

IUPAC Task Group on Atmospheric Chemical Kinetic Data Evaluation – Data Sheet V.A4.2 HSTD2

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Experimental data

Parameter	Temp./K	Reference	Technique/ Comments
<i>Uptake coefficients: γ</i>			
0.6×10^{-3} (60 wt. % H_2SO_4 , RH 40 %)	192	Hanson and Ravishankara, 1993	CWFT-CIMS (a)
2.4×10^{-3} (60 wt. % H_2SO_4 , RH 80 %)	192		
5×10^{-3} (57.5 wt. % H_2SO_4 , RH 44-100 %)	195		
8×10^{-3} (57.5 wt. % H_2SO_4 , RH 22-85 %)	205		
5×10^{-3} (60 wt. % H_2SO_4 , RH 24-87 %)	205		

Comments

- (a) Sulphuric acid tetrahydrate was generated by freezing H_2SO_4 solutions (57.5 or 60 wt. %). The relative humidity above the film was varied by adjusting the temperature at fixed H_2O partial pressure or by adjusting the H_2O partial pressure at fixed temperature. The geometric surface area was used to calculate the uptake coefficient. Experiments were conducted with $[\text{N}_2\text{O}_5]$ at $\approx 10^{-7}$ Torr.

Preferred Values

Parameter	Value	T/K
$\gamma(\text{RH } 22 - 100 \%)$	6.5×10^{-3}	195 - 205 K
<i>Reliability</i>		
$\Delta \log \gamma_{\text{net}}$	0.4	195 - 205 K

Comments on Preferred Value

The hydrolysis of N_2O_5 on sulphuric acid tetrahydrate films is much less efficient (\approx factor 20) than on liquid H_2SO_4 . For SAT formed from an acid of concentration 57.5 wt. %, no dependence on RH was observed, whereas at 60 wt. % larger RH resulted in larger γ , possibly due to the presence of other hydrates. At 205 K values of γ were larger than at 192 K and the authors speculated that this may have been due to formation of a liquid ternary mixture. Our preferred value uses the data obtained at 57.5 wt. % H_2SO_4 , which corresponds to the

composition of SAT. It takes a simple average value of the results at the two temperatures covered and is independent of RH from 22 to 100 %.

References

Hanson, D. R. and Ravishankara, A. R.: J. Geophys. Res. 98, 22931-22936, 1993.