# Supplementary Information

# The influence of gas-liquid interfacial transport theory on numerical modelling of Plasma Activation of Water

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*Table 1: Gaseous and aqueous species included in the one-film and two-film models. The short-lived species only exist in the plasma region. The long-lived species exist in both the plasma and air-gap regions, and are absorbed into the liquid phase. The aqueous species exist in the liquid phase and can be desorbed back into the air gap if a negative concentration gradient occurs across the gas-liquid interface.*

| **Air-plasma species** | |
|---|---|
| **Short-lived species** | **Long-lived species** |
| $e^-$, $N(^2D)$, $N_2(A^3\Sigma)$, $N_2(B^3\Pi)$, $N^+$, $N_2^+$, $O(^1D)$, $O_2^+$, $O^+$, $H_2O^+$, $H$, $OH^+$, $H^+$, $H_2^+$, $NO_2^+$, $N_3^+$, $N_4^+$, $O_4^+$, $N_2O^+$, $NO^+$, $H_3^+$, $H_3O^+$, $O^-$, $O_2^-$, $O_3^-$, $NO^-$, $NO_2^-$, $NO_3^-$, $H^-$, $OH^-$, $O_4^-$, $N_2O^-$, | $N_2$, $N$, $O_2$, $O$, $O_2(a^1\Delta)$, $O_3$, $H_2O$, $OH$, $H_2$, $N_2O_5$, $NO_3$, $NO$, $N_2O$, $NO_2$, $HNO_3$, $HO_2$, $N_2O_3$, $N_2O_4$, $H_2O_2$, $HNO$, $HNO_2$, |
| **Aqueous species** | |
| $O$, $O_2$, $O_2(a^1\Delta)$, $O_3$, $OH$, $ONOOH$, $O_2NOOH$, $H$, $H_2$, $H_2O_2$, $HO_2$, $HO_3$, $HNO$, $HNO_2$, $HNO_3$, $N$, $N_2$, $NO$, $NO_2$, $NO_3$, $N_2O$, $N_2O_3$, $N_2O_4$, $N_2O_5$, $H^+$, $O^-$, $O_2^-$, $O_3^-$, $OH^-$, $ONOO^-$, $O_2NOO^-$, $HO_2^-$, $NO_2^-$, $NO_3^-$ | |

*Table 2: Liquid-phase chemical reactions included in both the one-film and two-film models.*

| Reversible reactions | | | | |
|---|---|---|---|---|
| No. | Reaction | Forward rate coefficient | Reverse rate coefficient | Source |
| 1 | $H_2O \rightleftharpoons H^+ + OH^-$ | $1.90 \times 10^5 \times e^{-\frac{6800}{T_{liq}}}\ s^{-1}$ | $1.3 \times 10^{11}\ M^{-1}s^{-1}$ | [1] |
| 2 | $H_2O_2 \rightleftharpoons H^+ + HO_2^-$ | $5.0 \times 10^{10} \times 2.2 \times 10^{-12} \times e^{-3730\times\left(\frac{1}{T_{liq}}-\frac{1}{298}\right)}\ s^{-1}$ | $5.0 \times 10^{10}\ M^{-1}s^{-1}$ | [2] [3] |
| 3 | $2HNO_2 \rightleftharpoons NO + NO_2\ (+ H_2O)$ | $13.4\ M^{-1}s^{-1}$ | $1.1 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 4 | $HNO_2 \rightleftharpoons H^+ + NO_2^-$ | $9.73 \times 10^9 \times e^{-\frac{1760}{T_{liq}}}\ s^{-1}$ | $5 \times 10^{10}\ M^{-1}s^{-1}$ | [1] |
| 5 | $HNO_3 \rightleftharpoons H^+ + NO_3^-$ | $2.6 \times 10^9 \times e^{\frac{1800}{T_{liq}}}\ s^{-1}$ | $5 \times 10^{10}\ M^{-1}s^{-1}$ | [1] |
| 6 | $HO_2 + NO_2 \rightleftharpoons O_2NOOH$ | $1.8 \times 10^9\ M^{-1}s^{-1}$ | $5.27 \times 10^{16} \times e^{-\frac{13200}{T_{liq}}}\ s^{-1}$ | [4] [5] |
| 7 | $HO_2 \rightleftharpoons H^+ + O_2^-$ | $5.0 \times 10^{10} \times 10^{-4.57}\ s^{-1}$ | $5.0 \times 10^{10}\ M^{-1}s^{-1}$ | [3] |
| 8 | $HO_3 \rightleftharpoons H^+ + O_3^-$ | $1.4 \times 10^5\ s^{-1}$ | $5 \times 10^{10}\ M^{-1}s^{-1}$ | [4] |
| 9 | $NO + NO_2 \rightleftharpoons N_2O_3$ | $1.1 \times 10^9\ M^{-1}s^{-1}$ | $8.4 \times 10^4\ s^{-1}$ | [4] |
| 10 | $2NO_2 \rightleftharpoons N_2O_4$ | $4.5 \times 10^8\ M^{-1}s^{-1}$ | $6.9 \times 10^3\ s^{-1}$ | [4] |

| | | | | |
|---|---|---|---|---|
| 11 | $2NO_2\ (+H_2O) \rightleftharpoons 2H^+ + NO_2^- + NO_3^-$ | $1.5\times10^{10} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | $41\ M^{-3}s^{-1}$ | [2] [4] |
| 12 | $NO_2 + O_2^- \rightleftharpoons O_2NOO^-$ | $4.5\times10^{9}\ M^{-1}s^{-1}$ | $1.05\ s^{-1}$ | [4] |
| 13 | $O + O_2 \rightleftharpoons O_3$ | $4.0\times10^{9}\ M^{-1}s^{-1}$ | $3.0\times10^{-6}\ s^{-1}$ | [4] |
| 14 | $O^- + O_2 \rightleftharpoons O_3^-$ | $3.6\times10^{9}\ M^{-1}s^{-1}$ | $3.3\times10^{3}\ s^{-1}$ | [4] |
| 15 | $O_2NOOH \rightleftharpoons H^+ + O_2NOO^-$ | $5\times10^{5}\ s^{-1}$ | $5\times10^{5} \times 10^{5.9}\ M^{-1}s^{-1}$ | [1] [1] |
| 16 | $OH + OH^- \rightleftharpoons H_2O + O^-$ | $1.3\times10^{10}\ M^{-1}s^{-1}$ | $1.7\times10^{6}\ M^{-1}s^{-1}$ | [4] |
| 17 | $OH \rightleftharpoons H^+ + O^-$ | $1.0\times10^{11}\times10^{-11.9}\ s^{-1}$ | $1.0\times10^{11}\ M^{-1}s^{-1}$ | [3] |
| 18 | $ONOO^- \rightleftharpoons NO + O_2^-$ | $0.02\ s^{-1}$ | $5\times10^{9}\ M^{-1}s^{-1}$ | [4] |
| 19 | $ONOO^- \rightleftharpoons NO_2 + O^-$ | $1\times10^{-6}\ s^{-1}$ | $3.5\times10^{9}\ M^{-1}s^{-1}$ | [4] |
| 20 | $ONOOH \rightleftharpoons H^+ + ONOO^-$ | $5\times10^{5}\ s^{-1}$ | $5\times10^{5} \times 10^{6.6}\ M^{-1}s^{-1}$ | [2] [1] |
| 21 | $ONOOH \rightleftharpoons NO_2 + OH$ | $0.35\ s^{-1}$ | $4.5\times10^{9}\ M^{-1}s^{-1}$ | [4] |

[1]Reverse rate coefficient calculated from forward reaction using pKa from [4]
[2]Forward rate coefficient estimated to be the same as that of Reaction 15

Irreversible reactions

| No. | Reaction | Rate coefficient | Source |
|---|---|---|---|
| 22 | $2H \rightarrow H_2$ | $7.8\times10^{9}\ M^{-1}s^{-1}$ | [4] |
| 23 | $H + H_2O \rightarrow H_2 + OH$ | $11\ M^{-1}s^{-1}$ | [4] |
| 24 | $H + H_2O_2 \rightarrow H_2O + OH$ | $9.0\times10^{7}\ M^{-1}s^{-1}$ | [4] |
| 25 | $H + HNO_2 \rightarrow H_2O + NO$ | $4.5\times10^{8}\ M^{-1}s^{-1}$ | [6] |
| 26 | $H + HO_2 \rightarrow H_2O_2$ | $1.8\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 27 | $H + HO_2^- \rightarrow OH + OH^-$ | $9.0\times10^{7}\ M^{-1}s^{-1}$ | [4] |
| 28 | $H + N_2O \rightarrow N_2 + OH$ | $2.1\times10^{6}\ M^{-1}s^{-1}$ | [4] |
| 29 | $H + NO_2 \rightarrow HNO_2$ | $1.0\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 30 | $H + NO_2^- \rightarrow NO + OH^-$ | $7.1\times10^{8}\ M^{-1}s^{-1}$ | [4] |
| 31 | $H + O^- \rightarrow OH^-$ | $1.1\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 32 | $H + O_2 \rightarrow HO_2$ | $2.1\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 33 | $H + O_2^- \rightarrow HO_2^-$ | $1.8\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 34 | $H + O_3 \rightarrow HO_3$ | $3.8\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 35 | $H + O_3^- \rightarrow O_2 + OH^-$ | $1.0\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 36 | $H + OH \rightarrow H_2O$ | $7.0\times10^{9}\ M^{-1}s^{-1}$ | [4] |
| 37 | $H^+ + H_2O_2 + NO_2^- \rightarrow H_2O + ONOOH$ | $1.1\times10^{3}\ M^{-2}s^{-1}$ | [7] |
| 38 | $H^+ + O_3^- \rightarrow O_2 + OH$ | $9.0\times10^{10}\ M^{-1}s^{-1}$ | [4] |
| 39 | $H^+ + ONOOH \rightarrow 2H^+ + NO_3^-$ | $4.3\ M^{-1}s^{-1}$ | [4] |
| 40 | $H_2 + H_2O_2 \rightarrow H + H_2O + OH$ | $6\times10^{6}\ M^{-1}s^{-1}$ | [6] |
| 41 | $H_2 + O^- \rightarrow H + OH^-$ | $8.0\times10^{7}\ M^{-1}s^{-1}$ | [4] |
| 42 | $H_2 + OH \rightarrow H + H_2O$ | $4\times10^{7}\ M^{-1}s^{-1}$ | [6] |
| 43 | $HO_2 + O_2^-\ (+H_2O) \rightarrow H_2O_2 + O_2 + OH^-$ | $1.5\times10^{10}\times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 44 | $H_2O + N_2O_3 \rightarrow 2HNO_2$ | $1.16\times10^{4}\ M^{-1}s^{-1}$ | [6] |
| 45 | $H_2O + N_2O_4 \rightarrow HNO_2 + HNO_3$ | $8.00\times10^{2}\ M^{-1}s^{-1}$ | [6] |
| 46 | $H_2O + N_2O_5 \rightarrow H_2O + NO_2 + NO_3$ | $84\ M^{-1}s^{-1}$ | [6] |
| 47 | $H_2O + N_2O_5 \rightarrow 2HNO_3$ | $1\ M^{-1}s^{-1}$ | [6] |
| 48 | $H_2O + N_2O_5 \rightarrow 2ONOOH$ | $1\ M^{-1}s^{-1}$ | [6] |
| 49 | $H_2O + NO_2^- + O^- \rightarrow NO_2 + 2OH^-$ | $1.10\times10^{-17}\ M^{-2}s^{-1}$ | [6] |
| 50 | $H_2O + NO_3 \rightarrow HNO_3 + OH$ | $2.9\times10^{7}\ M^{-1}s^{-1}$ | [6] |

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|---|---|---|---|
| 51 | $H_2O_2 + HNO_2 \rightarrow H_2O + ONOOH$ | $1.4 \times 10^2 \times [H^+]\ M^{-1}s^{-1}$ | [4] |
| 52 | $H_2O_2 + HNO_2 \rightarrow 2H^+ + H_2O + NO_3^-$ | $3.7 \times 10^{13} \times [H^+] \times e^{-\frac{6700}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 53 | $H_2O_2 + HO_2 \rightarrow H_2O + O_2 + OH$ | $0.5\ M^{-1}s^{-1}$ | [4] |
| 54 | $H_2O_2 + NO_3 \rightarrow H^+ + HO_2 + NO_3^-$ | $4.0 \times 10^9 \times e^{-\frac{2000}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 55 | $H_2O_2 + O \rightarrow HO_2 + OH$ | $1.6 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 56 | $H_2O_2 + O^- \rightarrow H_2O + O_2^-$ | $5.0 \times 10^7\ M^{-1}s^{-1}$ | [4] |
| 57 | $H_2O_2 + O_2^- \rightarrow O_2 + OH + OH^-$ | $0.13\ M^{-1}s^{-1}$ | [4] |
| 58 | $H_2O_2 + O_3 \rightarrow HO_2 + O_2 + OH$ | $6.5 \times 10^{-3}\ M^{-1}s^{-1}$ | [4] |
| 59 | $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$ | $7.8 \times 10^{-3} \times [O_3]^{-\frac{1}{2}}\ M^{-1}s^{-1}$ | [2] |
| 60 | $H_2O_2 + OH \rightarrow H_2O + HO_2$ | $8.4 \times 10^9 \times e^{-\frac{1680}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 61 | $HNO + O_2 \rightarrow HO_2 + NO$ | $5.00\ M^{-1}s^{-1}$ | [6] |
| 62 | $HNO + O_3 \rightarrow HNO_2 + O_2$ | $5.79 \times 10^6\ M^{-1}s^{-1}$ | [6] |
| 63 | $HNO + OH \rightarrow H_2O + NO$ | $4.82 \times 10^{10}\ M^{-1}s^{-1}$ | [6] |
| 64 | $HNO_2 + O_2NOOH \rightarrow 2H^+ + 2NO_3^-$ | $12\ M^{-1}s^{-1}$ | [4] |
| 65 | $HNO_2 + O_2NOOH \rightarrow 2HNO_3$ | $12.0\ M^{-1}s^{-1}$ | [6] |
| 66 | $HNO_2 + OH \rightarrow H_2O + NO_2$ | $1.5 \times 10^{11} \times e^{-\frac{1500}{t_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 67 | $HNO_3 + OH \rightarrow H_2O + NO_3$ | $5.3 \times 10^7\ M^{-1}s^{-1}$ | [4] |
| 68 | $HO_2 + HO_3 \rightarrow H_2O_2 + 1.5O_2$ | $5 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 69 | $2HO_2 \rightarrow H_2O_2 + O_2$ | $7.6 \times 10^9 \times e^{-\frac{2720}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 70 | $HO_2 + HO_2^- \rightarrow O_2 + OH + OH^-$ | $0.5\ M^{-1}s^{-1}$ | [4] |
| 71 | $HO_2 + NO \rightarrow ONOOH$ | $3.2 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 72 | $HO_2 + NO \rightarrow HNO_3$ | $3.21 \times 10^9\ M^{-1}s^{-1}$ | [6] |
| 73 | $HO_2 + NO_3 \rightarrow H^+ + NO_3^- + O_2$ | $6.9 \times 10^{11} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 74 | $HO_2 + O^- \rightarrow O_2 + OH^-$ | $6.0 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 75 | $HO_2 + O_2^- \rightarrow HO_2^- + O_2$ | $8.0 \times 10^7\ M^{-1}s^{-1}$ | [4] |
| 76 | $HO_2 + O_3 \rightarrow HO_3 + O_2$ | $5.0 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 77 | $HO_2 + O_3 \rightarrow 2O_2 + OH$ | $1.0 \times 10^4\ M^{-1}s^{-1}$ | [4] |
| 78 | $HO_2 + O_3^- \rightarrow 2O_2 + OH^-$ | $6.0 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 79 | $HO_2 + OH \rightarrow H_2O + O_2$ | $1.1 \times 10^{12} \times e^{-\frac{1500}{t_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 80 | $HO_2^- + O \rightarrow O_2^- + OH$ | $5.3 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 81 | $HO_2^- + O^- \rightarrow O_2^- + OH$ | $4.0 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 82 | $HO_2^- + O_2^- \rightarrow O^- + O_2 + OH$ | $0.13\ M^{-1}s^{-1}$ | [4] |
| 83 | $HO_2^- + O_3 \rightarrow O_2 + O_2^- + OH$ | $5.5 \times 10^6\ M^{-1}s^{-1}$ | [4] |
| 84 | $HO_2^- + OH \rightarrow HO_2 + OH^-$ | $7.5 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 85 | $2HO_3 \rightarrow H_2O_2 + 2O_2$ | $5 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 86 | $HO_3 + O_2^- \rightarrow 2O_2 + OH^-$ | $1 \times 10^{10}\ M^{-1}s^{-1}$ | [4] |
| 87 | $HO_3 + OH \rightarrow H_2O_2 + O_2$ | $5 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 88 | $HO_3 \rightarrow O_2 + OH$ | $1.1 \times 10^5\ s^{-1}$ | [4] |
| 89 | $2N \rightarrow N_2$ | $3 \times 10^7\ M^{-1}s^{-1}$ | [6] |
| 90 | $N_2O + NO_2^- \rightarrow N_2 + NO_3^-$ | $3 \times 10^8\ M^{-1}s^{-1}$ | [6] |
| 91 | $N_2O_3 + ONOO^- \rightarrow 2NO_2 + NO_2^-$ | $3 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 92 | $N_2O_3\ (+\ OH^-) \rightarrow H^+ + 2NO_2^-$ | $2 \times 10^3 + 1 \times 10^8 \times [OH^-]\ s^{-1}$ | [4] |
| 93 | $N_2O_4\ (+\ H_2O) \rightarrow 2H^+ + NO_2^- + NO_3^-$ | $1 \times 10^3\ s^{-1}$ | [4] |
| 94 | $N_2O_5\ (+\ H_2O) \rightarrow 2H^+ + 2NO_3^-$ | $5 \times 10^9\ s^{-1}$ | [4] |
| 95 | $2NO + O_2 \rightarrow 2NO_2$ | $2.3 \times 10^6\ M^{-2}s^{-1}$ | [4] |

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| 96 | $NO + NO_2\ (+H_2O) \rightarrow 2H^+ + 2NO_2^-$ | $3.1 \times 10^{10} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 97 | $NO + O_2^- \rightarrow NO_3^-$ | $4 \times 10^9\ M^{-1}s^{-1}$ | [6] |
| 98 | $NO + OH \rightarrow H^+ + NO_2^-$ | $3.1 \times 10^{12} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 99 | $NO + OH \rightarrow HNO_2$ | $2.0 \times 10^{10}\ M^{-1}s^{-1}$ | [6] |
| 100 | $2NO_2\ (+H_2O) \rightarrow H^+ + HNO_2 + NO_3^-$ | $5.0 \times 10^{3} \times e^{\frac{2900}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 101 | $NO_2 + NO_3 \rightarrow N_2O_5$ | $1.7 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 102 | $NO_2 + O_2^- \rightarrow NO_2^- + O_2$ | $1 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 103 | $NO_2 + OH \rightarrow H^+ + NO_3^-$ | $2.0 \times 10^{11} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 104 | $NO_2 + OH \rightarrow HNO_3$ | $1 \times 10^{10}\ M^{-1}s^{-1}$ | [6] |
| 105 | $NO_2^- + NO_3 \rightarrow NO_2 + NO_3^-$ | $1.8 \times 10^{11} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 106 | $NO_2^- + O_3 \rightarrow NO_3^- + O_2$ | $8 \times 10^{15} \times e^{-\frac{7000}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 107 | $NO_2^- + OH \rightarrow NO_2 + OH^-$ | $1.5 \times 10^{12} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 108 | $NO_3 + O_2^- \rightarrow NO_3^- + O_2$ | $1.5 \times 10^{11} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 109 | $NO_3 + OH^- \rightarrow NO_3^- + OH$ | $8.1 \times 10^{11} \times e^{-\frac{2700}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 110 | $2O \rightarrow O_2$ | $2.8 \times 10^{10}\ M^{-1}s^{-1}$ | [4] |
| 111 | $O + OH^- \rightarrow HO_2^-$ | $4.2 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 112 | $O\ (+H_2O) \rightarrow 2OH$ | $50\ s^{-1}$ | [4] |
| 113 | $2O^-\ (+H_2O) \rightarrow HO_2^- + OH^-$ | $1.0 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 114 | $O^- + O_2^-\ (+H_2O) \rightarrow O_2 + 2OH^-$ | $6.0 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 115 | $O^- + O_3 \rightarrow O_2 + O_2^-$ | $5.0 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 116 | $O^- + O_3^- \rightarrow 2O_2^-$ | $7.0 \times 10^8\ M^{-1}s^{-1}$ | [4] |
| 117 | $O^- + OH \rightarrow HO_2^-$ | $2.6 \times 10^{10}\ M^{-1}s^{-1}$ | [4] |
| 118 | $2O_2^-\ (+2H_2O) \rightarrow H_2O_2 + O_2 + 2OH^-$ | $0.3\ M^{-1}s^{-1}$ | [4] |
| 119 | $O_2^- + O_3 \rightarrow O_2 + O_3^-$ | $1.6 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 120 | $O_2^- + O_3\ (+H_2O) \rightarrow 2O_2 + OH + OH^-$ | $7.6 \times 10^{9} \times e^{-\frac{1500}{T_{liq}}}\ M^{-1}s^{-1}$ | [2] |
| 121 | $O_2^- + OH \rightarrow O_2 + OH^-$ | $1.4 \times 10^{13} \times e^{-\frac{2120}{T_{liq}}}\ M^{-1}s^{-1}$ | [1] |
| 122 | $O_2(a^1\Delta) + OH \rightarrow O_2 + OH$ | $2.2 \times 10^3\ M^{-1}s^{-1}$ | [4] |
| 123 | $O_2(a^1\Delta) \rightarrow O_2$ | $2.5 \times 10^5\ s^{-1}$ | [4] |
| 124 | $O_2NOO^- \rightarrow NO_2^- + O_2$ | $3 \times 10^{18} \times e^{-\frac{12700}{T_{liq}}}\ s^{-1}$ | [5] |
| 125 | $O_2NOOH \rightarrow HNO_2 + O_2$ | $7 \times 10^{-4}\ s^{-1}$ | [6] |
| 126 | $O_3 + OH \rightarrow HO_2 + O_2$ | $3 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 127 | $O_3 + OH^- \rightarrow HO_2^- + O_2$ | $40\ M^{-1}s^{-1}$ | [4] |
| 128 | $O_3 + OH^- \rightarrow HO_2 + O_2^-$ | $70\ M^{-1}s^{-1}$ | [4] |
| 129 | $O_3^- + OH \rightarrow HO_2 + O_2^-$ | $6 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 130 | $O_3^- + OH \rightarrow O_3 + OH^-$ | $2.5 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 131 | $O_3^-\ (+H_2O) \rightarrow O_2 + OH + OH^-$ | $25\ s^{-1}$ | [4] |
| 132 | $OH + N_2O \rightarrow HNO + NO$ | $2.3 \times 10^4\ M^{-1}s^{-1}$ | [6] |
| 133 | $2OH \rightarrow H_2O_2$ | $5.0 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 134 | $OH + ONOO^- \rightarrow H^+ + NO_2^- + O_2^-$ | $4 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 135 | $OH + ONOO^- \rightarrow NO + O_2 + O_2^-$ | $4.8 \times 10^9\ M^{-1}s^{-1}$ | [4] |
| 136 | $ONOO^- + ONOOH \rightarrow NO_2^- + O_2NOOH$ | $1.3 \times 10^3\ M^{-1}s^{-1}$ | [4] |
| 137 | $ONOO^- \rightarrow NO_3^-$ | $8 \times 10^{-6}\ s^{-1}$ | [4] |

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| 138 | $ONOOH \rightarrow H^{+} + NO_3^{-}$ | $7.3 \times 10^{15} \times e^{-\frac{10800}{T_{liq}}}\ s^{-1}$ | [5] |
| 139 | $ONOOH \rightarrow HNO_3$ | $8.5 \times 10^{9} \times e^{-\frac{7500}{T_{liq}}}\ s^{-1}$ | [8] |

## References


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