Authors: Marin Chabot & Karine Béroff (Orsay)

$$C_{10}^+ + e^- \rightarrow C_9 + C \quad (1)$$
$$\rightarrow C_8 + C_2 \quad (2)$$
$$\rightarrow C_7 + C_3 \quad (3)$$
$$\rightarrow C_6 + C_4 \quad (4)$$
$$\rightarrow C_5 + C_5 \quad (5)$$
$$\rightarrow C_4 + C_3 + C_3 \quad (6)$$

Thermodynamic Data

ΔH^o_0 (1) = - 163 kJ mol^{-1}

ΔH^o_0 (2) = - 134 kJ mol^{-1}

ΔH^o_0 (3) = - 308 kJ mol^{-1}

ΔH^o_0 (4) = - 144 kJ mol^{-1}

ΔH^o_0 (5) = -308 kJ mol^{-1}

ΔH^o_0 (5) = + 192 kJ mol^{-1}

Ionisation Potential = 887 kJ mol^{-1} = 9.10 eV

Thermochemical data have been obtained with ΔH^o_0=DE-IP. DE from Raghavachari (1987), IP (vertical) from Belau et al (2007) (estimated error bars 0.1). Estimated error bars on ΔH values: ~ 60kJ mol^{-1}

Rate Coefficient Data

k / cm^3 molecule^{-1} s^{-1}	T / K	Reference	Comments
Rate Coefficient Measurement			
None			
Reviews and Evaluations			
$2.0 \times 10^{-6}(T/300)^{-0.3}$		OSU09 website	(a)
$2.0 \times 10^{-6}(T/300)^{-0.3}$	10-300	UMIST06 database	(a)
Branching Fraction Measurement			
(1) = 0.01 (±0.005)		Chabot 2006, 2010	(b)
(2) = 0.01 (±0.005)			
(3) = 0.70 (±0.03)			
(4) = 0.03 (±0.01)			
(5) = 0.25 (±0.02)			
Branching fraction Reviews and Evaluations			
(1) = (2) = 0.5; (3) = (4) = (5) = 0.0		OSU09 website	
(1) = (2) = 0.5; (3) = (4) = (5) = 0.0	10-300	UMIST06 database	

Comments

(a) OSU and UMIST estimations for reaction rates and branching fractions are from Herbst & Leung (1989). Lognormal factor 1.25 of accuracy is reported.

(b) Measurements have been performed with High Velocity Collision experiments on hot (3000°K) C^{+}_{10} clusters produced by a sputtering source and capturing an electron from an atom. Results have been interpreted satisfactorily within a statistical fragmentation behaviour (Martinet, 2004). Derivation of these experimental results in astrochemical context assumes that statistical fragmentation occurs under DR process (Chabot 2010).

Preferred Values

Rate constant:
$k = 2 \times 10^{-6}\ (T/300)^{-0.3}$ cm^3 molecule^{-1} s^{-1}
Reliability of rate constant:
F0=2; g=0

Recommended Branching Fractions:
(1) = (2) = (4) = 0.00
(3) = 0.75
(5) = 0.25

Reliability of Branching Fractions:
±0.1 (uniform)

References

- K.Raghavachari & J.Binkley (1987) JCP**87**(4), 2191
- L. Belau et al (2007) JACS **129**, 10229
- M. Chabot et al, (2006) J. Phys. B **39** 2593
- M. Chabot et al, (2010) A&A **524**, A39 (2010)
- E. Herbst & C.L. Leung, (1989) APJS **69**, 271
- G. Martinet et al, (2004) Phys.Rev.Lett. **93**, 063401