

Supplementary Material

file "neutbase.txt"

P: H2 -> H + H MOSES
P: tCH2 -> CH + H MOSES
P: CH3 -> CH + H2 MOSES
P: CH3 -> oCH2 + H MOSES
P: CH4 -> CH3 + H MOSES
P: CH4 -> oCH2 + H2 MOSES
P: CH4 -> oCH2 + H + H MOSES
P: CH4 -> tCH2 + H + H MOSES
P: CH4 -> CH + H + H2 MOSES
P: C2H2 -> C2H + H MOSES
P: C2H2 -> C2 + H2 MOSES
P: C2H3 -> C2H2 + H MOSES
P: C2H4 -> C2H2 + H2 MOSES
P: C2H4 -> C2H2 + H + H MOSES
P: C2H4 -> C2H3 + H MOSES
P: C2H5 -> CH3 + oCH2 MOSES
P: C2H6 -> C2H4 + H2 MOSES
P: C2H6 -> C2H4 + H + H MOSES
P: C2H6 -> C2H2 + H2 + H2 MOSES
P: C2H6 -> CH4 + oCH2 MOSES
P: C2H6 -> CH3 + CH3 MOSES
P: C3H2 -> C3 + H2 MOSES
P: C3H3 -> C3H2 + H MOSES
P: C3H3 -> C3H + H2 MOSES
P: CH3C2H -> C3H3 + H MOSES
P: CH3C2H -> C3H2 + H2 MOSES
P: CH3C2H -> oCH2 + C2H2 MOSES
P: CH2CCH2 -> C3H3 + H MOSES
P: CH2CCH2 -> C3H2 + H2 MOSES

P: C3H5 -> CH3C2H + H MOSES
P: C3H5 -> CH2CCH2 + H MOSES
P: C3H5 -> C2H2 + CH3 MOSES
P: C3H6 -> C3H5 + H MOSES
P: C3H6 -> CH3C2H + H2 MOSES
P: C3H6 -> CH2CCH2 + H2 MOSES
P: C3H6 -> C2H4 + oCH2 MOSES
P: C3H6 -> C2H3 + CH3 MOSES
P: C3H6 -> C2H2 + CH4 MOSES
P: C3H8 -> C3H6 + H2 MOSES
P: C3H8 -> C2H6 + oCH2 MOSES
P: C3H8 -> C2H5 + CH3 MOSES
P: C3H8 -> C2H4 + CH4 MOSES
P: C4H2 -> C4H + H MOSES
P: C4H2 -> C2H2 + C2 MOSES
P: C4H2 -> C2H + C2H MOSES
P: C4H2 -> C4H2s MOSES
P: C4H4 -> C4H2 + H2 MOSES
P: C4H4 -> C2H2 + C2H2 MOSES
P: omC4H6 -> C4H4 + H + H MOSES
P: omC4H6 -> C3H3 + CH3 MOSES
P: omC4H6 -> C2H5 + C2H MOSES
P: omC4H6 -> C2H4 + C2H + H MOSES
P: omC4H6 -> C2H3 + C2H + H2 MOSES
P: omC4H6 -> C2H2 + C2H2 + H2 MOSES
P: oc2mC4H6 -> C4H5 + H MOSES
P: oc2mC4H6 -> C4H4 + H + H MOSES
P: oc2mC4H6 -> C3H3 + CH3 MOSES
P: oc2mC4H6 -> C2H4 + C2H2 MOSES
P: oc2mC4H6 -> C2H3 + C2H2 + H MOSES
P: oc2mC4H6 -> C2H3 + C2H + H2 MOSES
P: oc2mC4H6 -> C2H2 + C2H2 + H2 MOSES
P: oc3mC4H6 -> C4H5 + H MOSES
P: oc3mC4H6 -> C4H4 + H2 MOSES
P: oc3mC4H6 -> C3H3 + CH3 MOSES
P: oc3mC4H6 -> C2H4 + C2H2 MOSES
P: oc3mC4H6 -> C2H3 + C2H3 MOSES
P: C4H8 -> oc3mC4H6 + H + H MOSES

P: C4H8 -> C3H5 + CH3 MOSES
P: C4H8 -> CH3C2H + CH4 MOSES
P: C4H8 -> CH2CCH2 + CH4 MOSES
P: C4H8 -> C2H5 + C2H3 MOSES
P: C4H8 -> C2H4 + C2H4 MOSES
P: C4H8 -> C2H2 + CH3 + CH3 MOSES
P: C4H10 -> C4H8 + H2 MOSES
P: C4H10 -> C3H8 + oCH2 MOSES
P: C4H10 -> C3H6 + CH4 MOSES
P: C4H10 -> C3H6 + CH3 + H MOSES
P: C4H10 -> C2H6 + C2H4 MOSES
P: C4H10 -> C2H5 + C2H5 MOSES
P: C4H10 -> C2H4 + CH3 + CH3 MOSES
P: C5H4 -> C3H2 + C2H2 MOSES
P: C6H2 -> C6H + H MOSES
P: C6H2 -> C4H + C2H MOSES
P: C6H4 -> C6H3 + H MOSES
P: C6H4 -> C6H2 + H2 MOSES
P: C6H4 -> C4H2 + C2H2 MOSES
P: C6H5 -> C6H4 + H MOSES
P: C6H5 -> C4H3 + C2H2 MOSES
P: C6H6 -> C6H5 + H MOSES
P: C6H6 -> C6H4 + H2 MOSES
P: C6H6 -> C5H3 + CH3 MOSES
P: C6H6 -> C4H3 + C2H3 MOSES
P: C6H6 -> C3H3 + C3H3 MOSES
P: emC6H6 -> C6H5 + H MOSES
P: emC6H6 -> C6H4 + H2 MOSES
P: emC6H6 -> C5H3 + CH3 MOSES
P: emC6H6 -> C4H4 + C2H2 MOSES
P: emC6H6 -> C3H3 + C3H3 MOSES
P: C8H2 -> C6H + C2H MOSES
P: C8H2 -> C4H + C4H MOSES
P: O2 -> O + O MOSES
P: O2 -> O + O1d MOSES
P: OH -> O + H MOSES
P: H2O -> H + OH MOSES
P: H2O -> H + H + O MOSES

P: H2O -> H2 + O1d MOSES
P: CO -> C + O MOSES
P: CO2 -> CO + O MOSES
P: CO2 -> CO + O1d MOSES
P: HCO -> H + CO MOSES
P: H2CO -> HCO + H MOSES
P: H2CO -> H2 + CO MOSES
P: H2CO -> H + H + CO MOSES
P: CH3OH -> CH3 + OH MOSES
P: CH3OH -> H2CO + H2 MOSES
P: CH3OH -> CH3O + H MOSES
P: HCCO -> CO + CH MOSES
P: H2CCO -> oCH2 + CO MOSES
P: CH3CHO -> CH4 + CO MOSES
P: CH3CHO -> CH3 + HCO MOSES
O: H2 + H + H -> H2 + H2 2.7e-31*T**(-0.6) ; Baulch et al. [1994]
O: H2 + H + H -> H2 + H2 1.0e-32 (T<243K) ; Moses, 2005
I: 1.e-11 ; Moses, 2005
C: H + CH -> C + H2 1.3e-10*EXP(-80/T) ; Harding et al [1993]
C: H + oCH2 -> CH + H2 3.0e-10 ; Moses, 1995
C: H + tCH2 -> CH + H2 2.66e-10 ; Boullart and Peeters [1992]
O: H2 + H + tCH2 -> H2 + CH3 9.0e-32*EXP(550/T) ; Moses, 1995
I: 8.55e-12*T**0.15 ; Moses, 1995
O: H2 + H + CH3 -> H2 + CH4 1.5e-24*T**(-1.8) ; Moses, 1995
O: H2 + H + CH3 -> H2 + CH4 6.0e-29 (T<277.5K) ; Moses,1995
I: 1.92e-8*T**(-0.5)*EXP(-400/T) ; Moses, 1995
I: 4.823e-11 (T<110K); Moses, 1995
F: 0.3+0.58*EXP(-T/800); Moses, 1995
C: H + CH4 -> CH3 + H2 2.2e-20*T**3.*EXP(-4045/T); Baulch et al [1992]
O: H2 + H + C2H -> H2 + C2H2 1.26e-18*T**(-3.1)*EXP(-721/T)
I: 3.0e-10
O: H2 + H + C2H2 -> H2 + C2H3 3.3e-30*EXP(-740/T)
I: 1.4e-11*EXP(-1300/T)
F: 0.44
C: H + C2H3 -> C2H2 + H2 1.5e-12*T**0.5
O: H2 + H + C2H3 -> H2 + C2H4 2.3e-24/T
I: 1.8e-10
C: H + C2H4 -> C2H3 + H2 8.41e-17*T**(1.93)*EXP(-6518/T)

O: H2 + H + C2H4 -> H2 + C2H5 1.3e-29*EXP(-380/T)
 O: H2 + H + C2H4 -> H2 + C2H5 3.7e-30 (T<302.4K)
 I: 6.6e-15*T**1.28*EXP(-650/T)
 F: 0.24*EXP(-T/40)+0.76*EXP(-T/1025)
 C: H + C2H5 -> CH3 + CH3 1.25e-10
 C: H + C2H5 -> C2H4 + H2 3.0e-12
 O: H2 + H + C2H5 -> H2 + C2H6 4.0e-19*T**(-3.0)*EXP(-600/T)
 O: 2.489e-27 (T<200K)
 I: 2.0e-10
 C: H + C2H6 -> C2H5 + H2 2.35e-15*T**(1.5)*EXP(-3725/T)
 O: H2 + H + C3H2 -> H2 + C3H3 4.0e-19*T**(-3.0)*EXP(-600/T)
 O: 2.489e-27 (T<200K)
 I: 2.4e-10
 O: H2 + H + C3H3 -> H2 + CH3C2H 9.4e-20*T**(-3.3)
 O: 7.779e-27 (T<140K)
 I: 1.0e-10
 O: H2 + H + C3H3 -> H2 + CH2CCH2 1.6e-20*T**(-3.3)
 O: 1.324e-27 (T<140K)
 I: 1.0e-10
 C: H + CH3C2H -> C3H3 + H2 4.7e-16*T**(1.74)*EXP(-3873/t)
 C: H + CH3C2H -> CH3 + C2H2 2.5e-10*EXP(-3052/T)
 O: H2 + H + CH3C2H -> H2 + C3H5 3.2e-24*T**(-1.7)*EXP(-300/T)
 I: 5.0e-11*EXP(-1180/T)
 C: H + CH2CCH2 -> CH3C2H + H 3.0e-18*T*T*EXP(-52/T)
 O: H2 + H + CH2CCH2 -> H2 + C3H5 3.0e-28*EXP(-360/T)
 I: 1.0e-18*T*T*EXP(-52/T)
 C: H + C3H5 -> CH3C2H + H2 3.0e-11
 C: H + C3H5 -> CH2CCH2 + H2 3.0e-11
 C: H + C3H5 -> CH3 + C2H3 4.e-12
 O: H2 + H + C3H5 -> H2 + C3H6 1.5e-29
 I: 2.4e-10
 C: H + C3H6 -> C3H5 + H2 2.87e-19*T**(2.5)*EXP(-1254/T)
 C: H + C3H6 -> CH3 + C2H4 2.2e-11*EXP(-1641/T)
 O: H2 + H + C3H6 -> H2 + C3H7 1.3e-28*EXP(-380/T)
 I: 9.47e-15*T**1.16*EXP(-440/T)
 C: H + C3H7 -> C3H6 + H2 3.0e-12
 C: H + C3H7 -> C2H5 + CH3 6.0e-11
 O: H2 + H + C3H7 -> H2 + C3H8 4.0e-19*T**(-3.0)*EXP(-600/T)

O: 2.489e-27 (T<200K)
 I: 2.49e-10
 C: H + C3H8 -> C3H7 + H2 2.16E-18*T**(2.4)*EXP(-2250/T)
 O: H2 + H + C4H -> H2 + C4H2 1.26E-18*T**(-3.1)*EXP(-721/T)
 I: 3.0E-10
 O: H2 + H + C4H2 -> H2 + C4H3 2.0E-26*EXP(-740/T)
 I: 1.5E-10*EXP(-1184/T)
 C: H + C4H3 -> C2H2 + C2H2 1.0E-11
 C: H + C4H3 -> C4H2 + H2 6.0E-11
 O: H2 + H + C4H3 -> H2 + C4H4 1.5E-19*T**(-3)*EXP(-300/T)
 I: 8.56E-10*EXP(-405/T)
 O: H2 + H + C4H4 -> H2 + C4H5 1.5E-20*T**(-3.0)*EXP(-300/T)
 I: 9.35E-12*EXP(-309/T)
 C: H + C4H5 -> C4H4 + H2 1.5E-12*T**0.5
 O: H2 + H + C4H5 -> H2 + omC4H6 1.5E-19*T**(-3.0)*EXP(-300/T)
 I: 1.0E-10
 C: H + C4H9 -> C4H8 + H2 1.05E-11
 O: H2 + H + C4H9 -> H2 + C4H10 1.5E-19*T**(-3.0)*EXP(-300/T)
 I: 8.95E-11
 C: H + C5H3 -> C3H2 + C2H2 1.5E-12*T**0.5
 O: H2 + H + C6H2 -> H2 + C6H3 1.0E-29*EXP(-360/T)
 I: 1.39E-10*EXP(-1184/T)
 C: H + C6H3 -> C6H2 + H2 3.0E-12*T**0.5
 C: H + C6H3 -> C4H2 + C2H2 3.99E-5*T**(-1.6)*EXP(-1409/T)
 O: H2 + H + C6H3 -> H2 + C6H4 1.5E-19*T**(-3.0)*EXP(-300/T)
 I: 8.56E-10*EXP(-405/T)
 O: H2 + H + C6H4 -> H2 + C6H5 1.5E-19*T**(-3.0)*EXP(-300/T)
 I: 9.35E-12*EXP(-309/T)
 C: H + C6H5 -> C4H4 + C2H2 3.16E-5*T**(-1.6)*EXP(-1117/T)
 O: H2 + H + C6H5 -> H2 + C6H6 1.5E-19*T**(-3.0)*EXP(-300/T)
 I: 3.65E-10
 O: H2 + C + H2 -> H2 + tCH2 7.0E-32
 I: 2.06E-11*EXP(-57/T)
 O: H2 + C + C2H2 -> H2 + C3H2 1.0E-30
 I: 5.95E-10
 O: H2 + C + C2H4 -> H2 + CH3C2H 1.0E-30
 I: 2.0E-10
 C: CH + H2 -> tCH2 + H 3.75e-10*EXP(-1663/T)

O: $\text{H}_2 + \text{CH} + \text{H}_2 \rightarrow \text{H}_2 + \text{CH}_3$ $9.0\text{E-}31*\text{EXP}(550/\text{T})$
 I: $8.55\text{E-}11*\text{T}^{*0.15}$
 C: $\text{CH} + \text{tCH}_2 \rightarrow \text{C}_2\text{H}_2 + \text{H}$ $3.96\text{e-}8*\text{T}^{*(-1.04)}*\text{EXP}(-36/\text{T})$
 C: $\text{CH} + \text{CH}_3 \rightarrow \text{C}_2\text{H}_3 + \text{H}$ $3.96\text{e-}8*\text{T}^{*(-1.04)}*\text{EXP}(-36/\text{T})$
 C: $\text{CH} + \text{CH}_4 \rightarrow \text{C}_2\text{H}_4 + \text{H}$ $3.96\text{e-}8*\text{T}^{*(-1.04)}*\text{EXP}(-36/\text{T})$
 C: $1.58\text{e-}8*\text{T}^{*(-0.9)}$ (T>295K)
 C: $\text{CH} + \text{C}_2\text{H}_2 \rightarrow \text{C}_3\text{H}_2 + \text{H}$ $1.59\text{e-}9*\text{T}^{*(-0.233)}*\text{EXP}(-16/\text{T})$
 C: $3.255\text{e-}10*\text{EXP}(61/\text{T})$ (T>295K)
 C: $\text{CH} + \text{C}_2\text{H}_3 \rightarrow \text{C}_3\text{H}_3 + \text{H}$ $7.74\text{e-}9*\text{T}^{*(-0.546)}*\text{EXP}(-29.6/\text{T})$
 C: $\text{CH} + \text{C}_2\text{H}_4 \rightarrow \text{CH}_2\text{CCH}_2 + \text{H}$ $7.74\text{e-}9*\text{T}^{*(-0.546)}*\text{EXP}(-29.6/\text{T})$
 C: $\text{CH} + \text{C}_2\text{H}_5 \rightarrow \text{C}_3\text{H}_5 + \text{H}$ $3.8\text{e-}8*\text{T}^{*(-0.859)}*\text{EXP}(-33.5/\text{T})$
 C: $\text{CH} + \text{C}_2\text{H}_6 \rightarrow \text{C}_3\text{H}_6 + \text{H}$ $3.8\text{e-}8*\text{T}^{*(-0.859)}*\text{EXP}(-33.5/\text{T})$
 C: $\text{CH} + \text{C}_3\text{H}_2 \rightarrow \text{C}_4\text{H}_2 + \text{H}$ $1.59\text{e-}9*\text{T}^{*(-0.233)}*\text{EXP}(-16/\text{T})$
 C: $\text{CH} + \text{C}_3\text{H}_3 \rightarrow \text{C}_4\text{H}_3 + \text{H}$ $1.59\text{e-}9*\text{T}^{*(-0.233)}*\text{EXP}(-16/\text{T})$
 C: $\text{CH} + \text{CH}_3\text{C}_2\text{H} \rightarrow \text{C}_4\text{H}_4 + \text{H}$ $1.59\text{e-}9*\text{T}^{*(-0.233)}*\text{EXP}(-16/\text{T})$
 C: $\text{CH} + \text{CH}_2\text{CCH}_2 \rightarrow \text{C}_4\text{H}_4 + \text{H}$ $1.59\text{e-}9*\text{T}^{*(-0.233)}*\text{EXP}(-16/\text{T})$
 C: $\text{oCH}_2 + \text{H}_2 \rightarrow \text{tCH}_2 + \text{H}_2$ $1.26\text{e-}11$
 C: $\text{oCH}_2 + \text{H}_2 \rightarrow \text{CH}_3 + \text{H}$ $9.24\text{e-}11$
 C: $\text{oCH}_2 + \text{CH}_3 \rightarrow \text{C}_2\text{H}_4 + \text{H}$ $7.0\text{e-}11$
 C: $\text{oCH}_2 + \text{CH}_4 \rightarrow \text{tCH}_2 + \text{CH}_4$ $1.2\text{e-}11$
 C: $\text{oCH}_2 + \text{CH}_4 \rightarrow \text{CH}_3 + \text{CH}_3$ $5.9\text{e-}11$
 C: $\text{oCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{tCH}_2 + \text{C}_2\text{H}_2$ $6.6\text{e-}11$
 O: $\text{H}_2 + \text{oCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{H}_2 + \text{CH}_3\text{C}_2\text{H}$ $7.5\text{e-}19*\text{T}^{*(-3.0)}*\text{EXP}(-300/\text{T})$
 I: $2.5\text{e-}11$
 O: $\text{H}_2 + \text{oCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{H}_2 + \text{CH}_2\text{CCH}_2$ $7.5\text{e-}19*\text{T}^{*(-3.0)}*\text{EXP}(-300/\text{T})$
 I: $2.5\text{e-}11$
 C: $\text{oCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{C}_3\text{H}_3 + \text{H}$ $2.5\text{e-}10$
 C: $\text{oCH}_2 + \text{C}_2\text{H}_4 \rightarrow \text{tCH}_2 + \text{C}_2\text{H}_4$ $1.8\text{e-}11$
 O: $\text{H}_2 + \text{oCH}_2 + \text{C}_2\text{H}_4 \rightarrow \text{H}_2 + \text{C}_3\text{H}_6$ $1.5\text{e-}18*\text{T}^{*(-3.0)}*\text{EXP}(-300/\text{T})$
 I: $1.32\text{e-}10$
 C: $\text{oCH}_2 + \text{C}_2\text{H}_6 \rightarrow \text{tCH}_2 + \text{C}_2\text{H}_6$ $3.6\text{e-}11$
 C: $\text{tCH}_2 + \text{tCH}_2 \rightarrow \text{C}_2\text{H}_2 + \text{H} + \text{H}$ $1.8\text{e-}10*\text{EXP}(-400/\text{T})$
 C: $\text{tCH}_2 + \text{CH}_3 \rightarrow \text{C}_2\text{H}_4 + \text{H}$ $7.0\text{e-}11$
 C: $\text{tCH}_2 + \text{CH}_4 \rightarrow \text{CH}_3 + \text{CH}_3$ $7.1\text{e-}12*\text{EXP}(-5051/\text{T})$
 C: $\text{tCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{C}_3\text{H}_2 + \text{H}_2$ $1.0\text{e-}12*\text{EXP}(-3332/\text{T})$
 C: $\text{tCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{C}_3\text{H}_3 + \text{H}$ $1.9\text{e-}11*\text{EXP}(-3332/\text{T})$
 O: $\text{H}_2 + \text{tCH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{H}_2 + \text{CH}_3\text{C}_2\text{H}$ $1.5\text{e-}18*\text{T}^{*(-3.0)}*\text{EXP}(-300/\text{T})$
 I: $2.0\text{e-}12*\text{EXP}(-3332/\text{T})$

C: tCH2 + C2H3 -> C2H2 + CH3 8.0e-11
 C: tCH2 + C2H4 -> C3H5 + H 4.25e-12*EXP(-2658/T)
 O: H2 + tCH2 + C2H4 -> H2 + C3H6 1.5e-18*T**(-3.0)*EXP(-300./T)
 I: 1.0e-12*EXP(-2658/T)
 C: tCH2 + C2H5 -> C2H4 + CH3 8.0e-11
 C: tCH2 + C3H2 -> C4H3 + H 8.0e-11
 C: tCH2 + C3H3 -> C4H4 + H 3.0e-11
 C: CH3 + H2 -> CH4 + H 6.6e-20*T**2.24*EXP(-3220/T)
 O: H2 + CH3 + CH3 -> H2 + C2H6 3.51e-7*T**(-7.03)*EXP(-1390/T)
 O: 6.15e-18*T**(-3.5) (T<300K)
 I: 1.12e-9*T**(-0.5)*EXP(-25/T)
 F: 0.62*EXP(-T/1180)+0.38*EXP(-T/73)
 O: H2 + CH3 + C2H -> H2 + CH3C2H 1.5e-18*T**(-3.0)*EXP(-300/T)
 I: 1.7e-10
 C: CH3 + C2H3 -> CH4 + C2H2 3.0e-11
 O:291: H2 + CH3 + C2H3 -> H2 + C3H6 5.0e-27
 I: 1.1e-10
 C: CH3 + C2H3 -> C3H5 + H 1.1e-10-rate(291)*H2
 C: CH3 + C2H5 -> CH4 + C2H4 2.0e-12
 O: H2 + CH3 + C2H5 -> H2 + C3H8 7.5e-17*T**(-3.0)*EXP(-300/T)
 I: 6.64e-11
 C: CH3 + C3H2 -> C2H2 + C2H3 1.0e-11
 O: H2 + CH3 + C3H3 -> H2 + omC4H6 9.0e-19*T**(-3.0)*EXP(-300/T)
 I: 9.96e-12
 O: H2 + CH3 + C3H3 -> H2 + oc2mC4H6 6.0e-19*T**(-3.0)*EXP(-300/T)
 I: 6.64e-12
 C: CH3 + C3H5 -> CH4 + CH3C2H 2.0e-11
 C: CH3 + C3H5 -> CH4 + CH2CCH2 2.0e-11
 O: H2 + CH3 + C3H5 -> H2 + C4H8 3.7e-19*T**(-3.0)*EXP(-300/T)
 I: 9.5e-10*T**(-0.54)*EXP(117/T)
 A: 1.34e-13*EXP(-3330/T)
 C: CH3 + C3H7 -> CH4 + C3H6 1.9e-11*T**(-0.3)
 O: H2 + CH3 + C3H7 -> H2 + C4H10 7.07e-22*EXP(255/T)
 O: 4.46e-26*EXP(2189/T) (T>200K)
 I: 3.2e-10*T**(-0.32)
 C: CH3 + C4H5 -> CH4 + C4H4 3.3e-11
 O: CH3 + C4H5 -> CH4 + C4H4 1.5e-17*T**(-3.0)*EXP(-300/T)
 I: 3.2e-10*T**(-0.32)

C: CH3 + C5H3 -> C6H5 + H 2.0e-11
 C: CH3 + C5H3 -> C4H4 + C2H2 1.0e-11
 C: CH3 + C5H3 -> C3H3 + C3H3 4.0e-11
 O: H2 + CH3 + C5H3 -> H2 + C6H6 1.5e-17*T**(-3.0)*EXP(-300/T)
 I: 3.2e-10*T**(-0.32)
 C: C2 + H2 -> C2H + H 1.77e-10*EXP(-1469/T)
 C: C2 + CH4 -> C2H + CH3 5.05e-11*EXP(-297/T)
 C: C2H + H2 -> C2H2 + H 9.2e-18*T**(2.17)*EXP(-478/T)
 C: C2H + CH4 -> C2H2 + CH3 1.2e-11*EXP(-491/T)
 C: C2H + C2H2 -> C4H2 + H 1.3e-10
 C: C2H + C2H3 -> C4H3 + H 1.45e-10*EXP(134/T)
 C: C2H + C2H4 -> C4H4 + H 7.8e-11*EXP(134/T)
 C: C2H + C2H5 -> C4H5 + H 1.2e-10
 C: C2H + C2H5 -> C3H3 + CH3 3.0e-11
 C: C2H + C2H5 -> C2H2 + C2H4 3.0e-12
 C: C2H + C2H6 -> C2H2 + C2H5 1.19e-12*T**(0.54)*EXP(180/T)
 C: C2H + C4H2 -> C6H2 + H 1.3e-10
 C: C2H + C4H10 -> C4H9 + C2H2 1.0e-11
 C: C2H3 + H2 -> C2H4 + H 1.57e-20*T**2.56*EXP(-2529/T)
 C: C2H3 + CH4 -> C2H4 + CH3 2.4e-24*T**(4.02)*EXP(-2754/T)
 C: C2H3 + C2H2 -> C4H4 + H 3.31e-12*EXP(-2516/T)
 O: H2 + C2H3 + C2H2 -> H2 + C4H5 8.2e-30*EXP(-352/T)
 I: 4.17e-19*T**(1.9)*EXP(-1058/T)
 O:333: H2 + C2H3 + C2H3 -> H2 + oc3mC4H6 5.0e-18*T**(-3.75)*EXP(-300/T)
 I: 1.4e-10
 C: C2H3 + C2H3 -> C2H4 + C2H2 1.4e-10-rate(333)
 C: C2H3 + C2H4 -> omC4H6 + H 1.05e-12*EXP(-1559/T)
 C: C2H3 + C2H5 -> C2H4 + C2H4 8.0e-13
 C: C2H3 + C2H5 -> C2H6 + C2H2 8.0e-13
 C: C2H3 + C2H5 -> CH3 + C3H5 2.5e-11/(1.0+2.5e-36*T**11.25*EXP(3289/T))
 O: H2 + C2H3 + C2H5 -> H2 + C4H8 3.476e-15*T**(-3.75)*EXP(-300/T)
 I: 2.5e-11-2.5e-11/(1.0+2.5e-36*T**11.25*EXP(3289/T))
 C: C2H3 + C3H2 -> C3H3 + C2H2 8.0e-11
 C: C2H3 + C3H3 -> CH3C2H + C2H2 2.0e-11
 C: C2H5 + H2 -> C2H6 + H 5.1e-24*T**3.6*EXP(-4253/T)
 C: C2H5 + C2H5 -> C2H6 + C2H4 2.4e-12
 O: H2 + C2H5 + C2H5 -> H2 + C4H10 1.5e-17*T**(-3.0)*EXP(-300/T)
 I: 1.4e-11*EXP(35/T)

C: C2H5 + C3H2 -> C3H3 + C2H4 8.0e-11
 C: C2H5 + C3H3 -> CH3C2H + C2H4 2.0e-11
 C: C3 + H2 -> C3H + H 5.5e-13*EXP(-1200/T)
 C: C3H + H2 -> C3H2 + H 5.5e-13*EXP(-1200/T)
 O: H2 + C3H2 + C2H2 -> H2 + C5H4 1.5e-18*T**(-3.0)*EXP(-300/T)
 I: 2.0e-11*EXP(-3330/T)
 O: H2 + C3H3 + C3H3 -> H2 + emC6H6 2.812e-21*T**(-2.0)
 I: 4.1e-11
 O: H2 + C3H3 + C3H3 -> H2 + C6H6 1.48e-22*T**(-2.0)
 I: 6.0e-12
 C: C3H3 + C3H5 -> CH3C2H + CH3C2H 2.0e-11
 C: C3H7 + H2 -> C3H8 + H 3.0e-21*T**(2.84)*EXP(-4600/T)
 C: C4H + H2 -> C4H2 + H 3.92e-19*T**2.57*EXP(-130/T)
 C: C4H + CH4 -> C4H2 + CH3 1.2e-11*EXP(-491/T)
 C: C4H + C2H2 -> C6H2 + H 2.5e-11
 C: C4H + C2H6 -> C4H2 + C2H5 1.19e-12*T**0.54*EXP(180/T)
 C: C4H2s -> C4H2 1.0e3
 C: C4H2s + H2 -> C4H2 + H2 1.4e-15
 C: C4H2s + CH4 -> C4H2 + CH4 1.4e-15; 363, 366, 367 left out
 O: H2 + C4H3 + C2H2 -> C6H5 + H2 3.0e-23/T
 I: 6.84e-18*T**1.646*EXP(-1258/T)
 C: C4H5 + H2 -> omC4H6 + H 6.61e-15*T**(0.5)*EXP(-1864/T)
 C: C4H5 + C2H2 -> C6H6 + H 2.86e-18*T**1.792*EXP(-1127/T)
 C: C6H + H2 -> C6H2 + H 3.92e-19*t**2.57*exp(-130/T)
 C: C6H + CH4 -> C6H2 + CH3 1.2e-11*exp(-491/t)
 C: C6H + C2H6 -> C6H2 + C2H5 3.5e-11*exp(3/t)
 C: C6H5 + H2 -> C6H6 + H 9.48e-20*t**2.43*exp(-3159/t)
 C: C6H5 + CH4 -> C6H6 + CH3 3.32e-12*exp(-4329/t)
 C: C6H5 + C2H2 -> C8H2 + H2 + H2 + H 3.72e-13*exp(-1560/T)
 C: C6H5 + C2H4 -> C8H2 + H2 + H2 + H2 + H 1.20e-12*EXP(-2250/t)
 C: emC6H6 -> C6H6 1.0e3
 C: emC6H6 + H -> C6H6 + H 1.44e-7*t**(-1.34)*exp(-1761/t)
 C: O + H + H2 -> H2 + OH 1.3e-29/T
 C: O + H2 -> OH + H 8.49e-20*t**2.67*exp(-3160/t)
 C: O + CH3 -> H2CO + H 1.4e-10
 C: O + C2H2 -> CO + tCH2 1.5e-11*exp(-1600/T)
 C: O + C2H2 -> HCCO + H 1.5e-11*exp(-1600/T)
 C: O + C2H3 -> H2CCO + H 1.25e-11

C: O + C2H3 -> OH + C2H2 1.25e-11
 C: O + C2H3 -> CO + CH3 1.25e-11
 C: O + C2H3 -> HCO + tCH2 1.25e-11
 C: O + C2H4 -> CH3CO + H 2.0e-18*T**2.08
 C: O + C2H4 -> HCO + CH3 3.45e-18*T**2.08
 C: O + C2H4 -> H2CO + tCH2 1.5e-19*T**2.08
 C: O + C2H4 -> H2CCO + H2 1.5e-19*T**2.08
 C: O + C2H5 -> CH3CHO + H 8.3e-11
 C: O + C2H5 -> H2CO + CH3 1.7e-11
 C: O1d + H2 -> OH + H 1.1e-10
 C: O1d + CH4 -> OH + CH3 1.35e-10
 C: O1d + CH4 -> H2CO + H2 1.5e-11
 O: H2 + OH + H -> H2 + H2O 6.1e-26*T**(-2.0)
 I: 2.69e-10*EXP(-75/T)
 C: OH + H2 -> H2O + H 7.7e-12*EXP(-2100/T)
 C: OH + CH3 -> H2O + oCH2 1.0e-12
 O: H2 + OH + CH3 -> H2 + CH3OH 6.4e-29*EXP(1033/T)
 I: 1.44e-10*T**0.1
 C: OH + CH4 -> H2O + CH3 3.9e-12*EXP(-1885/T)
 O: H2 + OH + C2H2 -> H2 + CH3CO 2.6e-26*T**(-1.5)
 I: 1.0e-17*T*T
 C: OH + C2H3 -> H2O + C2H2 5.0e-11
 O: H2 + OH + C2H4 -> H2 + C2H4OH 3.34e-21*T**(-3.1)
 I: 9.0e-12
 C: OH + C2H5 -> H2O + C2H4 4.0e-11
 C: OH + C2H6 -> H2O + C2H5 7.8e-12*exp(-1020/t)
 C: OH + C3H8 -> H2O + C3H7 9.8e-12*exp(-640/t)
 C: OH + CO -> CO2 + H 1.5e-13
 O: H2 + CO + H -> H2 +HCO 1.4e-34*exp(-100/T)
 I: 1.96e-13*exp(-1366/t)
 C: CO2 + CH -> CO + HCO 5.7e-12*exp(-345/t)
 C: CO2 + tCH2 -> CO + H2CO 3.9e-14
 C: HCO + H -> CO + H2 1.5e-10
 C: HCO + tCH2 -> CO + CH3 3.0e-11
 C: HCO + CH3 -> CO + CH4 4.4e-11
 O: H2 + HCO + CH3 -> H2 + CH3CHO 1.0e-31
 I: 5.0e-11
 C: HCO + C2H3 -> CO + C2H4 1.5e-10

C: HCO + C2H5 -> CO + C2H6 2.0e-10
 C: HCO + HCO -> CO + H2CO 5.0e-11
 C: H2CO + H -> HCO + H2 3.8e-14*T**1.05*exp(-1650/t)
 C: H2CO + CH -> CO + CH3 8.0e-11*exp(260/t)
 C: H2CO + CH -> H2CCO + H 8.0e-11*exp(260/T)
 C: CH3O + H -> OH + CH3 7.52e-11*exp(-375/T)
 C: CH3O + H -> H2CO + H2 3.38e-11*exp(-375/t)
 C: CH3O + CH3 -> H2CO + CH4 4.0e-11
 C: CH3O + C2H3 -> H2CO + C2H4 4.0e-11
 C: CH3O + C2H5 -> H2CO + C2H6 4.0e-11
 C: CH3OH + H -> H2O + CH3 1.8e-17*T**2.1*exp(-2450/t)
 C: HCCO + H -> CO + tCH2 2.5e-10
 C: H2CCO + H -> CO + CH3 3.0e-11*exp(-1700/t)
 C: H2CCO + tCH2 -> CO + C2H4 2.1e-10
 C: CH3CO + H -> H2CCO + H2 1.92e-11
 C: CH3CO + H -> HCO + CH3 3.57e-11
 C: CH3CO + CH3 -> H2CCO + CH4 1.0e-11
 C: CH3CO + CH3 -> CO + C2H6 4.9e-11
 C: CH3CHO + H -> CH3CO + H2 2.23e-11*exp(-1661/t)
 C: C2H4OH + H -> CH3CHO + H2 8.3e-11
 C: C2H4OH + CH3 -> CH3CHO + CH4 4.0e-11
 C: tCH2 + O -> CO + H2 4.e-11 ; kida.obs.u-bordeaux1.fr
 C: tCH2 + O -> H + HCO 2.e-12 ; kida.obs.u-bordeaux1.fr
 C: HCO + O -> H + CO2 5.e-11 ; kida.obs.u-bordeaux1.fr
 C: HCO + O -> CO + OH 5.e-11 ; kida.obs.u-bordeaux1.fr
 C: C3 + O -> C2 + CO 5.e-12*EXP(-900/T) ; kida.obs.u-bordeaux1.fr
 C: O + C4H -> CO + C3H 8.5e-11 ; kida.obs.u-bordeaux1.fr
 C: O + C6H -> CO + C5H 7e-11 ; kida.obs.u-bordeaux1.fr
 C: O2 + CH -> CO + OH 3.8e-11*(T/300.)**(-0.48) ; kida.obs.u-bordeaux1.fr
 C: O2 + CH -> O + HCO 1.44e-11*(T/300.)**0.7*EXP(-300/T) ; kida.obs.u-bordeaux1.fr
 C: O + CH -> CO + H 6.6e-11
 C: O + tCH2 -> CO + H + H 2.0e-10
 C: O + OH -> O2 + H 4.3e-11*(300./T)**0.5*EXP(-30./T)
 C: OH + H -> H2 + O 7.0e-14*(300./T)**(-2.8)*EXP(-1950/T)
 C: OH + HCO -> CO + H2O 1.8e-10 ; kida
 C: O + C3H -> CO + CCH 5.0e-11 ; kida
 C: O + C3H -> H + C3O 2e-11 ; kida
 C: O + C3H -> CO + CCH 5.3e-11 ; kida

C: C3O + O -> CO + CO 2.0e-11 ; kida
C: O + C3H2 -> CO + C2H2 4.0e-11 ; kida
C: O + C3H2 -> H + CO + CCH 4.e-11 ; kida
C: O + C3H2 -> H + HC3O 4.0e-11 ; kida
C: C5H + O -> CO + C4H 6.0e-11 ; kida
C: C5H + O -> H + C5O 1.0e-11 ; kida
C: tCH2 + OH -> H + H2CO 3.0e-10 ; kida
C: tCH2 + OH -> CH + H2O 1.44e-11*(T/300.)**0.5*EXP(-3000/T) ; kida
C: tCH2 + OH -> O + CH3 1.44e-11*(T/300.)**0.5*EXP(-3000/T) ; kida
C: CCH + O2 -> CH + CO2 2.2e-11*(T/300.)**(-0.32) ; kida
C: CCH + O2 -> H + CO + CO 1.0e-11*(T/300.)**(-0.32) ; kida
C: CCH + O2 -> O + HC2O 1.0e-11*(T/300.)**(-0.32) ; kida
C: C + CO -> O + C2 1.e-10*EXP(-5280/T) ; kida
C: O2 + H -> O + OH 2.94e-10*EXP(-8380/T) ; kida
C: C2 + O -> C + CO 2e-10*(T/300.)**(-0.12) ; kida
C: COO + O -> CO + CO 8.6e-11 ; kida
C: C + O2 -> O + CO 4.9e-11*(T/300.)**(-0.32) ; kida
C: C + OH -> H + CO 1.15e-10*(T/300.)**(-0.339)*EXP(0.108/T) ; kida
C: C + OH -> O + CH 2.25e-11*(T/300.)**0.5*EXP(-14800./T) ; kida
C: C6H2 + O -> CO + C5H2 3.0e-11*(T/300.)**(-0.5) ; kida
C: C8H2 + O -> CO + C7H2 3.0e-11*(T/300.)**(-0.5) ; kida
C: CH4 + O -> OH + CH3 8.41e-12*(T/300.)**1.56*EXP(-4280./T) ; kida
C: C2H6 + O -> OH + C2H5 8.63e-12*(T/300.)**1.5*EXP(-2923./T) ; kida
C: CH3O + O -> OH + H2CO 6.0e-12 ; kida
C: CH3O + O -> O2 + CH3 1.9e-11 ; kida
C: CH3OH + O -> OH + CH2OH 1.63e-11*EXP(-2270./T) ; kida
C: CH3OH + O -> OH + CH3O 1.66e-11*EXP(-2360./T) ; kida
C: CH2OH + O -> OH + H2CO 1.0e-10 ; kida
C: CH3CO + O -> CO2 + CH3 2.63e-10 ; kida
C: CH3CO + O -> OH + H2CCO 8.75e-11 ; kida
C: CH3CHO + O -> OH + CH3CO 1.79e-11*EXP(-1100./T) ; kida
C: CCH + OH -> H + HC2O 2.e-10 ; kida
C: C3H5 + O -> H2CO + C2H3 3.0e-11 ; kida
C: C3H5 + O -> H + C2H3CHO 9.0e-11 ; kida
C: C3H5 + O -> H + CO + C2H4 8.0e-11 ; kida
C: C3H5 + O -> H + C2H2 + H2CO 1.0e-11 ; kida
C: CH2CCH + O -> CO + C2H3 5.0e-11 ; kida
C: CH2CCH + O -> HCO + C2H2 2.0e-11 ; kida

C: CH2CCH + O -> H + HCCCHO 1.6e-10 ; kida
C: CH2CCH + O -> OH + C3H2 1.0e-11 ; kida
C: CO + O2 -> O + CO2 5.99e-12*EXP(-24100./T) ; kida
C: CO2 + O -> CO + O2 2.46e-11*EXP(-26600./T) ; kida
C: H2O + O -> H + O2H 4.48e-12*(T/300.)**0.97*EXP(-34500./T) ; kida
C: H2O + O -> OH + OH 1.85e-11*(T/300.)**0.95*EXP(-8570./T) ; kida
C: C4H2 + O -> CO + C3H2 8.4e-12*(T/300.)**1.03*EXP(-1200./T) ; kida
C: O + C4H4 -> HCO + CH2CCH 4.98e-11*EXP(-906./T) ; kida
C: O + HC2O -> H + CO + CO 1.6e-10 ; kida
C: O + HC2O -> H + CH + CO2 4.90e-11*EXP(-560./T) ; kida
C: O + C3H7 -> H + C2H5CHO 6.0e-11 ; kida
C: O + C3H7 -> H2CO + C2H5 2.0e-11 ; kida
C: O + C3H7 -> H + CH3COCH3 4.0e-11 ; kida
C: O + C3H7 -> CH3 + CH3CHO 4.0e-11 ; kida
C: O + HC3O -> OH + C3O 5.0e-11 ; kida
C: O + HC3O -> CCO + HCO 5.0e-11 ; kida
C: O + HC3O -> CCH + CO2 5.0e-11 ; kida
C: C + O -> CO 9.74e-18*(T/300.)**(-0.705)*EXP(-136./T) ; kida
C: H + H2O -> H2 + OH 6.82e-12*(T/300.)**1.6*EXP(-9720/T) ; kida
C: H2O + O1d -> OH + OH 2.14e-10 ; kida
C: H2O + O1d -> H2 + O2 2.14e-12 ; kida
C: H2O + O1d -> O + H2O 6.60e-13 ; kida
C: O + O2H -> O2 + OH 2.7e-11*EXP(224/T) ; kida
C: O2H + OH -> O2 + H2O 4.8e-11*EXP(250/T) ; kida
C: H + O2H -> H2 + O2 5.6e-12 ; kida
C: H + O2H -> OH + OH 7.2e-11 ; kida
C: H + O2H -> O + H2O 2.4e-12 ; kida
C: H2 + O2H -> H + HOOH 4.38e-12*EXP(-1080/T) ; kida
C: CH + O2H -> OH + HCO 1.44e-11*(T/300.)**0.5*EXP(-3000/T) ; kida
C: CH + O2H -> O2 + tCH2 2.94e-13*(T/300.)**0.5*EXP(-7550/T) ; kida
C: CH3 + O2H -> O2 + CH4 6.0e-12 ; kida
C: CO + O2H -> OH + CO2 5.6e-10*EXP(-1220/T) ; kida
C: H2O + O2H -> OH + HOOH 4.65e-11*EXP(-16500/T) ; kida
C: HCO + O2H -> O2 + H2CO 5.0e-11 ; kida
C: C2H4 + CH -> H + CH3CCH 1.e-10*(T/300.)**(-0.546)*EXP(-29.6/T) ; kida
C: C + CH3CCH -> H + C4H3 2.67e-10*(T/300.)**(-0.11) ; kida
C: C + H2 -> H + CH 6.64e-10*EXP(-11700/T) ; kida
C: C + H -> CH 1.e-17 ; kida

6.2. file "ionbase.txt"

C: CO + H2plus -> H + HCOplus 2.2e-9 ; kida.obs.u-bordeaux1.fr
C: H2plus + HCO -> CO + H3plus 0.5*2.73e-9*(0.62+0.4767*2.37*(300/T)**0.5) ; kida
C: Oplus + H -> Hplus + O 6.8e-10
C: Oplus + H2 -> OHplus + H 1.7e-9
C: Oplus + CH4 -> CH4plus + O 8.9e-10
C: OHplus + H2 -> H2Oplus + H 1.0e-9
C: OHplus + CH4 -> H3Oplus + tCH2 1.3e-9
C: H2Oplus + H2 -> H3Oplus + H 8.3e-10
C: H2Oplus + CH4 -> H3Oplus + CH3 1.1e-9
C: H3Oplus + CH -> CH2plus + H2O 6.8e-10
C: H3Oplus + tCH2 -> CH3plus + H2O 9.4e-10
C: H3Oplus + C2H2 -> C2H5Oplus 4.5e-10*(300./T)**1.6
C: H3Oplus + C2H4 -> C2H7Oplus 2.4e-14*(300./T)**2.8
C: H3Oplus + C2H6 -> C2H7plus + H2O 1.4e-9
C: O + Hplus -> Oplus + H 6.0e-10
C: O + H3plus -> OHplus + H2 8.0e-10
C: O + CH3plus -> HCOplus + H2 4.e-10 ; OCH replaced with HCO
C: O + CH5plus -> H3Oplus + tCH2 2.2e-10
C: O + CH5plus -> H2COHplus + H2 4.4e-12 ; OCH replaced with HCO
C: O + C2H3plus -> HCOplus + tCH2 0.5e-10 ; OCH replaced with HCO
C: O + C2H3plus -> OC2Hplus + H2 1.0e-10
C: OH + Hplus -> OHplus + H 2.1e-9
C: OH + H3plus -> H2Oplus + H2 1.3e-9
C: OH + CH5plus -> H2Oplus + CH4 7.0e-10
C: H2O + Hplus -> H2Oplus + H 6.9e-9
C: H2O + H3plus -> H3Oplus + H2 5.9e-9
C: H2O + CH3plus -> CH3OH2plus 5.5e-13*(300./T)**1.7
C: H2O + CH4plus -> H3Oplus + CH3 2.6e-9
C: H2O + CH5plus -> H3Oplus + CH4 3.7e-9
C: H2O + C2H2plus -> H2Oplus + C2H2 2.2e-10
C: H2O + C2H3plus -> H3Oplus + C2H2 1.1e-9
C: H2O + C2H5plus -> H3Oplus + C2H4 1.4e-9
C: H2O + C2H6plus -> H3Oplus + C2H5 2.9e-9
C: Oplus + e1 -> O 3.4e-12*(300./T)**0.5 ; kim2001icarus
C: OHplus + e1 -> O 3.7e-8*(30./T)**0.5 ; kim2001icarus

C: H2Oplus + e1 -> OH + H 1.6e-7*(300./T)**0.5 ; kim2001icarus
 C: H2Oplus + e1 -> O + H2 2.0e-7*(300./T)**0.5 ; kim2001icarus
 C: H3Oplus + e1 -> H2O + H 3.5e-7*(300./T)**0.5 ; kim2001icarus
 C: H3Oplus + e1 -> OH + H + H 6.5e-7*(300./T)**0.5 ; kim2001icarus
 C: CH4plus + O -> OH + CH3plus 1.e-9 ; kida
 C: Hplus + e1 -> H 4.0e-10*(250/TE)**0.7 ; kim1994icarus
 C: H2plus + e1 -> H + H 2.3e-7*(300/TE)**0.4 ; kim1994icarus
 C: H3plus + e1 -> H2 + H 4.4e-8*(300/TE)**0.5 ; kim1994icarus
 C: H3plus + e1 -> H + H + H 5.6e-8*(300/TE)**0.5 ; kim1994icarus
 C: Cplus + e1 -> C 4.0e-12*(250/TE)**0.7 ; kim1994icarus
 C: CHplus + e1 -> C + H 1.5e-7*(300/TE)**0.41 ; kim1994icarus
 C: CH2plus + e1 -> CH + H 2.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH3plus + e1 -> tCH2 + H 3.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH4plus + e1 -> CH3 + H 1.75e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH4plus + e1 -> tCH2 + H + H 1.75e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH5plus + e1 -> tCH2 + H + H2 8.8e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH5plus + e1 -> CH3 + H + H 2.2e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2plus + e1 -> C + C 3.0e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2Hplus + e1 -> C2 + H 1.35e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2Hplus + e1 -> CH + C 1.35e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H2plus + e1 -> C2H + H 1.35e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H2plus + e1 -> C2 + CH 1.35e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H3plus + e1 -> C2H2 + H 2.25e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H3plus + e1 -> tCH2 + CH 2.25e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H4plus + e1 -> C2H3 + H 1.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H4plus + e1 -> tCH2 + tCH2 1.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H5plus + e1 -> C2H4 + H 3.7e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H5plus + e1 -> CH3 + tCH2 3.7e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H6plus + e1 -> C2H5 + H 1.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H6plus + e1 -> CH3 + CH3 1.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: C2H7plus + e1 -> C2H6 + H 3.5e-7*(300/TE)**0.5 ; kim1994icarus
 C: CH3OH2plus + e1 -> H + H2 + H2CO 9.1e-8*(T/300)**(-0.67) ; kida
 C: CH3OH2plus + e1 -> H2O + CH3 8.19e-8*(T/300)**(-0.67) ; kida
 C: CH3OH2plus + e1 -> H + OH + CH3 4.64e-7*(T/300)**(-0.67) ; kida
 C: CH3OH2plus + e1 -> H + tCH2 + H2O 1.91e-7*(T/300)**(-0.67) ; kida
 C: CH3OH2plus + e1 -> H + CH3OH 2.73e-8*(T/300)**(-0.67) ; kida
 C: C2H5Oplus + e1 -> H2CO + CH3 1.5e-7*(T/300.)**(-0.5) ; kida - analogy with C2H4
 C: C2H5Oplus + e1 -> H + H2 + H2CCO 1.5e-7*(T/300.)**(-0.5) ; kida - analogy with

C: C2H7Oplus + e1 -> H2 + H2CO + CH3 1.5e-7*(T/300.)**(-0.5) ; kida - analogy with
 C: C2H7Oplus + e1 -> H2 + H2 + H2CCO 1.5e-7*(T/300.)**(-0.5) ; kida - analogy with
 C: C + HCOplus -> CO + CHplus 1.1e-9 ; kida
 C: C2 + HCOplus -> CO + C2Hplus 8.3e-10 ; kida
 C: CH + HCOplus -> CO + CH2plus 1.14e-9*(0.62+0.4767*3.3*(300/T)**0.5) ; kida
 C: OH + HCOplus -> CO + H2Oplus 3.71e-10*(0.62+0.4767*5.5*(300/T)**0.5) ; kida
 C: COplus + H2 -> H + HCOplus 7.5e-10 ; kida
 C: COplus + H2 -> H + HOCplus 7.5e-10 ; kida
 C: COplus + OH -> O + HCOplus 0.5*7.45e-10*(0.62+0.4767*5.5*(300/T)**0.5) ; kida
 C: CH + COplus -> CH + HCOplus 0.57e-9*(0.62+0.4767*3.3*(300/T)**0.5) ; kida
 C: tCH2 + COplus -> CH + HCOplus 0.56e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: COplus + H2O -> OH + HCOplus 8.6e-10 ; kida
 C: Cplus + H2CO -> CO + CH2plus 0.482*1.29e-9*(0.62+0.4767*5.15*(300/T)**0.5) ; ki
 C: Cplus + H2CO -> CH + HCOplus 0.209*1.29e-9*(0.62+0.4767*5.15*(300/T)**0.5) ; ki
 C: CH4 + COplus -> CH3 + HCOplus 4.15e-10 ; kida
 C: CH4 + COplus -> H + CH3COplus 5.95e-10 ; kida
 C: H2plus + H2CO -> H + H2 + HCOplus 1.38e-9*(0.62+0.4767*5.15*(300/T)**0.5) ; ki
 C: C2Hplus + O -> C + HCOplus 3.3e-10 ; kida
 C: CH2plus + O -> H + HCOplus 7.5e-10 ; kida
 C: CH2plus + O2 -> OH + HCOplus 9.1e-10 ; kida
 C: CH2plus + O2 -> H + HOCOplus 4.7e-10 ; kida
 C: CH2plus + H2CO -> CH3 + HCOplus 0.85*1.22e-9*(0.62+0.4767*5.15*(300/T)**0.5) ;
 C: CH2plus + H2CO -> H2 + H2CCOplus 0.0501*1.22e-9*(0.62+0.4767*5.15*(300/T)**0.5)
 C: CH2plus + H2CO -> H + CH3COplus 1.22e-9*(0.62+0.4767*5.15*(300/T)**0.5) ; kida
 C: CH2plus + CH4 -> H2 + C2H4plus 9.1e-10 ; kida
 C: CH2plus + CH4 -> H + C2H5plus 3.75e-10 ; kida
 C: CH + CH5plus -> CH4 + CH2plus 1.26e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH + H2Oplus -> OH + CH2plus 0.62e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH + H3plus -> H2 + CH2plus 1.09e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH + H2COHplus -> H2CO + CH2plus 1.13e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH + H2COplus -> HCO + CH2plus 0.566e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CHplus + H2 -> H + CH2plus 1.20e-9 ; kida
 C: CHplus + HCO -> CO + CH2plus 0.625e-9*(0.62+0.4767*3.58*(300/T)**0.5) ; kida
 C: CH + OHplus -> O + CH2plus 0.63e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH + HO2plus -> O2 + CH2plus 1.12e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2H2 + CH2plus -> H + C3H3plus 2.50e-9 ; kida
 C: CH2plus + H -> H2 + CHplus 1.2e-9*EXP(-2.7e3/T) ; kida
 C: CH3plus + H -> H2 + CH2plus 7.0e-10*EXP(-1.06e4/T) ; kida

C: tCH2 + Oplus -> O + CH2plus 1.25e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: Cplus + tCH2 -> C + CH2plus 0.67e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + COplus -> CO + CH2plus 0.56e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + H2plus -> H2 + CH2plus 1.29e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + H2Oplus -> H2O + CH2plus 0.605e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + Hplus -> H + CH2plus 1.765e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + OHplus -> OH + CH2plus 0.615e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + H2COplus -> H2CO + CH2plus 0.55e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: C2plus + tCH2 -> C2 + CH2plus 0.55e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida
 C: tCH2 + O2plus -> O2 + CH2plus 0.545e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: Cplus + H2 -> CH2plus 2e-16*(T/300)**(-1.3)*EXP(-23/T) ; kida
 C: tCH2 + CH2plus -> H + C2H3plus 1.29e-9*(0.62+0.4767*1.41*(300/T)**0.5) ; kida?
 C: Cplus + CH3 -> H2 + C2Hplus 1.0e-9 ; kida
 C: Cplus + CH3 -> H + C2H2plus 1.0e-9 ; kida
 C: Cplus + CH4 -> H2 + C2H2plus 3.89e-10 ; kida
 C: Cplus + CH4 -> H + C2H3plus 3.89e-10 ; kida
 C: C2Hplus + CH -> H + C3Hplus 0.55*1.17e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2Hplus + CH -> H2 + C3plus 0.27*1.17e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2Hplus + CH -> C + C2H2plus 0.07*1.17e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2Hplus + CH -> C2H2 + Cplus 0.07*1.17e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2Hplus + HCO -> CO + C2H2plus 1.02e-9*(0.62+0.4767*3.58*(300/T)**0.5) ; kida
 C: C2Hplus + CH4 -> CH3 + C2H2plus 3.74e-10 ; kida
 C: C2Hplus + CH4 -> CH3 + C2H2plus 3.74e-10 ; kida
 C: C2Hplus + CH4 -> CH3 + C3H4plus 1.32e-10 ; kida
 C: CH + CH2plus -> H + C2H2plus 1.31e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: C2H3plus + H -> H2 + C2H2plus 6.8e-11 ; kida
 C: Hplus + C3H -> H2 + C3plus 0.28*1.098e-8*(0.62+0.4767*4.13*(300/T)**0.5) ; kida
 C: Hplus + C3H -> C2H2 + Cplus 0.05*1.098e-8*(0.62+0.4767*4.13*(300/T)**0.5) ; kida
 C: Hplus + C3H -> C + C2H2plus 0.04*1.098e-8*(0.62+0.4767*4.13*(300/T)**0.5) ; kida
 C: Hplus + C3H -> CCH + CH4plus 0.04*1.098e-8*(0.62+0.4767*4.13*(300/T)**0.5) ; kida
 C: C2H3 + Hplus -> H2 + C2H2plus 3e-9*(T/300)**(-0.5) ; kida
 C: CHplus + CH4 -> H + H2 + C2H2plus 1.41e-10 ; kida
 C: CHplus + CH4 -> H2 + C2H3plus 1.10e-9 ; kida
 C: CHplus + CH4 -> H + C2H4plus 6.50e-11 ; kida
 C: CCH + OHplus -> O + C2H2plus 0.5*1.61e-9*(0.62+0.4767*1.34*(300/T)**0.5) ; kida
 C: C2H5 + HCOplus -> CO + C2H6plus 1.02e-9*(T/300)**(-0.5)*EXP(-23/T) ; kida
 C: Hplus + HCO -> H2 + COplus 0.333*3.79e-9*(0.62+0.4767*3.58*(300/T)**0.5) ; kida
 C: Hplus + HCO -> CO + H2plus 0.333*3.79e-9*(0.62+0.4767*3.58*(300/T)**0.5) ; kida

C: H2plus + OH -> H2 + OHplus 0.5*1.81e-9*(0.62+0.4767*5.50*(300/T)**0.5) ; kida
 C: Hplus + H2 -> H + H2plus 5.01e-13 ; kida
 C: H + Hplus -> H2plus 1.15e-18*(T/300) ; kida (+ photon)
 C: Cplus + CH -> H + C2plus 0.43*1.37e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: Cplus + CH -> C2 + Hplus 0.04*1.37e-9*(0.62+0.4767*3.33*(300/T)**0.5) ; kida
 C: CH4 + H2plus -> H + H2 + CH3plus 2.3e-9 ; kida
 C: CH4 + H2plus -> H + CH5plus 1.1e-10 ; kida
 C: CH4plus + H2 -> H + CH5plus 3.50e-11 ; kida
 C: CH4 + CH4plus -> CH3 + CH5plus ; 1.5e-9 ; kida
 C: CH4 + HOC0plus -> CO2 + CH5plus 7.8e-10 ; kida
 C: CH4 + HOCplus -> CO + CH5plus 1.10e-9 ; kida
 C: CH4 + HCOplus -> CO + CH5plus 9.90e-10*EXP(-4920/T) ; kida
 C: CH3plus + H2 -> CH5plus 3.78e-16*(T/300)**(-2.3)*EXP(-21.5/T) ; kida (+ photon)
 C: Cplus + H2O -> H + HCOplus 0.331*1.03e-9*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: Cplus + H2O -> H + HCOplus 2.16e-9 ; kida
 C: Cplus + H2O -> H + HOCplus 2.10e-9 ; kida
 C: H2plus + H2O -> H + H3Oplus 3.4e-9 ; kida
 C: H2O + HCOplus -> CO + H3Oplus 2.1e-9*(T/300.)**(-0.5) ; kida
 C: H2O + H2Oplus -> OH + H3Oplus 2.1e-9 ; kida
 C: C3 + H3Oplus -> H2O + C2H0plus 1.5e-9 ; kida need reaction
 C: C4 + H3Oplus -> H2O + C4Hplus 1.1e-9 ; kida need reaction
 C: H2CO + H3Oplus -> H2O + H2COHplus 1.11e-9*(0.62+0.4767*5.15*(300/T)**0.5) ; kida
 C: H2CCO + H3Oplus -> H2O + CH3COplus 1.34e-9*(0.62+0.4767*2.37*(300/T)**0.5) ; kida
 C: C2H3 + H3Oplus -> H2O + C2H4plus 1.74e-9*(T/300)**(-0.5) ; kida
 C: H3Oplus + C3H2 -> H2O + C3H3 1.48e-9*(0.62+0.4767*5.78*(300/T)**0.5) ; kida
 C: C4H + H3Oplus -> H2O + C4H2plus 1.69e-9*(0.62+0.4767*1.13*(300/T)**0.5) ; kida
 C: C4H2 + H3Oplus -> H2O + C4H3plus 1.1e-9 ; kida
 C: CH3OH + H3Oplus -> H2O + CH3OH2plus 1.20e-9*(0.62+0.4767*3.32*(300/T)**0.5) ; kida
 C: H2O + HOC0plus -> CO2 + H3Oplus 7.73d-10*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: C2plus + H2O -> OH + C2Hplus 0.5*8.65e-10*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: C2plus + H2O -> H + C2H0plus 0.5*8.65e-10*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: CHplus + H2O -> H2 + HCOplus 2.9e-9 ; kida
 C: CHplus + H2O -> H + H2COplus 5.8e-10 ; kida
 C: CHplus + H2O -> C + H3Oplus 5.8e-10 ; kida
 C: H2O + OHplus -> O + H3Oplus 0.464*9.39e-10*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: H2O + HO2plus -> O2 + H3Oplus 8.51e-10*(0.62+0.4767*5.41*(300/T)**0.5) ; kida
 C: C4H3plus + CH3CCH -> C2H2 + C5H5plus 6.39e-10*(T/300)**(-0.5) ; kida
 C: C4H3plus + CH3CCH -> C6H5plus + oCH2 2.0e-11 ; kida