# IUPAC Subcommittee on Gas Kinetic Data Evaluation – Data Sheet NOx7

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$$O(^1D) + N_2O \rightarrow N_2 + O_2 \quad (1)$$
$$\rightarrow 2NO \quad (2)$$

$\Delta H°(1) = -521.0$ kJ·mol$^{-1}$
$\Delta H°(2) = -340.4$ kJ·mol$^{-1}$

**Rate coefficient data ($k = k_1 + k_2$)**

| $k$/cm$^3$ molecule$^{-1}$ s$^{-1}$ | Temp./K | **Reference** | Technique/ Comments |
|---|---|---|---|
| *Absolute Rate Coefficients* | | | |
| $(1.1 \pm 0.2) \times 10^{-10}$ | 204-359 | Davidson *et al*., 1977[1] | PLP (a) |
| $(1.20 \pm 0.1) \times 10^{-10}$ | 295 | Amimoto *et al*., 1979[2] | PLP-RA (b) |
| $(1.17 \pm 0.12) \times 10^{-10}$ | 298 | Wine and Ravishankara, 1981[3] | PLP-RF (b) |
| *Branching Ratios* | | | |
| $k_2/k = 0.62 \pm 0.02$ | 298 | Marx, Bahe and Schurath, 1979[4] | P-GC/CL |
| $k_2/k = 0.62 \pm 0.09$ | 177-296 | Lam *et al*., 1981[5] | P-CL |
| $k_2/k = 0.61 \pm 0.08$ | 296 | Cantrell, Shetter and Calvert, 1994[6] | (c) |

**Comments**

(a) $O(^1D)$ atoms were monitored by time-resolved detection of $O(^1D) \rightarrow O(^3P)$ emission.
(b) $O(^3P)$ atom product monitored.
(c) Static photolysis of $N_2O$-$O_3$ mixtures at $\lambda$>240 nm with product analysis by FTIR spectroscopy. The amount of NO formed in reaction (2) was determined from the yield of $HNO_3$ formed by total oxidation and hydration of $NO_x$ products, corrected for losses to the wall. The value of $k_2/k$ obtained from the experimental data was $0.57 \pm 0.08$; the value given in the table was obtained by averaging the experimental value with selected literature data.

## Preferred Values

$k_1 = 4.4 \times 10^{-11}$ cm$^3$ molecule$^{-1}$ s$^{-1}$, independent of temperature over the range 200-350 K.
$k_2 = 7.2 \times 10^{-11}$ cm$^3$ molecule$^{-1}$ s$^{-1}$, independent of temperature over the range 200-350 K.

*Reliability*

$\Delta \log k_1 = \Delta \log k_2 = \pm 0.1$ at 298 K.
$\Delta(E_1/R) = (E_2/R) = \pm 100$ K.

*Comments on Preferred Values*

The data and recommendation for the branching ratio at room temperature of $k_2/k = 0.61 \pm 0.08$ given by Cantrell *et al*.[6] are in accord with the earlier results of Marx *et al*.[4] and Lam *et al*.[5] The overall rate coefficient values at room temperature are the average of the results of Davidson *et al*.,[1] Amimoto *et al*.[2] and Wine and Ravishankara,[3] all of which are in close agreement (see also data by Volltrauer *et al.*[8]). The temperature independence reported by Davidson *et al*.[1,7] is accepted.

## References


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