

## **Reactions and rate constants used in the peroxy models**

## II.1 Chemistry of the CH<sub>3</sub>O<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{CH}_4 \rightarrow \text{HF} + \text{CH}_3$	$6.4 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3 + \text{CH}_3 \rightarrow \text{CH}_3\text{CH}_3$	$4 \times 10^{-11}$	Wang and Fockenberg (2001)
$\text{CH}_3 + \text{O}_2 \rightarrow \text{CH}_3\text{O}_2$	$6 \times 10^{-14}$ at 6 Torr	Sander <i>et al.</i> (2003)
$\text{CH}_3 + \text{CH}_3\text{O}_2 \rightarrow \text{CH}_3\text{O} + \text{CH}_3\text{O}$	$(1 - 4) \times 10^{-11}$	varied
$\text{CH}_3\text{O}_2 + \text{CH}_3\text{O}_2 \rightarrow \text{CH}_3\text{O} + \text{CH}_3\text{O} + \text{O}_2$	$1.3 \times 10^{-13}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3\text{O}_2 + \text{CH}_3\text{O}_2 \rightarrow \text{CH}_2\text{O} + \text{CH}_3\text{OH} + \text{O}_2$	$2.4 \times 10^{-13}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3\text{O}_2 + \text{CH}_3\text{O} \rightarrow \text{products}$	$4 \times 10^{-12}$	estimated
$\text{CH}_3\text{O} + \text{CH}_3\text{O} \rightarrow \text{products}$	$1.3 \times 10^{-11}$	Biggs <i>et al.</i> (1997)
$\text{CH}_3\text{O} \rightarrow \text{products}$	$0 - 50 \text{ s}^{-1}$	varied
$\text{CH}_3\text{O}_2 \rightarrow \text{products}$	$5 - 7 \text{ s}^{-1}$	varied
$\text{F} + \text{CH}_3\text{O}_2 \rightarrow \text{FO} + \text{CH}_3\text{O}$	$(1 - 5) \times 10^{-10}$	estimated and varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{CH}_3\text{O} + \text{O}_2 \rightarrow \text{CH}_2\text{O} + \text{HO}_2$	$1.9 \times 10^{-15}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3\text{O}_2 + \text{HO}_2 \rightarrow \text{CH}_3\text{O}_2\text{H} + \text{O}_2$	$5.2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3\text{O}_2 + \text{NO} \rightarrow \text{NO}_2 + \text{CH}_3\text{O}$	$7.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_3\text{O} + \text{NO} \rightarrow \text{products}$	$5 \times 10^{-12}$	Daële <i>et al.</i> (1995)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{CH}_4 \rightarrow \text{H}_2\text{O} + \text{CH}_3$	$6.3 \times 10^{-15}$	Sander <i>et al.</i> (2003)
$\text{CH}_3 + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-13}$	Vakhtin and. Petrov (1991)
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + \text{CH}_3\text{O}_2 \rightarrow \text{NO}_2 + \text{CH}_3\text{O} + \text{O}_2$	$(0.1 - 2.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{CH}_3\text{O} \rightarrow \text{NO}_2 + \text{CH}_3\text{O}_2$	$(1.5 - 3.5) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

## II.2 Chemistry of the C<sub>2</sub>H<sub>5</sub>O<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{C}_2\text{H}_6 \rightarrow \text{HF} + \text{C}_2\text{H}_5$	$1.7 \times 10^{-10}$	Persky (2003)
$\text{C}_2\text{H}_5 + \text{C}_2\text{H}_5 \rightarrow \text{products}$	$2 \times 10^{-11}$	Baulch <i>et al.</i> (1992)
$\text{C}_2\text{H}_5 + \text{O}_2 \rightarrow \text{C}_2\text{H}_5\text{O}_2$	$(2 - 4.2) \times 10^{-12}$ at 6 Torr	varied, Plumb and Ryan (1981)
$\text{C}_2\text{H}_5 + \text{O}_2 \rightarrow \text{C}_2\text{H}_4 + \text{HO}_2$	$(1 - 2) \times 10^{-13}$ at 6 Torr	varied, Plumb and Ryan (1981)
$\text{C}_2\text{H}_5 + \text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{C}_2\text{H}_5\text{O} + \text{C}_2\text{H}_5\text{O}$	$(2.3 - 40) \times 10^{-12}$	varied
$\text{C}_2\text{H}_5\text{O}_2 + \text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{C}_2\text{H}_5\text{O} + \text{C}_2\text{H}_5\text{O} + \text{O}_2$	$4.3 \times 10^{-14}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5\text{O}_2 + \text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{C}_2\text{H}_4\text{O} + \text{C}_2\text{H}_5\text{OH} + \text{O}_2$	$2.5 \times 10^{-14}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5\text{O}_2 + \text{C}_2\text{H}_5\text{O} \rightarrow \text{products}$	$2 \times 10^{-12}$	estimated
$\text{C}_2\text{H}_5\text{O} + \text{C}_2\text{H}_5\text{O} \rightarrow \text{products}$	$1.5 \times 10^{-11}$	estimated
$\text{C}_2\text{H}_5\text{O} \rightarrow \text{products}$	$0 - 50 \text{ s}^{-1}$	varied
$\text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{products}$	$4 - 7 \text{ s}^{-1}$	varied
$\text{F} + \text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{FO} + \text{C}_2\text{H}_5\text{O}$	$(1 - 5) \times 10^{-10}$	varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{C}_2\text{H}_5\text{O} + \text{O}_2 \rightarrow \text{C}_2\text{H}_4\text{O} + \text{HO}_2$	$8.1 \times 10^{-15}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5\text{O}_2 + \text{HO}_2 \rightarrow \text{C}_2\text{H}_5\text{O}_2\text{H} + \text{O}_2$	$8 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5\text{O}_2 + \text{NO} \rightarrow \text{NO}_2 + \text{C}_2\text{H}_5\text{O}$	$9.2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5\text{O} + \text{NO} \rightarrow \text{products}$	$1.5 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{C}_2\text{H}_6 \rightarrow \text{H}_2\text{O} + \text{C}_2\text{H}_5$	$2.4 \times 10^{-13}$	Atkinson <i>et al.</i> (2005)
$\text{C}_2\text{H}_5 + \text{NO} \rightarrow \text{products}$	$(3 - 100) \times 10^{-13}$	varied
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + \text{C}_2\text{H}_5\text{O}_2 \rightarrow \text{NO}_2 + \text{C}_2\text{H}_5\text{O}_2$	$(0.5 - 6.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{C}_2\text{H}_5\text{O} \rightarrow \text{NO}_2 + \text{C}_2\text{H}_5\text{O}_2$	$(1.5 - 3.5) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

## II.3 Chemistry of the CH<sub>2</sub>FO<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{CH}_3\text{F} \rightarrow \text{HF} + \text{CH}_2\text{F}$	$3 \times 10^{-11}$	Moore and Smith (1995)
$\text{CH}_2\text{F} + \text{CH}_2\text{F} \rightarrow \text{CH}_2\text{FCH}_2\text{F}$	$1.3 \times 10^{-11}$	Beiderhase <i>et al.</i> (1995)
$\text{CH}_2\text{F} + \text{O}_2 \rightarrow \text{CH}_2\text{FO}_2$	$(1 - 2) \times 10^{-13}$ at 5 Torr	estimated and varied
$\text{CH}_2\text{F} + \text{CH}_2\text{FO}_2 \rightarrow \text{CH}_2\text{FO} + \text{CH}_2\text{FO}$	$(1 - 2) \times 10^{-11}$	estimated and varied
$\text{CH}_2\text{FO}_2 + \text{CH}_2\text{FO}_2 \rightarrow \text{CH}_2\text{FO} + \text{CH}_2\text{FO} + \text{O}_2$	$2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005), estimated branching ratio
$\text{CH}_2\text{FO}_2 + \text{CH}_2\text{FO}_2 \rightarrow$ $\text{HC(O)F} + \text{CH}_2\text{FOH} + \text{O}_2$	$1 \times 10^{-12}$	Atkinson <i>et al.</i> (2005), estimated branching ratio
$\text{CH}_2\text{FO}_2 + \text{CH}_2\text{FO} \rightarrow \text{products}$	$(0.4 - 1.4) \times 10^{-11}$	varied
$\text{CH}_2\text{FO} + \text{CH}_2\text{FO} \rightarrow \text{products}$	$1.3 \times 10^{-11}$	estimate
$\text{CH}_2\text{FO} \rightarrow \text{products}$	$0 - 50 \text{ s}^{-1}$	varied
$\text{CH}_2\text{FO}_2 \rightarrow \text{products}$	$0 - 3 \text{ s}^{-1}$	varied
$\text{F} + \text{CH}_2\text{FO}_2 \rightarrow \text{FO} + \text{CH}_2\text{FO}$	$(1 - 5) \times 10^{-10}$	estimated and varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{CH}_2\text{FO} + \text{O}_2 \rightarrow \text{HC(O)F} + \text{HO}_2$	$(5 - 8) \times 10^{-14}$	estimated and varied
$\text{CH}_2\text{FO}_2 + \text{HO}_2 \rightarrow \text{products}$	$5.0 \times 10^{-12}$	estimated
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{FO}_2 + \text{NO} \rightarrow \text{NO}_2 + \text{CH}_2\text{FO}$	$1.3 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{FO} + \text{NO} \rightarrow \text{products}$	$5 \times 10^{-12}$	estimated
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{CH}_3\text{F} \rightarrow \text{H}_2\text{O} + \text{CH}_2\text{F}$	$2 \times 10^{-14}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{F} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-13}$	estimated
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + \text{CH}_2\text{FO}_2 \rightarrow \text{NO}_2 + \text{CH}_2\text{FO} + \text{O}_2$	$(0.1 - 4.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{CH}_2\text{FO} \rightarrow \text{NO}_2 + \text{CH}_2\text{FO}_2$	$(2 - 4) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

## II.4 Chemistry of the CH<sub>2</sub>ClO<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{CH}_3\text{Cl} \rightarrow \text{HF} + \text{CH}_2\text{Cl}$	$3.3 \times 10^{-11}$	Wallington <i>et al.</i> (1993)
$\text{CH}_2\text{Cl} + \text{CH}_2\text{Cl} \rightarrow \text{CH}_2\text{ClCH}_2\text{Cl}$	$1 \times 10^{-11}$	Roussel <i>et al.</i> (1991)
$\text{CH}_2\text{Cl} + \text{O}_2 \rightarrow \text{CH}_2\text{ClO}_2$	$2.3 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{Cl} + \text{CH}_2\text{ClO}_2 \rightarrow \text{CH}_2\text{ClO} + \text{CH}_2\text{ClO}$	$(0.6 - 1.2) \times 10^{-11}$	varied
$\text{CH}_2\text{ClO}_2 + \text{CH}_2\text{ClO}_2 \rightarrow \text{CH}_2\text{ClO} + \text{CH}_2\text{ClO} + \text{O}_2$	$3.3 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{ClO}_2 + \text{CH}_2\text{ClO}_2 \rightarrow \text{HC(O)Cl} + \text{CH}_2\text{ClOH} + \text{O}_2$	$0.3 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{ClO}_2 + \text{CH}_2\text{ClO} \rightarrow \text{products}$	$(0.4 - 1.4) \times 10^{-11}$	varied
$\text{CH}_2\text{ClO} + \text{CH}_2\text{ClO} \rightarrow \text{products}$	$1.3 \times 10^{-11}$	estimated
$\text{CH}_2\text{ClO} \rightarrow \text{HCl} + \text{HCO}$	$325 - 650 \text{ s}^{-1}$ at 5 Torr	Wu and Carr (2001), varied
$\text{HCO} + \text{O}_2 \rightarrow \text{HO}_2 + \text{CO}$	$5.2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{ClO}_2 \rightarrow \text{products}$	$0 - 3 \text{ s}^{-1}$	varied
$\text{F} + \text{CH}_2\text{ClO}_2 \rightarrow \text{FO} + \text{CH}_2\text{ClO}$	$(1 - 5) \times 10^{-10}$	estimated and varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{CH}_2\text{ClO} + \text{O}_2 \rightarrow \text{HC(O)Cl} + \text{HO}_2$	$8.0 \times 10^{-14}$	Wu and Carr (2001)
$\text{CH}_2\text{ClO}_2 + \text{HO}_2 \rightarrow \text{CH}_2\text{ClO}_2\text{H} + \text{O}_2$	$5.0 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{ClO}_2 + \text{NO} \rightarrow \text{NO}_2 + \text{CH}_2\text{ClO}$	$1.9 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{ClO} + \text{NO} \rightarrow \text{products}$	$2.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{HCO} + \text{NO} \rightarrow \text{HNO} + \text{CO}$	$1.3 \times 10^{-11}$	Nesbitt <i>et al.</i> (1999)
$\text{OH} + \text{CH}_3\text{Cl} \rightarrow \text{H}_2\text{O} + \text{CH}_2\text{Cl}$	$4.2 \times 10^{-14}$	Atkinson <i>et al.</i> (2005)
$\text{CH}_2\text{Cl} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-13}$	estimated
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + \text{CH}_2\text{ClO}_2 \rightarrow \text{NO}_2 + \text{CH}_2\text{ClO} + \text{O}_2$	$(0.6 - 8.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{CH}_2\text{ClO} \rightarrow \text{NO}_2 + \text{CH}_2\text{ClO}_2$	$(2 - 4) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

## II.5 Chemistry of the *c*-C<sub>5</sub>H<sub>9</sub>O<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + c\text{-C}_5\text{H}_{10} \rightarrow \text{HF} + c\text{-C}_5\text{H}_9$	$2.8 \times 10^{-10}$	Bartels <i>et al.</i> (1985)
$c\text{-C}_5\text{H}_9 + c\text{-C}_5\text{H}_9 \rightarrow \text{products}$	$3 \times 10^{-11}$	estimated
$c\text{-C}_5\text{H}_9 + \text{O}_2 \rightarrow c\text{-C}_5\text{H}_9\text{O}_2$	$1.7 \times 10^{-11}$	Wu and Bayes (1986)
$c\text{-C}_5\text{H}_9 + c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow c\text{-C}_5\text{H}_9\text{O} + c\text{-C}_5\text{H}_9\text{O}$	$(0.2 - 2.0) \times 10^{-12}$	estimated and varied
$c\text{-C}_5\text{H}_9\text{O}_2 + c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow$ $c\text{-C}_5\text{H}_9\text{O} + c\text{-C}_5\text{H}_9\text{O} + \text{O}_2$	$4.4 \times 10^{-14}$	Rowley <i>et al.</i> (1992a)
$c\text{-C}_5\text{H}_9\text{O}_2 + c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow \text{other products}$	$2.3 \times 10^{-14}$	Rowley <i>et al.</i> (1992a)
$c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow \text{products}$	$0 - 4 \text{ s}^{-1}$	varied
$c\text{-C}_5\text{H}_9\text{O} + \text{O}_2 \rightarrow c\text{-C}_5\text{H}_8\text{O} + \text{HO}_2$	$1.1 \times 10^{-14}$	Aschmann <i>et al.</i> (1997)
$\text{F} + c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow \text{FO} + c\text{-C}_5\text{H}_9\text{O}$	$(1 - 5) \times 10^{-10}$	estimated and varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$c\text{-C}_5\text{H}_9\text{O}_2 + \text{NO} \rightarrow c\text{-C}_5\text{H}_9\text{O} + \text{NO}_2$	$1.1 \times 10^{-11}$	Eberhard and Howard (1997)
$c\text{-C}_5\text{H}_9\text{O} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-11}$	estimated
$c\text{-C}_5\text{H}_9\text{O} \rightarrow \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$80000 - 800000 \text{ s}^{-1}$	varied
$c\text{-C}_5\text{H}_9\text{O} \rightarrow \text{other products}$	$10 \text{ s}^{-1}$	estimated
$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$	estimated
$\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} +$ $\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow$ $2\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2$	$(5 - 75) \times 10^{-13}$	estimated and varied
$\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} +$ $\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow \text{other products}$	$(5 - 75) \times 10^{-13}$	estimated and varied
$c\text{-C}_5\text{H}_9\text{O}_2 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow$ $c\text{-C}_5\text{H}_9\text{O} + \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2$	$2.5 \times 10^{-13}$	estimated
$c\text{-C}_5\text{H}_9\text{O}_2 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$ $\rightarrow \text{other products}$	$2.5 \times 10^{-13}$	estimated
$\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO}$ $\rightarrow \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2$ $\rightarrow \text{HC}(\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$(1 - 10) \times 10^{-11}$	estimated and varied
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$(3 - 30) \times 10^{-12}$	estimated and varied

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHO}_2\text{C}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHO}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow \text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$(3 - 30) \times 10^{-12}$	estimated and varied
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} \rightarrow \text{HOCH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{HCO}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HCO} + \text{O}_2 \rightarrow \text{HO}_2 + \text{CO}$	$5.2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HCO} + \text{NO} \rightarrow \text{HNO} + \text{CO}$	$1.3 \times 10^{-11}$	Nesbitt <i>et al.</i> (1999)
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} \rightarrow \text{HOCHCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HOCHCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-12}$	estimated
$\text{HOCHCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HC}(\text{O})\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{HO}_2$	$2 \times 10^{-11}$	estimated
$\text{HOCHCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCHO}_2\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H}$	$5 \times 10^{-12}$	estimated
$\text{HOCHO}_2\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{HOCHOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOC}(\text{O})\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{HO}_2$	$2 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} \rightarrow \text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{HCO}_2\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-12}$	estimated
$\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{O}_2\text{CH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HC}(\text{O})\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{OCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-12}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{O}_2$	$5 \times 10^{-12}$	estimated

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{HOCH}_2\text{CH}_2\text{CHOHC(O)O}_2 + \text{NO} \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CHOHC(O)O} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOHC(O)O} \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CHOH} + \text{CO}_2$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HOCH}_2\text{CH}_2\text{CHOH} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOH} + \text{O}_2 \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{C(O)H} + \text{HO}_2$	$1 \times 10^{-11}$	estimated
$c\text{-C}_5\text{H}_9\text{O}_2 + \text{HO}_2 \rightarrow c\text{-C}_5\text{H}_9\text{O}_2\text{H} + \text{O}_2$	$1.8 \times 10^{-11}$	Rowley <i>et al.</i> (1992b)
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{OH} + c\text{-C}_5\text{H}_{10} \rightarrow \text{H}_2\text{O} + c\text{-C}_5\text{H}_9$	$5 \times 10^{-12}$	DeMore and Bayes (1999)
$c\text{-C}_5\text{H}_9 + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-12}$	estimated
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + c\text{-C}_5\text{H}_9\text{O}_2 \rightarrow \text{NO}_2 + c\text{-C}_5\text{H}_9\text{O} + \text{O}_2$	$(0.1 - 3.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C(O)H} \rightarrow$ $\text{NO}_2 + \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C(O)H}$	$(0.1 - 2.5) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

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## II.6 Chemistry of the *c*-C<sub>6</sub>H<sub>11</sub>O<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + c\text{-C}_6\text{H}_{12} \rightarrow \text{HF} + c\text{-C}_6\text{H}_{11}$	$1 \times 10^{-10}$	Heinemann-Fiedler <i>et al.</i> (1990)
$c\text{-C}_6\text{H}_{11} + c\text{-C}_6\text{H}_{11} \rightarrow \text{products}$	$3 \times 10^{-11}$	Platz <i>et al.</i> (1999)
$c\text{-C}_6\text{H}_{11} + \text{O}_2 \rightarrow c\text{-C}_6\text{H}_{11}\text{O}_2$	$1.3 \times 10^{-11}$	Platz <i>et al.</i> (1999)
$c\text{-C}_6\text{H}_{11} + c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow c\text{-C}_6\text{H}_{11}\text{O} + c\text{-C}_6\text{H}_{11}\text{O}$	$(0.2 - 20) \times 10^{-12}$	estimated and varied
$c\text{-C}_6\text{H}_{11}\text{O}_2 + c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow$ $c\text{-C}_6\text{H}_{11}\text{O} + c\text{-C}_6\text{H}_{11}\text{O} + \text{O}_2$	$2.0 \times 10^{-14}$	Rowley <i>et al.</i> (1992a)
$c\text{-C}_6\text{H}_{11}\text{O}_2 + c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow \text{other products}$	$2.2 \times 10^{-14}$	Rowley <i>et al.</i> (1992a)
$c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow \text{products}$	$0 - 2 \text{ s}^{-1}$	varied
$c\text{-C}_6\text{H}_{11}\text{O} + \text{O}_2 \rightarrow c\text{-C}_6\text{H}_{10}\text{O} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{F} + c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow \text{FO} + c\text{-C}_6\text{H}_{11}\text{O}$	$(1 - 5) \times 10^{-10}$	estimated and varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$c\text{-C}_6\text{H}_{11}\text{O}_2 + \text{NO} \rightarrow c\text{-C}_6\text{H}_{11}\text{O} + \text{NO}_2$	$6.7 \times 10^{-12}$	Platz <i>et al.</i> (1999)
$c\text{-C}_6\text{H}_{11}\text{O} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-11}$	estimated
$c\text{-C}_6\text{H}_{11}\text{O} \rightarrow \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$300 - 1000 \text{ s}^{-1}$	varied
$c\text{-C}_6\text{H}_{11}\text{O} \rightarrow \text{other products}$	$10 \text{ s}^{-1}$	estimated
$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$1 \times 10^{-13}$	estimated
$2\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow$ $2\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2$	$5 \times 10^{-13}$	estimated
$2\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow$ other products	$5 \times 10^{-13}$	estimated
$c\text{-C}_6\text{H}_{11}\text{O}_2 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$ $\rightarrow c\text{-C}_6\text{H}_{11}\text{O} + \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$ $+ \text{O}_2$	$2.5 \times 10^{-13}$	estimated
$c\text{-C}_6\text{H}_{11}\text{O}_2 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$ $\rightarrow \text{other products}$	$2.5 \times 10^{-13}$	estimated
$\text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ $\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HC}(\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$1 \times 10^{-11}$	estimated and varied

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-12}$	estimated and varied
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHO}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHO}_2\text{CH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOCH}_2\text{C}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-12}$	estimated and varied
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOCH}_2\text{C}(\text{O})\text{H} \rightarrow$ $\text{HOCHCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HCO} + \text{O}_2 \rightarrow \text{HO}_2 + \text{CO}$	$5.2 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HCO} + \text{NO} \rightarrow \text{HNO} + \text{CO}$	$1.3 \times 10^{-11}$	Nesbitt <i>et al.</i> (1999)
$\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CHOC}(\text{O})\text{H} \rightarrow$ $\text{HOCHCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HOCHCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-12}$	estimated
$\text{HOCHCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HC}(\text{O})\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$2 \times 10^{-11}$	estimated
$\text{HOCHCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HOCHO}_2\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H}$	$5 \times 10^{-12}$	estimated
$\text{HOCHO}_2\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ $\text{HOCHOCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HC}(\text{O})\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$2 \times 10^{-11}$	estimated
$\text{HOCHOCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} \rightarrow$ $\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{HCO}_2\text{H}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-12}$	estimated
$\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{O}_2\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H}$	$1 \times 10^{-11}$	estimated
$\text{O}_2\text{CH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ $\text{OCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow$ products	$3 \times 10^{-11}$	estimated
$\text{OCH}_2\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{O}_2 \rightarrow$ $\text{HC}(\text{O})\text{CH}_2\text{CHOHCH}_2\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-14}$	estimated

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{HOCH}_2\text{CH}_2\text{CHOHCHC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHCHO}_2\text{C}(\text{O})\text{H}$	$5 \times 10^{-12}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOHCHO}_2\text{C}(\text{O})\text{H} + \text{NO} \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHCHOC}(\text{O})\text{H} + \text{NO}_2$	$1 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOHCHOC}(\text{O})\text{H} \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{H} + \text{HCO}$	$0 - 5000 \text{ s}^{-1}$	varied
$\text{HOCH}_2\text{CH}_2\text{CHOHCHOC}(\text{O})\text{H} + \text{NO} \rightarrow \text{products}$	$3 \times 10^{-11}$	estimated
$\text{HOCH}_2\text{CH}_2\text{CHOHCHOC}(\text{O})\text{H} + \text{O}_2 \rightarrow \text{HOCH}_2\text{CH}_2\text{CHOHC}(\text{O})\text{C}(\text{O})\text{H} + \text{HO}_2$	$1 \times 10^{-11}$	estimated
$c\text{-C}_6\text{H}_{11}\text{O}_2 + \text{HO}_2 \rightarrow c\text{-C}_6\text{H}_{11}\text{O}_2\text{H} + \text{O}_2$	$1.7 \times 10^{-11}$	Rowley <i>et al.</i> (1992b)
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{HO}_2 + \text{NO} \rightarrow \text{OH} + \text{NO}_2$	$8.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{OH} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-13}$ at 5 Torr	Atkinson <i>et al.</i> (2005)
$\text{OH} + c\text{-C}_6\text{H}_{12} \rightarrow \text{H}_2\text{O} + c\text{-C}_6\text{H}_{11}$	$7 \times 10^{-12}$	Atkinson (2003)
$c\text{-C}_6\text{H}_{11} + \text{NO} \rightarrow \text{products}$	$1 \times 10^{-12}$	estimated
$\text{HO}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{O}_2$	$1 \times 10^{-10}$	Atkinson <i>et al.</i> (2005)
$\text{OH} \rightarrow \text{products}$	$0 - 10 \text{ s}^{-1}$	determined experimentally
$\text{NO}_3 + c\text{-C}_6\text{H}_{11}\text{O}_2 \rightarrow \text{NO}_2 + c\text{-C}_6\text{H}_{11}\text{O} + \text{O}_2$	$(0.1 - 4.0) \times 10^{-12}$	varied
$\text{NO}_3 + \text{O}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H} \rightarrow \text{NO}_2 + \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{O})\text{H}$	$(0.1 - 2.5) \times 10^{-12}$	varied
$\text{NO}_3 + \text{HO}_2 \rightarrow \text{NO}_2 + \text{OH} + \text{O}_2$	$3.5 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

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## II.7 Chemistry of the CF<sub>3</sub>O<sub>2</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{CF}_3\text{H} \rightarrow \text{HF} + \text{CF}_3$	$1.5 \times 10^{-13}$	Møgelberg <i>et al.</i> (1996)
$\text{CF}_3 + \text{CF}_3 \rightarrow \text{products}$	$3.9 \times 10^{-12}$	Vakhtin (1996)
$\text{CF}_3 + \text{O}_2 \rightarrow \text{CF}_3\text{O}_2$	$1.4 \times 10^{-12}$ at 6 Torr	Atkinson <i>et al.</i> (2005)
$\text{CF}_3 + \text{CF}_3\text{O}_2 \rightarrow \text{CF}_3\text{O} + \text{CF}_3\text{O}$	$5 \times 10^{-12}$	estimated
$\text{CF}_3\text{O}_2 + \text{CF}_3\text{O}_2 \rightarrow$ $\text{CF}_3\text{O} + \text{CF}_3\text{O} + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CF}_3\text{O}_2 + \text{CF}_3\text{O} \rightarrow \text{CF}_3\text{OOOCF}_3$	$1 \times 10^{-10}$	Nielsen and Sehested (1993)
$\text{CF}_3\text{O} + \text{CF}_3\text{O} \rightarrow \text{products}$	$(1 - 20) \times 10^{-12}$	varied
$\text{CF}_3\text{O} \rightarrow \text{products}$	$0-50 \text{ s}^{-1}$	varied
$\text{CF}_3\text{O}_2 \rightarrow \text{products}$	$0 - 2 \text{ s}^{-1}$	varied
$\text{F} + \text{CF}_3\text{O}_2 \rightarrow \text{FO} + \text{CF}_3\text{O}$	$(1 - 5) \times 10^{-10}$	varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{NO} + \text{CF}_3\text{O}_2 \rightarrow \text{NO}_2 + \text{CF}_3\text{O}$	$1.6 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{CF}_3\text{O} + \text{NO} \rightarrow \text{products}$	$5.4 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 + \text{CF}_3\text{O}_2 \rightarrow$ $\text{NO}_2 + \text{CF}_3\text{O} + \text{O}_2$	$(1.0 - 12.0) \times 10^{-13}$	varied
$\text{NO}_3 + \text{CF}_3\text{O} \rightarrow \text{NO}_2 + \text{CF}_3\text{O}_2$	$(0.1 - 3.5) \times 10^{-12}$	varied
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

## II.8 Chemistry of the CF<sub>3</sub>CFO<sub>2</sub>CF<sub>3</sub> system

Reaction	$k / \text{cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$	Reference
$\text{F} + \text{CF}_3\text{CFHCF}_3 \rightarrow \text{HF} + \text{CF}_3\text{CFCF}_3$	$1.5 \times 10^{-13}$	Møgelberg <i>et al.</i> (1996)
$\text{CF}_3\text{CFCF}_3 + \text{CF}_3\text{CFCF}_3 \rightarrow \text{products}$	$1 \times 10^{-12}$	estimated, Skorobogatov <i>et al.</i> (1986)
$\text{CF}_3\text{CFCF}_3 + \text{O}_2 \rightarrow \text{CF}_3\text{CFO}_2\text{CF}_3$	$1.4 \times 10^{-12}$ at 6 Torr	estimated
$\text{CF}_3\text{CFCF}_3 + \text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow 2\text{CF}_3\text{CFOCF}_3$	$4 \times 10^{-12}$	estimated
$\text{CF}_3\text{CFO}_2\text{CF}_3 + \text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow 2\text{CF}_3\text{CFOCF}_3$	$1.8 \times 10^{-12}$	Møgelberg <i>et al.</i> (1996)
$\text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow \text{products}$	$0 - 5 \text{ s}^{-1}$	varied
$\text{CF}_3\text{CFOCF}_3 \rightarrow \text{CF}_3 + \text{CF}_3\text{CFO}$	$10^3 - 10^6 \text{ s}^{-1}$	Møgelberg <i>et al.</i> (1996), varied
$\text{CF}_3 + \text{O}_2 \rightarrow \text{CF}_3\text{O}_2$	$(1 - 1.4) \times 10^{-12}$ at 6 Torr	Atkinson <i>et al.</i> (2005)
$\text{CF}_3\text{CFO}_2\text{CF}_3 + \text{CF}_3\text{O}_2 \rightarrow \text{CF}_3\text{CFOCF}_3 + \text{CF}_3\text{O} + \text{O}_2$	$1.2 \times 10^{-12}$	estimated
$\text{CF}_3\text{O}_2 + \text{CF}_3\text{O}_2 \rightarrow \text{CF}_3\text{O} + \text{CF}_3\text{O} + \text{O}_2$	$1.7 \times 10^{-12}$	Atkinson <i>et al.</i> (2005)
$\text{CF}_3\text{O} + \text{CF}_3\text{O} \rightarrow \text{products}$	$(1 - 20) \times 10^{-12}$	varied
$\text{CF}_3\text{CFO}_2\text{CF}_3 + \text{CF}_3\text{O} \rightarrow (\text{CF}_3)_2\text{CFOOOCF}_3$	$1 \times 10^{-12}$	estimated
$\text{CF}_3\text{O}_2 + \text{CF}_3\text{O} \rightarrow \text{CF}_3\text{OOOCF}_3$	$1 \times 10^{-10}$	Nielsen and Sehested (1993)
$\text{CF}_3\text{O} \rightarrow \text{products}$	$0 - 50 \text{ s}^{-1}$	varied
$\text{CF}_3\text{O}_2 \rightarrow \text{products}$	$0 - 5 \text{ s}^{-1}$	varied
$\text{CF}_3 + \text{CF}_3\text{O}_2 \rightarrow \text{CF}_3\text{O} + \text{CF}_3\text{O}$	$5 \times 10^{-12}$	estimated
$\text{CF}_3 + \text{CF}_3 \rightarrow \text{products}$	$3.9 \times 10^{-12}$	Vakhtin (1996)
$\text{F} + \text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow \text{FO} + \text{CF}_3\text{CFOCF}_3$	$(1 - 5) \times 10^{-10}$	varied
$\text{FO} + \text{FO} \rightarrow \text{F} + \text{F} + \text{O}_2$	$1 \times 10^{-11}$	Sander <i>et al.</i> (2003)
$\text{NO} + \text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow \text{NO}_2 + \text{CF}_3\text{CFOCF}_3$	$2.1 \times 10^{-11}$	Møgelberg <i>et al.</i> (1996)
$\text{NO} + \text{CF}_3\text{O}_2 \rightarrow \text{NO}_2 + \text{CF}_3\text{O}$	$1.6 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{CF}_3\text{CFOCF}_3 + \text{NO} \rightarrow \text{products}$	$(2 - 5) \times 10^{-11}$	estimate
$\text{CF}_3\text{O} + \text{NO} \rightarrow \text{products}$	$5 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{FO} + \text{NO} \rightarrow \text{F} + \text{NO}_2$	$2.2 \times 10^{-11}$	Atkinson <i>et al.</i> (2005)
$\text{NO}_3 + \text{CF}_3\text{CFO}_2\text{CF}_3 \rightarrow \text{NO}_2 + \text{CF}_3\text{O} + \text{O}_2$	$(0.1 - 6) \times 10^{-13}$	varied
$\text{NO}_3 + \text{CF}_3\text{O}_2 \rightarrow \text{NO}_2 + \text{CF}_3\text{O} + \text{O}_2$	$6.2 \times 10^{-13}$	this work
$\text{NO}_3 + \text{CF}_3\text{O} \rightarrow \text{NO}_2 + \text{CF}_3\text{O}_2$	$(0.1 - 3.5) \times 10^{-12}$	varied
$\text{NO}_3 \rightarrow \text{products}$	$0 \text{ s}^{-1}$	determined experimentally

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