IUPAC Task Group on Atmospheric Chemical Kinetic Data Evaluation – Data Sheet PCl18

This data sheet updated: 15th December 2000.

CH_3CF_2Cl (HCFC-142b) + hν → products

Primary photochemical processes

Reaction	$\Delta H°$/kJ·mol^{-1}	$\lambda_{threshold}$/nm
$CH_3CF_2Cl + h\nu \rightarrow CH_3CF_2 + Cl$	335 (est)	360
$\rightarrow CH_2CF_2Cl + H$	400 (est)	300

Preferred Values

Absorption cross-sections for CH_3CF_2Cl at 298 K and 220 K

λ/nm	10^{20} σ/cm^2		λ/nm	10^{20} σ/cm^2	
	298 K	220 K		298 K	220 K
190	1.01	0.75	210	0.017	0.010
2	0.69	0.51	2	0.010	0.006
4	0.49	0.34	4	0.007	0.003
6	0.33	0.22	6	0.004	0.002
8	0.22	0.15	8	0.003	0.001
200	0.14	0.091	220	0.002	0.0007
2	0.09	0.057	2	0.0009	0.0004
4	0.061	0.037	4	0.0005	0.0002
6	0.039	0.024	6	0.0003	0.0001
8	0.026	0.015	8	0.0002	0.0001

Comments on Preferred Values

The preferred values of the absorption cross-sections at 298 K are the mean of the values reported by Gillotay and Simon[1], Orlando *et al.*[2] and (for 190-210 nm) Nayak *et al.*[4] The agreement between these studies over the wavelength range of preferred values is good. The results of Hubrich and Stuhl[3] are in reasonable agreement. The temperature dependence down to about 220 K has been reported by Gillotay and Simon,[1], Orlando *et al.*[2] and Nayak *et al.*[4] The preferred values at 220 K for the wavelength range 190 nm to 210 nm are the mean of the values reported

by Gillotay and Simon,[1] Orlando *et al*.[2] and Nayak *et al*.[4] Because Nayak *et al*.[4] did not report values for $\lambda > 210$ nm at their lowest temperature of 223 K, and the values of Orlando *et al*.[2] at wavelengths greater than approximately 210 nm have been questioned[1,4], the preferred values at 220 K and $\lambda > 210$ nm are the values reported by Gillotay and Simon.[1] Photolysis is expected to occur with unit quantum efficiency. At 193 nm Melchior *et al*.[5] have shown that C-Cl bond fission to give CH_3CF_2 + Cl is the main channel, but that C-H bond cleavage also occurs with a branching ratio of about 40%.

References

1 D. Gillotay and P. C. Simon, J. Atmos. Chem. **12**, 269 (1991).

2 J. J. Orlando, J. B. Burkholder, S. A. McKeen, and A. R. Ravishankara, J. Geophys. Res. **96**, 5013 (1991).

3 C. Hubrich and F. Stuhl, J. Photochem. **12**, 93 (1980).

4 A.K. Nayak, T. J. Buckley, M. J. Kurylo, and A. Fahr, J. Geophys. Res. **101**, 9055 (1996).

5 A. Melchior, I. Bar, and S. Rosenwaks, J. Chem. Phys. **107**, 8476 (1997).