

## IUPAC Task Group on Atmospheric Chemical Kinetic Data Evaluation – Data Sheet V.A5.1 HNNT1

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### O<sub>3</sub> + NAT → products

#### Experimental data

Parameter	Temp./K	Reference	Technique/ Comments
<i>Uptake coefficients: <math>\gamma</math></i>			
$\gamma_{ss} = (1-5) \times 10^{-4}$ ( $1.0 \times 10^{-8}$ mbar)	195	Dlugokencky and	CWFT-CLD(a)
$\gamma_{ss} = (0.2-9) \times 10^{-5}$ ( $5.0 \times 10^{-9}$ mbar)	196	Ravishankara, 1992	
$\gamma_{ss} < 8 \times 10^{-5}$ ( $1.6 \times 10^{-4}$ mbar)	183	Kenner, Plumb and Ryan, 1993	CWFT-MS(b)

#### Comments

- (a) Coated flow tube reactor using high sensitivity chemiluminescence detection of ozone.  $[O_3] = 10^8$  molecule  $cm^{-3}$  to  $10^{12}$  molecule  $cm^{-3}$  with 1.3 mbar of He carrier gas. The flow tube was coated by freezing a 0.25 mole fraction solution at 196 K onto the flow tube walls, resulting in a coating of approx. 2 mm thickness. These films were not characterized. They presumably contain some NAT, but likely also remaining nitric acid solution. A measurable but not well reproducible uptake of O<sub>3</sub> was observed that decreased with time.
- (b) Fast flow reactor with electron-impact MS. A 4-7  $\mu m$  thick NAT film was deposited from a 3:1 gas phase mixture of H<sub>2</sub>O:HNO<sub>3</sub> on top of a previously deposited 2-3  $\mu m$  thick ice film. No loss of O<sub>3</sub> could be observed, and the value given in the table is an upper limit based on the sensitivity. As ClO was the main target of this study, the O<sub>3</sub> detection by mass spectrometry was not calibrated, and the pressure given is only a rough estimate.

#### Preferred Values

Parameter	Value	T/K
$\gamma$	$< 1 \times 10^{-6}$	180 - 200
<i>Reliability</i>		
$\Delta \log(\gamma)$	undetermined	

#### Comments on Preferred Values

Even though the study using the more sensitive method to detect O<sub>3</sub> at very low concentration detects a measurable loss of O<sub>3</sub>, which decreases with time, the authors caution that they may have observed uptake of O<sub>3</sub> into cracks and remaining liquid nitric acid solution of the not well characterized NAT film. At higher O<sub>3</sub> concentration, the study by Kenner et al. could not detect any uptake. No products have been observed. We therefore use the lowest observed uptake coefficient of the experiment by Dlugokencky and Ravishankara (1992) to recommend an upper limit for  $\gamma$ .

## References

- Kenner, R. D., Plumb, I. C., and Ryan, K. R.: Laboratory measurement of the loss of ClO on pyrex, ice and NAT at 183 K, *Geophys. Res. Lett.*, 20, 193-196, 1993.
- Dlugokencky, E. J., and Ravishankara, A. R.: Laboratory Measurements of Direct Ozone Loss on Ice and Doped-Ice Surfaces, *Geophys. Res. Lett.*, 19, 41-44, 1992.