_7H_9^+$	+	e	→	C_7H_8	+	H			$1.90\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
R_{er}77b	4	$C_7H_9^+$	+	e	→	C_6H_5	+	CH_4			$1.90\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
R_{er}78a	4	C_8H^+	+	e	→	C_8	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}78b	4	C_8H^+	+	e	→	C_6H	+	C_2			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}78c	4	C_8H^+	+	e	→	C_6	+	C_2H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}78d	4	C_8H^+	+	e	→	C_4H	+	C_4			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}79a	4	$C_8H_2^+$	+	e	→	C_8H	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}79b	4	$C_8H_2^+$	+	e	→	C_6H	+	C_2H			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}79c	4	$C_8H_2^+$	+	e	→	C_4H	+	C_4H			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}80a	4	$C_8H_3^+$	+	e	→	C_8H_2	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}80b	4	$C_8H_3^+$	+	e	→	C_6H_2	+	C_2H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}80c	4	$C_8H_3^+$	+	e	→	C_6H	+	C_2H_2			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}80d	4	$C_8H_3^+$	+	e	→	C_4H_2	+	C_4H			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
R_{er}81	4	NH^+	+	e	→	N	+	H			$4.30\times10^{-08}T^{0.50}$	Mitchell (1990)
R_{er}82a	4	NH_2^+	+	e	→	N	+	H	+	H	$1.71\times10^{-07}T^{0.50}$	Mitchell (1990),Thomas et al. (2005)
R_{er}82b	4	NH_2^+	+	e	→	NH	+	H			$1.29\times10^{-07}T^{0.50}$	Mitchell (1990),Thomas et al. (2005)
R_{er}83	4	NH_3^+	+	e	→	NH_2	+	H			$3.10\times10^{-07}T^{0.50}$	Mitchell (1990),est.(products)

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	Type	Reaction	k	Ref.
$R_{er}84a$	4	NH_4^+ + e → NH_3 + H	$1.15\times10^{-06}T^{0.60}$	Alge et al. (1983),Öjekull et al. (2004)
$R_{er}84b$	4	NH_4^+ + e → NH_2 + H + H	$1.76\times10^{-07}T^{0.60}$	Alge et al. (1983),Öjekull et al. (2004)
$R_{er}84c$	4	NH_4^+ + e → NH_2 + H_2	$2.70\times10^{-08}T^{0.60}$	Alge et al. (1983),Öjekull et al. (2004)
$R_{er}85a$	4	CN^+ + e → $N(^2D)$ + C	$3.26\times10^{-07}T^{0.55}$	Le Padellec et al. (1999)
$R_{er}85b$	4	CN^+ + e → N + C	$1.36\times10^{-08}T^{0.55}$	Le Padellec et al. (1999)
$R_{er}86$	4	HCN^+ + e → CN + H	$3.90\times10^{-07}T^{0.96}$	Sheehan et al. (1999),est.(products)
$R_{er}87$	4	HNC^+ + e → CN + H	$1.82\times10^{-07}T^{0.96}$	Sheehan et al. (1999),est.(products)
$R_{er}88a$	4	$HCNH^+$ + e → HCN + H	$9.62\times10^{-08}T^{0.65}$	Wakelam et al. (2015)
$R_{er}88b$	4	$HCNH^+$ + e → HNC + H	$9.62\times10^{-08}T^{0.65}$	Wakelam et al. (2015)
$R_{er}88c$	4	$HCNH^+$ + e → CN + H + H	$9.06\times10^{-08}T^{0.65}$	Wakelam et al. (2015)
$R_{er}88d$	4	$HCNH^+$ + e → CN + H_2	$9.06\times10^{-08}T^{0.65}$	Wakelam et al. (2015)
$R_{er}89$	4	$HCNH^+CH_4$ + e → HCN + CH_4 + H	5.00×10^{-06}	est.(clusters)
$R_{er}90$	4	$HCNH^+N_2$ + e → HCN + N_2 + H	5.00×10^{-06}	est.(clusters)
$R_{er}91$	4	CH_2NH^+ + e → H_2CN + H	$8.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}92a$	4	$CH_2NH_2^+$ + e → CH_2NH + H	$7.00\times10^{-07}T^{0.70}$	Yelle et al. (2010)
$R_{er}92b$	4	$CH_2NH_2^+$ + e → NH_2 + $^3CH_2$	$7.00\times10^{-07}T^{0.70}$	Yelle et al. (2010)
$R_{er}92c$	4	$CH_2NH_2^+$ + e → HCN + H + H_2	$7.00\times10^{-07}T^{0.70}$	Yelle et al. (2010)
$R_{er}93a$	4	$CH_3NH_2^+$ + e → CH_2NH_2 + H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}93b$	4	$CH_3NH_2^+$ + e → NH_2 + CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}94a$	4	$CH_3NH_3^+$ + e → CH_3NH_2 + H	$7.00\times10^{-07}T^{0.70}$	Adams and Smith (1988a),est.(products)
$R_{er}94b$	4	$CH_3NH_3^+$ + e → NH_3 + CH_3	$7.00\times10^{-07}T^{0.70}$	Adams and Smith (1988a),est.(products)
$R_{er}95a$	4	CNC^+ + e → CN + C	$3.80\times10^{-07}T^{0.60}$	Wakelam et al. (2015)
$R_{er}95b$	4	CNC^+ + e → C_2 + N	$2.00\times10^{-08}T^{0.60}$	Wakelam et al. (2015)
$R_{er}96a$	4	C_2N^+ + e → CN + C	$3.80\times10^{-07}T^{0.60}$	est.(CNCP)
$R_{er}96b$	4	C_2N^+ + e → C_2 + N	$2.00\times10^{-08}T^{0.60}$	est.(CNCP)
$R_{er}97a$	4	HC_2N^+ + e → C_2N + H	$3.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}97b$	4	HC_2N^+ + e → CH + CN	$3.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}98$	4	HC_2NH^+ + e → HC_2N + H	$8.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}99a$	4	$C_2H_3N^+$ + e → CH_2CN + H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}99b$	4	$C_2H_3N^+$ + e → CN + CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}100a$	4	$C_2H_3NH^+$ + e → CH_3CN + H	$2.67\times10^{-07}T^{0.69}$	Geppert et al. (2007),Vigren et al. (2008)
$R_{er}100b$	4	$C_2H_3NH^+$ + e → CH_2CN + H + H	$2.67\times10^{-07}T^{0.69}$	Geppert et al. (2007),Vigren et al. (2008)
$R_{er}100c$	4	$C_2H_3NH^+$ + e → HNC + CH_3	$1.38\times10^{-07}T^{0.69}$	Geppert et al. (2007),Vigren et al. (2008)
$R_{er}100d$	4	$C_2H_3NH^+$ + e → HCN + $^3CH_2$ + H	$1.38\times10^{-07}T^{0.69}$	Geppert et al. (2007),Vigren et al. (2008)
$R_{er}101a$	4	$C_2H_5N^+$ + e → C_2H_4N + H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}101b$	4	$C_2H_5N^+$ + e → NH_2 + C_2H_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction									k	Ref.
$R_{er}102$	4	C_3N^+	+	e	→	CN	+	C_2			$6.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}103a$	4	HC_3N^+	+	e	→	C_3N	+	H			$6.60\times10^{-07}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}103b$	4	HC_3N^+	+	e	→	CN	+	C_2H			$3.60\times10^{-07}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}103c$	4	HC_3N^+	+	e	→	CN	+	C_2	+	H	$3.60\times10^{-07}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}103d$	4	HC_3N^+	+	e	→	C_2N	+	C	+	H	$6.00\times10^{-08}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}103e$	4	HC_3N^+	+	e	→	HC_2N	+	C			$3.00\times10^{-08}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}103f$	4	HC_3N^+	+	e	→	C_2N	+	CH			$3.00\times10^{-08}T^{0.60}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}104a$	4	HC_3NH^+	+	e	→	HC_3N	+	H			$7.80\times10^{-07}T^{0.58}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}104b$	4	HC_3NH^+	+	e	→	CN	+	C_2H_2			$7.20\times10^{-07}T^{0.58}$	Geppert et al. (2004b),Vigren et al. (2012a)
$R_{er}105a$	4	$C_3H_3N^+$	+	e	→	C_3H_2N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}105b$	4	$C_3H_3N^+$	+	e	→	CN	+	C_2H_3			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}106a$	4	$C_3H_3NH^+$	+	e	→	C_3H_3N	+	H			$9.00\times10^{-07}T^{0.80}$	Geppert et al. (2007),Vigren et al. (2009)
$R_{er}106b$	4	$C_3H_3NH^+$	+	e	→	HCN	+	C_2H_2	+	H	$4.50\times10^{-07}T^{0.80}$	Geppert et al. (2007),Vigren et al. (2009)
$R_{er}106c$	4	$C_3H_3NH^+$	+	e	→	HNC	+	C_2H_3			$4.50\times10^{-07}T^{0.80}$	Geppert et al. (2007),Vigren et al. (2009)
$R_{er}107a$	4	$C_3H_5N^+$	+	e	→	C_3H_4N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}107b$	4	$C_3H_5N^+$	+	e	→	C_2H_2N	+	CH_3			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}107c$	4	$C_3H_5N^+$	+	e	→	CN	+	C_2H_5			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}108a$	4	$C_3H_5NH^+$	+	e	→	C_3H_5N	+	H			$6.45\times10^{-07}T^{0.76}$	Vigren et al. (2010a)
$R_{er}108b$	4	$C_3H_5NH^+$	+	e	→	CH_2CN	+	CH_3	+	H	$6.45\times10^{-07}T^{0.76}$	Vigren et al. (2010a)
$R_{er}108c$	4	$C_3H_5NH^+$	+	e	→	HNC	+	C_2H_5			$2.10\times10^{-07}T^{0.76}$	Vigren et al. (2010a)
$R_{er}109a$	4	$C_3H_7NH^+$	+	e	→	C_3H_7N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}109b$	4	$C_3H_7NH^+$	+	e	→	C_2H_5N	+	CH_3			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}109c$	4	$C_3H_7NH^+$	+	e	→	NH_3	+	C_3H_5			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}110a$	4	$C_3H_9NH^+$	+	e	→	C_3H_9N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}110b$	4	$C_3H_9NH^+$	+	e	→	C_2H_7N	+	CH_3			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}110c$	4	$C_3H_9NH^+$	+	e	→	CH_3NH_2	+	C_2H_5			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}110d$	4	$C_3H_9NH^+$	+	e	→	NH_3	+	C_3H_7			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}111a$	4	C_4N^+	+	e	→	C_3N	+	C			$4.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}111b$	4	C_4N^+	+	e	→	CN	+	C_3			$4.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}112a$	4	HC_4N^+	+	e	→	C_4N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}112b$	4	HC_4N^+	+	e	→	C_3N	+	CH			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}112c$	4	HC_4N^+	+	e	→	CN	+	C_3H			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}113a$	4	HC_4NH^+	+	e	→	HC_4N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}113b$	4	HC_4NH^+	+	e	→	C_3N	+	$^3CH_2$			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}113c$	4	HC_4NH^+	+	e	→	CN	+	C_3H_2			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}114a$	4	$C_4H_3N^+$	+	e	→	C_4H_2N	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}114b$	4	$C_4H_3N^+$	+	e	→	C_3N	+	CH_3			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction							k	Ref.
$R_{er}114c$	4	$C_4H_3N^+$	+	e	→	CN	+	C_3H_3	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}115a$	4	$C_4H_3NH^+$	+	e	→	CH_3C_3N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}115b$	4	$C_4H_3NH^+$	+	e	→	HC_3N	+	CH_3	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}115c$	4	$C_4H_3NH^+$	+	e	→	HNC	+	C_3H_3	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}116a$	4	$C_4H_5N^+$	+	e	→	C_4H_4N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}116b$	4	$C_4H_5N^+$	+	e	→	CN	+	C_3H_5	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}116c$	4	$C_4H_5N^+$	+	e	→	C_3H_2N	+	CH_3	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}117$	4	$C_4H_5NH^+$	+	e	→	C_4H_5N	+	H	$4.00\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
$R_{er}118a$	4	$C_4H_7NH^+$	+	e	→	C_4H_7N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}118b$	4	$C_4H_7NH^+$	+	e	→	HCN	+	C_3H_7	$8.33\times10^{-08}T^{0.70}$	eq.(E23),est.(products)
$R_{er}118c$	4	$C_4H_7NH^+$	+	e	→	HNC	+	C_3H_7	$8.33\times10^{-08}T^{0.70}$	eq.(E23),est.(products)
$R_{er}118d$	4	$C_4H_7NH^+$	+	e	→	CH_3CN	+	C_2H_5	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}118e$	4	$C_4H_7NH^+$	+	e	→	C_3H_5N	+	CH_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}119a$	4	$C_4H_9NH^+$	+	e	→	C_4H_9N	+	H	$1.35\times10^{-06}T^{0.70}$	Osborne et al. (2011),est.(products)
$R_{er}119b$	4	$C_4H_9NH^+$	+	e	→	C_3H_7N	+	CH_3	$4.51\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
$R_{er}119c$	4	$C_4H_9NH^+$	+	e	→	C_2H_5N	+	C_2H_5	$4.51\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
$R_{er}119d$	4	$C_4H_9NH^+$	+	e	→	NH_3	+	C_4H_7	$4.51\times10^{-07}T^{0.70}$	Osborne et al. (2011),est.(products)
$R_{er}120a$	4	C_5N^+	+	e	→	C_3N	+	C_2	$5.00\times10^{-07}T^{0.70}$	Herbst and Leung (1989),est.(products)
$R_{er}120b$	4	C_5N^+	+	e	→	CN	+	C_4	$5.00\times10^{-07}T^{0.70}$	Herbst and Leung (1989),est.(products)
$R_{er}121a$	4	HC_5N^+	+	e	→	C_5N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}121b$	4	HC_5N^+	+	e	→	C_3N	+	C_2H	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}121c$	4	HC_5N^+	+	e	→	CN	+	C_4H	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}122a$	4	HC_5NH^+	+	e	→	HC_5N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}122b$	4	HC_5NH^+	+	e	→	C_3N	+	C_2H_2	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}122c$	4	HC_5NH^+	+	e	→	CN	+	C_4H_2	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}123a$	4	$C_5H_3N^+$	+	e	→	C_5H_2N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}123b$	4	$C_5H_3N^+$	+	e	→	C_4N	+	CH_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}123c$	4	$C_5H_3N^+$	+	e	→	C_2N	+	C_3H_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}123d$	4	$C_5H_3N^+$	+	e	→	N	+	C_5H_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}124a$	4	$C_5H_3NH^+$	+	e	→	C_5H_3N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}124b$	4	$C_5H_3NH^+$	+	e	→	HC_4N	+	CH_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}124c$	4	$C_5H_3NH^+$	+	e	→	C_5H_3N	+	H	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}124d$	4	$C_5H_3NH^+$	+	e	→	HC_2N	+	C_3H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}124e$	4	$C_5H_3NH^+$	+	e	→	CN	+	C_4H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}125a$	4	$C_5H_5N^+$	+	e	→	C_5H_4N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}125b$	4	$C_5H_5N^+$	+	e	→	C_3H_2N	+	C_2H_3	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}125c$	4	$C_5H_5N^+$	+	e	→	CN	+	C_4H_5	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction							k	Ref.
$R_{er}126$	4	$C_5H_5NH^+$	+	e	→	C_5H_5N	+	H	$8.90\times10^{-07}T^{0.50}$	Adams et al. (2010),Osborne et al. (2011),est.(products)
$R_{er}127a$	4	$C_5H_7NH^+$	+	e	→	C_5H_7N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}127b$	4	$C_5H_7NH^+$	+	e	→	C_4H_5N	+	CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}128a$	4	C_6N^+	+	e	→	C_5N	+	C	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}128b$	4	C_6N^+	+	e	→	C_3N	+	C_3	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}128c$	4	C_6N^+	+	e	→	CN	+	C_5	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}129$	4	HC_6NH^+	+	e	→	HC_6N	+	H	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
$R_{er}130a$	4	$C_6H_3NH^+$	+	e	→	CH_3C_5N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}130b$	4	$C_6H_3NH^+$	+	e	→	C_5N	+	CH_4	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}130c$	4	$C_6H_3NH^+$	+	e	→	CN	+	C_5H_4	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}131a$	4	$C_6H_5NH^+$	+	e	→	C_5H_3N	+	CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}131b$	4	$C_6H_5NH^+$	+	e	→	C_6H_5N	+	H	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}131c$	4	$C_6H_5NH^+$	+	e	→	HC_4N	+	C_2H_5	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}131d$	4	$C_6H_5NH^+$	+	e	→	HCCN	+	C_4H_5	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}131e$	4	$C_6H_5NH^+$	+	e	→	CN	+	C_5H_6	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}132a$	4	$C_6H_7N^+$	+	e	→	C_6H_6N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}132b$	4	$C_6H_7N^+$	+	e	→	C_5H_4N	+	CH_3	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}132c$	4	$C_6H_7N^+$	+	e	→	C_3H_2N	+	C_3H_5	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}132d$	4	$C_6H_7N^+$	+	e	→	CN	+	C_5H_7	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}133$	4	$C_6H_7NH^+$	+	e	→	C_5H_5N	+	CH_3	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
$R_{er}134a$	4	$C_6H_9N^+$	+	e	→	C_6H_8N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}134b$	4	$C_6H_9N^+$	+	e	→	C_5H_6N	+	CH_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}134c$	4	$C_6H_9N^+$	+	e	→	C_4H_4N	+	C_2H_5	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}134d$	4	$C_6H_9N^+$	+	e	→	C_3H_2N	+	C_3H_7	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}134e$	4	$C_6H_9N^+$	+	e	→	CN	+	C_5H_9	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}135a$	4	$C_6H_9NH^+$	+	e	→	C_6H_9N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}135b$	4	$C_6H_9NH^+$	+	e	→	C_5H_7N	+	CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}136a$	4	C_7N^+	+	e	→	C_5N	+	C_2	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}136b$	4	C_7N^+	+	e	→	C_3N	+	C_4	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}136c$	4	C_7N^+	+	e	→	CN	+	C_6	$3.33\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}137a$	4	HC_7N^+	+	e	→	C_7N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}137b$	4	HC_7N^+	+	e	→	C_5N	+	C_2H	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}137c$	4	HC_7N^+	+	e	→	C_3N	+	C_4H	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}137d$	4	HC_7N^+	+	e	→	CN	+	C_6H	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}138$	4	HC_7NH^+	+	e	→	HC_7N	+	H	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
$R_{er}139a$	4	$C_7H_3N^+$	+	e	→	C_7H_2N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}139b$	4	$C_7H_3N^+$	+	e	→	C_6N	+	CH_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction							k	Ref.
$R_{er}139c$	4	$C_7H_3N^+$	+	e	→	C_4N	+	C_3H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}139d$	4	$C_7H_3N^+$	+	e	→	C_2N	+	C_5H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}139e$	4	$C_7H_3N^+$	+	e	→	CN	+	C_6H_3	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}140a$	4	$C_7H_3NH^+$	+	e	→	C_7H_2N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}140b$	4	$C_7H_3NH^+$	+	e	→	HC_6N	+	CH_3	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141a$	4	$C_7H_7N^+$	+	e	→	C_7H_6N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141b$	4	$C_7H_7N^+$	+	e	→	C_6H_4N	+	CH_3	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141c$	4	$C_7H_7N^+$	+	e	→	C_5H_2N	+	C_2H_5	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141d$	4	$C_7H_7N^+$	+	e	→	C_4N	+	C_2H_7	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141e$	4	$C_7H_7N^+$	+	e	→	C_2N	+	C_4H_7	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}141f$	4	$C_7H_7N^+$	+	e	→	N	+	C_7H_7	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142a$	4	$C_7H_7NH^+$	+	e	→	C_7H_7N	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142b$	4	$C_7H_7NH^+$	+	e	→	C_6H_5N	+	CH_3	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142c$	4	$C_7H_7NH^+$	+	e	→	C_5H_3N	+	C_2H_5	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142d$	4	$C_7H_7NH^+$	+	e	→	HC_4N	+	C_3H_7	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142e$	4	$C_7H_7NH^+$	+	e	→	HCCN	+	C_5H_7	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}142f$	4	$C_7H_7NH^+$	+	e	→	CN	+	C_6H_8	$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}143a$	4	N_2^+	+	e	→	$N(^2D)$	+	$N(^2D)$	$1.14\times10^{-07}T^{0.39}$	Sheehan and St.-Maurice (2004a),Peterson et al. (1998)
$R_{er}143b$	4	N_2^+	+	e	→	N	+	$N(^2D)$	$1.06\times10^{-07}T^{0.39}$	Sheehan and St.-Maurice (2004a),Peterson et al. (1998)
$R_{er}144a$	4	N_2H^+	+	e	→	N_2	+	H	$2.47\times10^{-07}T^{0.84}$	Wakelam et al. (2015)
$R_{er}144b$	4	N_2H^+	+	e	→	NH	+	N	$1.30\times10^{-08}T^{0.84}$	Wakelam et al. (2015)
$R_{er}145a$	4	$N_2H_5^+$	+	e	→	N_2H_4	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}145b$	4	$N_2H_5^+$	+	e	→	NH_3	+	NH_2	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}146$	4	$C_2N_2^+$	+	e	→	CN	+	CN	$6.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}147a$	4	$C_2N_2H^+$	+	e	→	C_2N_2	+	H	$4.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}147b$	4	$C_2N_2H^+$	+	e	→	HCN	+	CN	$2.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}147c$	4	$C_2N_2H^+$	+	e	→	HNC	+	CN	$2.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}148$	4	$C_4N_2^+$	+	e	→	C_3N	+	CN	$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
$R_{er}149a$	4	$C_4N_2H^+$	+	e	→	C_4N_2	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}149b$	4	$C_4N_2H^+$	+	e	→	HC_3N	+	CN	$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}149c$	4	$C_4N_2H^+$	+	e	→	C_3N	+	HCN	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}149d$	4	$C_4N_2H^+$	+	e	→	C_3N	+	HNC	$1.25\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}150a$	4	$C_6N_2^+$	+	e	→	C_5N	+	CN	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}150b$	4	$C_6N_2^+$	+	e	→	C_3N	+	C_3N	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}151a$	4	$C_6N_2H^+$	+	e	→	C_6N_2	+	H	$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}151b$	4	$C_6N_2H^+$	+	e	→	HC_5N	+	CN	$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)

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	Type	Reaction									k	Ref.
$R_{er}151c$	4	$C_6N_2H^+$	+	e	→	C_5N	+	HCN			$8.33\times10^{-08}T^{0.70}$	eq.(E23),est.(products)
$R_{er}151d$	4	$C_6N_2H^+$	+	e	→	C_5N	+	HNC			$8.33\times10^{-08}T^{0.70}$	eq.(E23),est.(products)
$R_{er}151e$	4	$C_6N_2H^+$	+	e	→	HC_3N	+	C_3N			$1.67\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}152$	4	N_3^+	+	e	→	N_2	+	N			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}153$	4	N_4^+	+	e	→	N_2	+	N_2			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}154$	4	O^+	+	e	→	$O(^3P)$					$3.24\times10^{-12}T^{0.66}$	Nahar (1999)
$R_{er}155$	4	OH^+	+	e	→	$O(^3P)$	+	H			$3.75\times10^{-08}T^{0.50}$	Mul et al. (1983),Mitchell (1990)
$R_{er}156a$	4	H_2O^+	+	e	→	OH	+	H			$8.60\times10^{-08}T^{0.50}$	Rosén et al. (2000)
$R_{er}156b$	4	H_2O^+	+	e	→	$O(^3P)$	+	H_2			$3.87\times10^{-08}T^{0.50}$	Rosén et al. (2000)
$R_{er}156c$	4	H_2O^+	+	e	→	$O(^3P)$	+	H	+	H	$3.05\times10^{-07}T^{0.50}$	Rosén et al. (2000)
$R_{er}157a$	4	H_3O^+	+	e	→	OH	+	H	+	H	$5.09\times10^{-07}T^{0.83}$	Neau et al. (2000)
$R_{er}157b$	4	H_3O^+	+	e	→	H_2O	+	H			$1.37\times10^{-07}T^{0.83}$	Neau et al. (2000)
$R_{er}157c$	4	H_3O^+	+	e	→	OH	+	H_2			$8.36\times10^{-08}T^{0.83}$	Neau et al. (2000)
$R_{er}157d$	4	H_3O^+	+	e	→	$O(^3P)$	+	H_2	+	H	$3.04\times10^{-08}T^{0.83}$	Neau et al. (2000)
$R_{er}158a$	4	CO^+	+	e	→	$O(^3P)$	+	C			$2.50\times10^{-07}T^{0.55}$	Rosén et al. (1998)
$R_{er}158b$	4	CO^+	+	e	→	$O(^1D)$	+	C			$2.48\times10^{-08}T^{0.55}$	Rosén et al. (1998)
$R_{er}159$	4	CO^+N_2	+	e	→	CO	+	N_2			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}160a$	4	HCO^+	+	e	→	CO	+	H			$1.56\times10^{-07}T^{1.20}$	Le Padellec et al. (1997),Geppert et al. (2005)
$R_{er}160b$	4	HCO^+	+	e	→	OH	+	C			$1.19\times10^{-08}T^{1.20}$	Le Padellec et al. (1997),Geppert et al. (2005)
$R_{er}160c$	4	HCO^+	+	e	→	CH	+	$O(^3P)$			$1.70\times10^{-09}T^{1.20}$	Le Padellec et al. (1997),Geppert et al. (2005)
$R_{er}161$	4	HCO^+H_2	+	e	→	HCO	+	H_2			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}162$	4	HCO^+CO	+	e	→	HCO	+	CO			$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}163a$	4	HOC^+	+	e	→	CO	+	H			$1.56\times10^{-07}T^{1.20}$	est.(HCOP)
$R_{er}163b$	4	HOC^+	+	e	→	OH	+	C			$1.19\times10^{-08}T^{1.20}$	est.(HCOP)
$R_{er}163c$	4	HOC^+	+	e	→	CH	+	$O(^3P)$			$1.70\times10^{-09}T^{1.20}$	est.(HCOP)
$R_{er}164a$	4	CH_2O^+	+	e	→	CO	+	H	+	H	$2.50\times10^{-07}T^{0.70}$	Wakelam et al. (2015)
$R_{er}164b$	4	CH_2O^+	+	e	→	HCO	+	H			$1.50\times10^{-07}T^{0.70}$	Wakelam et al. (2015)
$R_{er}164c$	4	CH_2O^+	+	e	→	CO	+	H_2			$7.50\times10^{-08}T^{0.70}$	Wakelam et al. (2015)
$R_{er}164d$	4	CH_2O^+	+	e	→	$^3CH_2$	+	$O(^3P)$			$2.50\times10^{-08}T^{0.70}$	Wakelam et al. (2015)
$R_{er}165a$	4	CH_2OH^+	+	e	→	HCO	+	H	+	H	$6.44\times10^{-07}T^{0.78}$	Hamberg et al. (2007)
$R_{er}165b$	4	CH_2OH^+	+	e	→	OH	+	$^3CH_2$			$4.20\times10^{-08}T^{0.78}$	Hamberg et al. (2007)
$R_{er}165c$	4	CH_2OH^+	+	e	→	H_2O	+	CH			$1.40\times10^{-08}T^{0.78}$	Hamberg et al. (2007)
$R_{er}166$	4	HC_2O^+	+	e	→	ONEUT	+	H			$6.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}167$	4	CH_2CO^+	+	e	→	ONEUT	+	H			$8.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}168a$	4	CH_3CO^+	+	e	→	ONEUT	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}168b$	4	CH_3CO^+	+	e	→	CH_3	+	CO			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}169a$	4	CH_3COH^+	+	e	→	H_2O	+	C_2H_2			$5.40\times10^{-07}T^{0.70}$	Vigren et al. (2010b)

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	Type	Reaction									k	Ref.
$R_{er}169b$	4	CH_3COH^+	+	e	→	H_2CO	+	$^3CH_2$			$5.40\times10^{-07}T^{0.70}$	Vigren et al. (2010b)
$R_{er}169c$	4	CH_3COH^+	+	e	→	CH_2CO	+	H	+	H	$4.20\times10^{-07}T^{0.70}$	Vigren et al. (2010b)
$R_{er}170a$	4	CH_3CHOH^+	+	e	→	CH_3CHO	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}170b$	4	CH_3CHOH^+	+	e	→	H_2CO	+	CH_3			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}170c$	4	CH_3CHOH^+	+	e	→	OH	+	C_2H_4			$2.50\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}171$	4	HC_3O^+	+	e	→	ONEUT	+	H			$8.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}172a$	4	$C_2H_2CO^+$	+	e	→	ONEUT	+	H			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}172b$	4	$C_2H_2CO^+$	+	e	→	C_2H_2	+	CO			$5.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}173a$	4	$C_2H_3CO^+$	+	e	→	ONEUT	+	H			$1.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}173b$	4	$C_2H_3CO^+$	+	e	→	HCO	+	C_2H_2			$9.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}174$	4	CO_2^+	+	e	→	CO	+	O			$4.20\times10^{-07}T^{0.75}$	Viggiano et al. (2005)
$R_{er}175a$	4	$OCOH^+$	+	e	→	CO	+	O	+	H	$8.16\times10^{-07}T^{0.64}$	Geppert et al. (2004d)
$R_{er}175b$	4	$OCOH^+$	+	e	→	CO	+	OH			$3.24\times10^{-07}T^{0.64}$	Geppert et al. (2004d)
$R_{er}175c$	4	$OCOH^+$	+	e	→	CO_2	+	H			$6.00\times10^{-08}T^{0.64}$	Geppert et al. (2004d)
$R_{er}176a$	4	NO^+	+	e	→	$O(^3P)$	+	$N(^2D)$			$3.19\times10^{-07}T^{0.75}$	Dulaney et al. (1987),Kley et al. (1977)
$R_{er}176b$	4	NO^+	+	e	→	$O(^3P)$	+	N			$1.01\times10^{-07}T^{0.75}$	Dulaney et al. (1987),Kley et al. (1977)
$R_{er}177$	4	HNO^+	+	e	→	NO	+	H			$4.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}178$	4	NCO^+	+	e	→	CO	+	N			$4.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}179$	4	$HNCO^+$	+	e	→	CO	+	NH			$6.00\times10^{-07}T^{0.70}$	eq.(E23),est.(products)
$R_{er}180$	4	$CXHYNZ^+$	+	e	→	NEUT					$1.00\times10^{-06}T^{0.70}$	eq.(E23),est.(products)
$R_{er}181$	4	$Adduct^+$	+	e	→	NEUT					$5.00\times10^{-06}T^{0.70}$	est.(clusters)
$R_{er}182$	4	$AdductN^+$	+	e	→	NEUT					$5.00\times10^{-06}T^{0.70}$	est.(clusters)

Table B.18: Negative ion reaction list.

	Type			Reaction					k	Ref.
$R_{an}1$	2	H^-	+	C_2H_2	→	C_2H^-	+	H_2	3.10×10^{-09}	Martinez et al. (2010)
$R_{an}2$	2	H^-	+	C_4H_2	→	C_4H^-	+	H_2	6.40×10^{-09}	Langevin
$R_{an}3$	2	H^-	+	C_6H_2	→	C_6H^-	+	H_2	6.30×10^{-09}	Langevin
$R_{an}4$	2	H^-	+	HCN	→	CN^-	+	H_2	1.50×10^{-08}	Mackay et al. (1976)
$R_{an}5$	2	H^-	+	HC_3N	→	C_3N^-	+	H_2	2.40×10^{-08}	Su-Chesnavich
$R_{an}6$	2	H^-	+	HC_5N	→	C_5N^-	+	H_2	3.10×10^{-08}	Su-Chesnavich
$R_{an}7$	2	CH_2^-	+	HCN	→	CN^-	+	CH_3	6.20×10^{-09}	Su-Chesnavich
$R_{an}8$	2	CH_2^-	+	HC_3N	→	C_3N^-	+	CH_3	7.20×10^{-09}	Su-Chesnavich
$R_{an}9$	2	CH_2^-	+	HC_5N	→	C_5N^-	+	CH_3	8.90×10^{-09}	Su-Chesnavich
$R_{an}10$	2	CH_3^-	+	HCN	→	CN^-	+	CH_4	6.10×10^{-09}	Su-Chesnavich
$R_{an}11$	2	CH_3^-	+	HC_3N	→	C_3N^-	+	CH_4	7.00×10^{-09}	Su-Chesnavich
$R_{an}12$	2	CH_3^-	+	HC_5N	→	C_5N^-	+	CH_4	8.60×10^{-09}	Su-Chesnavich
$R_{an}13$	2	C_2H^-	+	C_2H_2	→	C_4H^-	+	H_2	1.00×10^{-12}	De Bleecker et al. (2006),Howling et al. (1994)
$R_{an}14$	2	C_2H^-	+	C_4H_2	→	C_4H^-	+	C_2H_2	1.50×10^{-09}	Langevin
$R_{an}15$	2	C_2H^-	+	C_6H_2	→	C_6H^-	+	C_2H_2	2.30×10^{-09}	Langevin
$R_{an}16$	2	C_2H^-	+	HCN	→	CN^-	+	C_2H_2	3.90×10^{-09}	Mackay et al. (1976)
$R_{an}17$	2	C_2H^-	+	HC_3N	→	C_3N^-	+	C_2H_2	5.80×10^{-09}	Su-Chesnavich
$R_{an}18$	2	C_2H^-	+	HC_5N	→	C_5N^-	+	C_2H_2	7.00×10^{-09}	Su-Chesnavich
$R_{an}19$	2	C_4H^-	+	C_2H_2	→	C_6H^-	+	H_2	1.00×10^{-12}	De Bleecker et al. (2006),Howling et al. (1994)
$R_{an}20$	2	C_4H^-	+	C_6H_2	→	C_6H^-	+	C_4H_2	1.80×10^{-09}	Langevin
$R_{an}21$	2	C_4H^-	+	N	→	CN^-	+	C_3H	6.00×10^{-12}	Eichelberger et al. (2007)
$R_{an}22$	2	C_4H^-	+	HCN	→	CN^-	+	C_4H_2	4.50×10^{-09}	Su-Chesnavich
$R_{an}23$	2	C_4H^-	+	HC_3N	→	C_3N^-	+	C_4H_2	4.80×10^{-09}	Su-Chesnavich
$R_{an}24$	2	C_4H^-	+	HC_5N	→	C_5N^-	+	C_4H_2	5.60×10^{-09}	Su-Chesnavich
$R_{an}25$	2	C_6H^-	+	C_2H_2	→	$C_xH_yN_z^-$			1.00×10^{-12}	De Bleecker et al. (2006),Howling et al. (1994)
$R_{an}26$	2	C_6H^-	+	N	→	CN^-	+	C_5H	1.00×10^{-11}	Eichelberger et al. (2007)
$R_{an}27$	2	C_6H^-	+	HCN	→	CN^-	+	C_6H_2	4.30×10^{-09}	Su-Chesnavich
$R_{an}28$	2	C_6H^-	+	HC_3N	→	C_3N^-	+	C_6H_2	4.30×10^{-09}	Su-Chesnavich
$R_{an}29$	2	C_6H^-	+	HC_5N	→	C_5N^-	+	C_6H_2	5.00×10^{-09}	Su-Chesnavich
$R_{an}30$	2	CN^-	+	HCN	→	$C_xH_yN_z^-$			1.00×10^{-12}	est.(C2HM+C2H2)
$R_{an}31$	2	CN^-	+	HC_3N	→	C_3N^-	+	HCN	$4.30\times10^{-09}T^{0.12}$	Biennier et al. (2014); Romanzin et al. (2016)
$R_{an}32$	2	CN^-	+	HC_5N	→	C_5N^-	+	HCN	6.90×10^{-09}	Su-Chesnavich
$R_{an}33$	2	C_3N^-	+	HC_5N	→	C_5N^-	+	HC_3N	5.40×10^{-09}	Su-Chesnavich
$R_{an}34$	2	O^-	+	H_2	→	OH^-	+	H	3.00×10^{-11}	Wakelam et al. (2015)

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	Type	Reaction							k	Ref.
$R_{an}35$	2	O^-	+	CH_4	→	OH^-	+	CH_3	1.00×10^{-10}	Bohme and Fehsenfeld (1969)
$R_{an}36$	2	O^-	+	C_2H_2	→	C_2H^-	+	OH	$1.76\times10^{-09}e^{-289.0/T}$	Viggiano and Paulson (1983)
$R_{an}37$	2	O^-	+	C_4H_2	→	C_4H^-	+	OH	$1.60\times10^{-09}e^{-289.0/T}$	Langevin
$R_{an}38$	2	O^-	+	C_6H_2	→	C_6H^-	+	OH	$1.60\times10^{-09}e^{-289.0/T}$	Langevin
$R_{an}39$	2	O^-	+	HCN	→	CN^-	+	OH	3.70×10^{-09}	Bohme (1975)
$R_{an}40$	2	O^-	+	HC_3N	→	C_3N^-	+	OH	6.80×10^{-09}	Su-Chesnavich
$R_{an}41$	2	O^-	+	HC_5N	→	C_5N^-	+	OH	8.40×10^{-09}	Su-Chesnavich
$R_{an}42$	2	OH^-	+	C_2H_2	→	C_2H^-	+	H_2O	2.20×10^{-09}	Raksit and Bohme (1983)
$R_{an}43$	2	OH^-	+	HCN	→	CN^-	+	H_2O	3.50×10^{-09}	Raksit and Bohme (1983)
$R_{an}44$	2	OH^-	+	HC_3N	→	C_3N^-	+	H_2O	6.70×10^{-09}	Su-Chesnavich
$R_{an}45$	2	OH^-	+	HC_5N	→	C_5N^-	+	H_2O	8.20×10^{-09}	Su-Chesnavich

Table B.19: Associative detachment reaction list.

	Type	Reaction							k	Ref.
$R_{ad}1$	2	H^-	+	H	→	H_2	+	e	5.50×10^{-09}	Gerlich et al. (2012)
$R_{ad}2$	2	H^-	+	CH_3	→	CH_4	+	e	5.50×10^{-09}	est.(HM+H)
$R_{ad}3$	2	H^-	+	N	→	NH	+	e	1.00×10^{-09}	Prasad and Huntress Jr. (1980)
$R_{ad}4$	2	CH_2^-	+	H	→	CH_3	+	e	1.80×10^{-09}	Adams (1996)
$R_{ad}5$	2	CH_2^-	+	CH_3	→	C_2H_5	+	e	1.80×10^{-09}	est.(CH2M+H)
$R_{ad}6$	2	CH_2^-	+	N	→	H_2CN	+	e	1.80×10^{-09}	est.(CH2M+H)
$R_{ad}7$	2	CH_3^-	+	H	→	CH_4	+	e	1.80×10^{-09}	Adams (1996)
$R_{ad}8$	2	CH_3^-	+	CH_3	→	C_2H_6	+	e	1.80×10^{-09}	est.(CH3M+H)
$R_{ad}9$	2	CH_3^-	+	N	→	CH_2NH	+	e	1.80×10^{-09}	est.(CH3M+H)
$R_{ad}10$	2	C_2H^-	+	H	→	C_2H_2	+	e	1.60×10^{-09}	Barckholtz et al. (2001)
$R_{ad}11$	2	C_2H^-	+	CH_3	→	CH_3CCH	+	e	1.60×10^{-09}	est.(C2HM+H)
$R_{ad}12$	2	C_2H^-	+	N	→	HC_2N	+	e	5.00×10^{-11}	Eichelberger et al. (2007)
$R_{ad}13$	2	C_4H^-	+	H	→	C_4H_2	+	e	8.30×10^{-10}	Barckholtz et al. (2001)
$R_{ad}14$	2	C_4H^-	+	CH_3	→	C_5H_4	+	e	8.30×10^{-10}	est.(C4HM+H)
$R_{ad}15$	2	C_6H^-	+	H	→	C_6H_2	+	e	5.00×10^{-10}	Barckholtz et al. (2001)
$R_{ad}16$	2	C_6H^-	+	CH_3	→	C_7H_4	+	e	5.00×10^{-10}	est.(C6HM+H)
$R_{ad}17$	2	CN^-	+	H	→	HCN	+	e	6.30×10^{-10}	Yang et al. (2011)
$R_{ad}18$	2	CN^-	+	CH_3	→	CH_3CN	+	e	6.30×10^{-10}	est.(CNM+H)
$R_{ad}19$	2	C_3N^-	+	H	→	HC_3N	+	e	5.40×10^{-10}	Snow et al. (2009),Yang et al. (2011)
$R_{ad}20$	2	C_3N^-	+	CH_3	→	CH_3C_3N	+	e	5.40×10^{-10}	est.(C3NM+H)
$R_{ad}21$	2	C_5N^-	+	H	→	HC_5N	+	e	5.80×10^{-10}	Yang et al. (2011)
$R_{ad}22$	2	C_5N^-	+	CH_3	→	CH_3C_5N	+	e	5.80×10^{-10}	est.(C5NM+H)
$R_{ad}23$	2	$C_xH_yN_z^-$	+	H	→	NEUT	+	e	1.00×10^{-09}	Adams (1996)
$R_{ad}24$	2	$C_xH_yN_z^-$	+	CH_3	→	NEUT	+	e	1.00×10^{-09}	est.(CXHYNZM+H)
$R_{ad}25$	2	$C_xH_yN_z^-$	+	N	→	NEUT	+	e	1.00×10^{-09}	est.(CXHYNZM+H)
$R_{ad}26$	2	O^-	+	H	→	OH	+	e	5.00×10^{-10}	Prasad and Huntress Jr. (1980)
$R_{ad}27$	2	O^-	+	CH_3	→	CH_2OH	+	e	5.00×10^{-10}	est.(OM+H)
$R_{ad}28$	2	O^-	+	C_2H_2	→	CH_2CO	+	e	$1.10\times10^{-09}T^{0.39}$	Viggiano and Paulson (1983)
$R_{ad}29$	2	O^-	+	N	→	NO	+	e	2.20×10^{-10}	Ferguson (1973)
$R_{ad}30$	2	O^-	+	CO	→	CO_2	+	e	7.30×10^{-10}	Parkes (1972)
$R_{ad}31$	2	OH^-	+	H	→	H_2O	+	e	1.40×10^{-09}	Howard et al. (1974)
$R_{ad}32$	2	OH^-	+	CH_3	→	CH_3OH	+	e	1.40×10^{-09}	est.(OHM+H)
$R_{ad}33$	2	OH^-	+	N	→	HNO	+	e	1.40×10^{-09}	est.(OHM+H)

Table B.20: Positive + negative ion reaction list.

	Type	Reaction									k	Ref.
$R_{ir}1$	2	H^-	+	CH_5^+	→	H	+	CH_4	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}2$	2	H^-	+	$C_2H_5^+$	→	H	+	C_2H_4	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}3$	2	H^-	+	$HCNH^+$	→	H	+	HCN	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}4$	2	CH_2^-	+	CH_5^+	→	$^3CH_2$	+	CH_4	+	H	$1.10\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}5$	2	CH_2^-	+	$C_2H_5^+$	→	$^3CH_2$	+	C_2H_4	+	H	$9.60\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}6$	2	CH_2^-	+	$HCNH^+$	→	$^3CH_2$	+	HCN	+	H	$9.70\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}7$	2	CH_3^-	+	CH_5^+	→	CH_3	+	CH_4	+	H	$1.40\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}8$	2	CH_3^-	+	$C_2H_5^+$	→	CH_3	+	C_2H_4	+	H	$1.20\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}9$	2	CH_3^-	+	$HCNH^+$	→	CH_3	+	HCN	+	H	$1.20\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}10$	2	C_2H^-	+	CH_5^+	→	C_2H	+	CH_4	+	H	$7.60\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}11$	2	C_2H^-	+	$C_2H_5^+$	→	C_2H	+	C_2H_4	+	H	$6.60\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}12$	2	C_2H^-	+	$HCNH^+$	→	C_2H	+	HCN	+	H	$6.70\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}13$	2	C_4H^-	+	CH_5^+	→	C_4H	+	CH_4	+	H	$6.70\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}14$	2	C_4H^-	+	$C_2H_5^+$	→	C_4H	+	C_2H_4	+	H	$5.60\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}15$	2	C_4H^-	+	$HCNH^+$	→	C_4H	+	HCN	+	H	$5.60\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}16$	2	C_6H^-	+	CH_5^+	→	C_6H	+	CH_4	+	H	$6.30\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}17$	2	C_6H^-	+	$C_2H_5^+$	→	C_6H	+	C_2H_4	+	H	$5.20\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}18$	2	C_6H^-	+	$HCNH^+$	→	C_6H	+	HCN	+	H	$5.20\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}19$	2	CN^-	+	CH_5^+	→	CN	+	CH_4	+	H	$2.60\times10^{-07}T^{1.10}$	Miller et al. (2012)
$R_{ir}20$	2	CN^-	+	$C_2H_5^+$	→	CN	+	C_2H_4	+	H	$2.60\times10^{-07}T^{1.10}$	Miller et al. (2012)
$R_{ir}21$	2	CN^-	+	$HCNH^+$	→	CN	+	HCN	+	H	$2.60\times10^{-07}T^{1.10}$	Miller et al. (2012)
$R_{ir}22$	2	C_3N^-	+	CH_5^+	→	C_3N	+	CH_4	+	H	$6.40\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}23$	2	C_3N^-	+	$C_2H_5^+$	→	C_3N	+	C_2H_4	+	H	$5.40\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}24$	2	C_3N^-	+	$HCNH^+$	→	C_3N	+	HCN	+	H	$5.40\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}25$	2	C_5N^-	+	CH_5^+	→	C_5N	+	CH_4	+	H	$6.20\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}26$	2	C_5N^-	+	$C_2H_5^+$	→	C_5N	+	C_2H_4	+	H	$5.00\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}27$	2	C_5N^-	+	$HCNH^+$	→	C_5N	+	HCN	+	H	$5.10\times10^{-08}T^{0.90}$	Miller et al. (2012)
$R_{ir}28$	2	$C_xH_yN_z^-$	+	CH_5^+	→	NEUT	+	CH_4	+	H	$1.00\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}29$	2	$C_xH_yN_z^-$	+	$C_2H_5^+$	→	NEUT	+	C_2H_4	+	H	$1.00\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}30$	2	$C_xH_yN_z^-$	+	$HCNH^+$	→	NEUT	+	HCN	+	H	$1.00\times10^{-07}T^{0.90}$	Miller et al. (2012)
$R_{ir}31$	2	O^-	+	CH_5^+	→	$O(^3P)$	+	CH_4	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}32$	2	O^-	+	$C_2H_5^+$	→	$O(^3P)$	+	C_2H_4	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}33$	2	O^-	+	$HCNH^+$	→	$O(^3P)$	+	HCN	+	H	$1.00\times10^{-07}T^{1.00}$	Hickman (1979),Smith et al. (1978b)
$R_{ir}34$	2	OH^-	+	CH_5^+	→	OH	+	CH_4	+	H	$2.70\times10^{-07}T^{1.10}$	Miller et al. (2012)

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	Type	Reaction									k	Ref.
$R_{ir}35$	2	OH^-	+	$C_2H_5^+$	→	OH	+	C_2H_4	+	H	$2.70\times10^{-07}T^{1.10}$	Miller et al. (2012)
$R_{ir}36$	2	OH^-	+	$HCNH^+$	→	OH	+	HCN	+	H	$2.70\times10^{-07}T^{1.10}$	Miller et al. (2012)