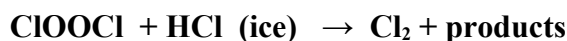


IUPAC Task Group on Atmospheric Chemical Kinetic Data Evaluation – Data Sheet V.A1.54 HI54

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This data sheet last evaluated: January 2009; last change in preferred values: January 2009.



Experimental data

Parameter	Temp./K	Reference	Technique/ Comments
<i>Uptake coefficients: γ</i>			
$\gamma_0 \approx 6 \times 10^{-3}$ (0.026 Torr HCl)	226 K	De Haan and Birks, 1997	CWFT-MS (a)
$\gamma_0 \approx 2 \times 10^{-4}$ (0.016 Torr HCl)			

Comments

- (a) Flow tube reactor using electron-impact MS. ClOOCl was generated in the self reaction of ClO at low temperatures and detected as Cl₂O₂⁺. The ice film (300 – 900 μm) was made by “brushing” water onto the cold flow tube surface and the geometric surface area was used to calculate the uptake coefficient. HCl was deposited from the gas-phase (0.004 – 0.06 Torr) to an existing ice surface. Thermodynamics suggests that the ice films were premelted by the large HCl concentrations. The uptake coefficient showed a strong dependence on the exposure time to HCl and also on the partial pressure of HCl. The values listed in the table are for long HCl exposure times when the entire ice surface was coated with HCl. Cl₂ was observed as the only gas-phase product. The initial uptake coefficients decreased within minutes of exposure to steady values (which were not reported).

Preferred Values

none

Comments on Preferred Values

The single study (De Haan and Birks, 1997) to present uptake coefficients for the ClOOCl / HCl system was conducted using HCl partial pressures that melted the ice surface. The uptake coefficients reported cannot therefore be reliably extrapolated to atmospheric HCl partial pressures (which typically are more than 3 orders of magnitude lower). McKeachie et al (2004) report complete uptake of ClOOCl to ice films at 213 K made from 10 % aqueous solutions of HCl, though an uptake coefficient was not reported. Both De Haan and Birks (1997) and McKeachie et al (2004) observed Cl₂ as product and De Haan and Birks (1997) speculate that the co-product would be HOCl (or surface bound ClOO⁻ and H₃O⁺).

References

De Haan, D. O. and Birks, J. W.: J. Phys. Chem. 101, 8026-8034, 1997.

McKeachie, J. R., Appel, M. F., Kirchner, U., Schindler, R. N. and Benter, T.: J. Phys. Chem. B 108, 16786-16797, 2004.