IUPAC Task Group on Atmospheric chemical Kinetic Data Evaluation – Data Sheet VI.A4.32 HET_SL_32

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$CH_3SO_3H + H_2SO_4$ (aqueous) → products

Experimental data

Parameter	$[H_2SO_4]$ /wt %	Temp./K	Reference	Technique/ Comments
Uptake coefficient: γ				
0.86 ± 0.08	47-90 <50%	296	Hanson, 2005	AFT-CIMS (c)
0.64 ± 0.2	50	296		
0.25 ± 0.05	65	296		

Comments

(c) Uptake to sulphuric acid aerosol was studied in a laminar flow reactor coupled to CIMS detection using HNO_3 as source of primary ions. Sulfuric acid particles were generated by homogeneous nucleation from supersaturated vapour leading to a lognormal particle size distribution within 50-120 nm, with a few 10^4 particles per cm^3, characterised by a differential mobility analyzer. Concentrations of CH_3SO_3H were 3 $\times 10^{10}$ cm^{-3} in the flow tube. The measured uptake coefficients were corrected for gas phase diffusion using the Fuchs-Sutugin correction factor. The diffusion coefficient was directly measured based on the observed wall loss rates in absence of aerosol particles. Its average value was 0.0786 atm cm^2 s^{-1} over the full range of humidity.

Preferred Values

Parameter	Value	T/K
α_b	1	296
Reliability		
$\Delta \log (\alpha_b)$	0.3	296

Comments on Preferred Values

The aerosol flow tube study by Hanson (2005) leads to uptake coefficients of CH_3SO_3H not significantly different from unity for solution compositions below 50 wt%, from which we adopt a value of 1 for α_b. Hanson argues that the solubility of CH_3SO_3H may be lower at higher H_2SO_4 concentration, so that uptake ran into solubility equilibrium during his experiments, which would explain the low uptake coefficient for high wt% solutions. No data of CH_3SO_3H solubility in H_2SO_4 solutions are available to our knowledge to assess this in more detail.

References

Hanson, D. R.: J. Phys. Chem. A, 109, 6919-6927, 2005.