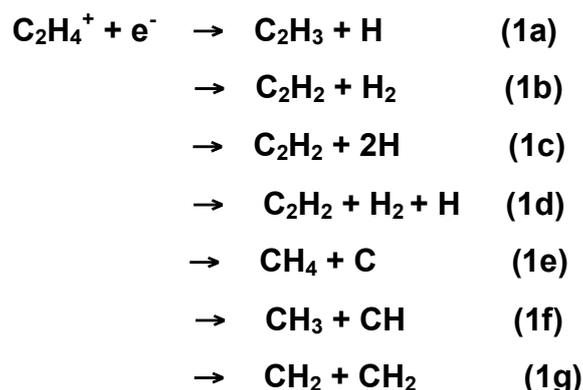


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*Thermodynamic Data*

$$\Delta H_{298}^{\circ}(1\text{a}) \approx -550 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{b}) \approx -838 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{c}) \approx -402 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{d}) \approx -283 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{e}) \approx -424 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{f}) \approx -327 \text{ kJ mol}^{-1}$$

$$\Delta H_{298}^{\circ}(1\text{g}) \approx -290 \text{ kJ mol}^{-1}$$

Thermochemical data for all the channels were taken from Ref. [1]. All reactions (1a-g) are highly exoergic, so small errors (by different experimental methods or theoretical approaches) in the formation enthalpies cannot affect the viability of the processes.

**Rate Coefficient Data  $k$**

$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	$T / \text{K}$	Reference	Comments
<i>Rate Coefficient Measurements</i>			
$5.6 \times 10^{-7}(\text{T}/300)^{-0.76}$	20 - 1000	[1]	Storage ring
<i>Rate Coefficient Reviews and Evaluations</i>			
$5.6 \times 10^{-7}(\text{T}/300)^{-0.76}$	10 - 300	UMIST database	
$5.6 \times 10^{-7}(\text{T}/300)^{-0.76}$		OSU website	
<i>Branching Fraction Measurements</i>			
1(a) = $0.11 \pm 0.07$		[1]	Storage ring
1(b) = $0.06 \pm 0.03$			
1(c) = $0.66 \pm 0.06$			
1(d) = $0.10 \pm 0.04$			

$$1(\text{e}) = 0.01 \pm 0.01$$

$$1(\text{f}) = 0.02 \pm 0.04$$

$$1(\text{g}) = 0.04 \pm 0.02$$

#### *Branching Fraction Reviews and Evaluations*

$$1(\text{a}) = 0.11$$

10 – 300

OSU website and UMIST database

$$1(\text{b}) = 0.06$$

$$1(\text{c}) = 0.66$$

$$1(\text{d}) = 0.10$$

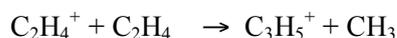
$$1(\text{e}) = 0.01$$

$$1(\text{f}) = 0.02$$

$$1(\text{g}) = 0.04$$

### **Comments**

To the best of our knowledge the only available measurements of the overall rate and branching fractions of the title reaction has been performed in a storage ring experiment [1]. Flowing afterglow measurements of the dissociative recombination of  $\text{C}_2\text{H}_4^+$  have been hampered by the fact that hydrocarbon ions with even numbers of hydrogen atoms swiftly undergo proton and alkyl transfers with their parent compound [2], e. g.



which makes them unfeasible objects to study in a high pressure regime. We also do not know of any theoretical study of this process.

### **Preferred Values**

*Recommended rate constant:*

$$k = 5.6 \times 10^{-7} (\text{T}/300)^{-0.76}$$

*Recommended branching fractions:*

$$1(\text{a}) = 0.34$$

$$1(\text{b}) = 0.06$$

$$1(\text{c}) = 0.66$$

$$1(\text{d}) = 0.10$$

$$1(\text{e}) = 0.01$$

$$1(\text{f}) = 0.02$$

$$1(\text{g}) = 0.01$$

#### *Comments on Preferred Values*

In lack of other data, I recommend the branching fraction and rate constant from the storage ring experiment, which are already used by the models. The overall rate constant appears reasonable for the system and is in line with other hydrocarbon ions. Therefore, there seems to be no reason to change the values already included in the models.

### **References**

[1] A. Ehlerding, F. Hellberg, R. Thomas, S. Kalhori, A. A. Viggiano, S. T. Arnold, M. Larsson and M. af Ugglas, Phys. Chem. Chem. Phys. **6**, 949 (2004)

[2] V. G. Anicich, J. Phys. Chem. Ref. Data, **22**, 1469 (1993)

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