This data sheet updated: 9th March 2005.

$FO_2 + M \rightarrow F + O_2 + M$

$\Delta H° = 54.0 \text{ kJ·mol}^{-1}$

Low-pressure rate coefficients
Rate coefficient data

k_0/s^{-1}	Temp./K	Reference	Technique/ Comments
Absolute Rate Coefficients			
1.8×10^{-17} [Ar]	295	Pagsberg et al., 1987	PR (a)
3.1×10^{-17} [Ar]	312.5		
2.8×10^{-16} [Ar]	359		
$(2.5 \pm 1.0) \times 10^{-18}$ [He]	298	Lyman and Holland, 1988	PLP (b)
$1.0 \times 10^{-5} \, T^{-1.25} \exp(-5990/T)$ [N$_2$]	315-420	Campuzano-Jost et al., 1995	PLP (c)
1.5×10^{-17} [N$_2$]	298		

Comments

(a) Experiments were carried out in Ar-F$_2$-O$_2$ mixtures with detection of FO$_2$ by absorption at 220 nm. The rate of approach to equilibrium was monitored and the equilibrium constant measured. A value of $\Delta H°(298 \text{ K}) = 52.8 \text{ kJ mol}^{-1}$ was derived by a third-law analysis.

(b) Photolysis of F$_2$ at 248 nm in the presence of O$_2$ and bath gases. Transient absorptions at 215 nm were monitored and the approach to equilibrium was analyzed. A value of $\Delta H°(298 \text{ K}) = 56.4 \text{ kJ mol}^{-1}$ was derived.

(c) The kinetics were followed by monitoring the FO$_2$ radical by UV absorption. Experiments were carried out between 100 K and 375 K at total pressures between 1 bar and 1000 bar, and in the bath gases He, Ar, and N$_2$. Measurements of the equilibrium constant lead to $\Delta H°(0 \text{ K}) = 49.8 \text{ kJ mol}^{-1}$. Falloff extrapolations were carried out with a value of F_c near 0.5. The expression for k_0 was derived from the recombination rate coefficients of the reverse reaction and the equilibrium constants.

Preferred Values

$k_0 = 1.5 \times 10^{-17}$ [N$_2$] s^{-1} at 298 K.
$k_0 = 8.4 \times 10^{-9}(T/300)^{-1.25} \exp(-5990/T)$ [N$_2$] s^{-1} over the temperature range 310-420 K.

Reliability
　　$\Delta \log k_0 = \pm 0.3$ at 298 K.
　　$\Delta n = \pm 0.5$.
　　$\Delta(E/R) = \pm 500$ K.

Comments on Preferred Values

The results of Campuzano-Jost *et al.*[3] are in reasonable agreement with those of Pagsberg et al. (1987), but differ at 298 K by a factor of 6 with the data from Lyman and Holland (1988). The preferred values are based on the data of Campuzano-Jost et al. (1995).

High-pressure rate coefficients
Rate coefficient data

k_∞/s^{-1}	Temp./K	Reference	Technique/ Comments
Absolute Rate Coefficients			
$1.3 \times 10^{13} \, T^{0.45} \exp(-5990/T)$	315-420	Campuzano-Jost et al., 1995	PLP (a)

Comments

(a) See comment (c) for k_0.

Preferred Values

$k_\infty = 3.1 \times 10^5$ s^{-1} at 298 K.

$k_\infty = 1.7 \times 10^{14} \, (T/300)^{0.45} \exp(-5990/T)$ s^{-1} over the temperature range 310-420 K.

Reliability

$\Delta \log k_\infty = \pm 0.3$ at 298 K.

$\Delta n = \pm 0.5$.

$\Delta(E/R) = \pm 500$ K.

Comments on Preferred Values

Because of the large pressure range studied by Campuzano-Jost et al. (1995), a reliable falloff extrapolation towards k_∞ was possible. The data of Campuzano-Jost et al. (1995) are therefore preferred, together with F_c values near 0.5.

References

Campuzano-Jost, P., Croce, A. E., Hippler, H., Siefke, M. and Troe, J.: J. Chem. Phys., 102, 5317, 1995.

Lyman, J. L. and Holland, R.: J. Phys. Chem., 92, 7232, 1988.

Pagsberg, P., Ratajczak, E., Sillesen, A. and Jodkowski, J. T.: Chem. Phys. Lett., 141, 88, 1987.