

IUPAC Task Group on Atmospheric Chemical Kinetic Data Evaluation – Data Sheet V.A1.47 HI47

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$\text{N}_2\text{O}_5 + \text{HBr} (\text{ice}) \rightarrow \text{products}$

Experimental data

Parameter	Temp./K	Reference	Technique/ Comments
<i>Experimental uptake coefficients: γ</i> $\gamma = (0.02 - 0.15)$	180-200	Seisel et al., 1998	Knudsen-MS/LIF (a)

Comments

- (a) Steady state and pulsed valve experiments, with the ice surface formed both by vapour deposition and freezing of liquid water. HBr was either present in the ice film during freezing (of a 0.1 M aqueous solution), or was introduced from the gas phase.

Preferred Values

no recommendation

Comments on Preferred Values

The study of Seisel et al. (1998) is the only published study of the title reaction. They determined uptake coefficients for N_2O_5 on ice that were dependent on the amount of HBr (gas phase concentrations of $\approx 10^{10}$ - 10^{11} molecule cm^{-3}) available for reaction and which varied between 0.02 and 0.15. At the lower range of HBr concentrations the uptake coefficient approached that of N_2O_5 on pure ice. The same authors measured Br_2 and HONO as the major gas phase products of the title reaction, with yields of up to 80% (at high [HBr] with the rest removed by hydrolysis. The non-observation of the expected BrNO_2 product and the formation Br_2 and HONO was attributed to the secondary reaction of BrNO_2 with HBr. Without knowledge of the thermodynamic state of the surface, and the fact that N_2O_5 was in excess of HBr makes this dataset unsuitable for parameterisation of the effect of adsorbed HBr on the uptake of N_2O_5 to an ice surface. Note however, that under normal atmospheric HBr concentrations, the title reaction will not compete with N_2O_5 hydrolysis.

References

Seisel, S., Flückiger, B. and Rossi, M. J.: Ber. Bunsen Ges. Phys. Chem. 102, 811-820, 1998.