

# OH radical reactions with oxygenated organic compounds in aqueous solution: A laser flash photolysis investigation

Thomas Schaefer and Hartmut Herrmann

*Leibniz Institute for Tropospheric Research, Atmospheric Chemistry Department (ACD), Permoserstraße 15,  
04318 Leipzig, Germany*

The degradation and conversion processes of organic compounds are often initiated by radical reactions. These can occur in the gas phase as well as in the aqueous phase of the troposphere, which is formed by cloud droplets, fog, haze, rain or hygroscopic particles containing ‘aerosol liquid water (ALW)’. As a result of biogenic or anthropogenic sources oxygenated organic compounds are omnipresent in the troposphere.

In the present study, the T-dependent OH radical reactions with oxygenated organic compounds in the aqueous phase have been investigated, by using a laser flash photolysis setup.

To determine the rate constants, the OH radical – thiocyanate anion – competition kinetic method has been used.<sup>1-2</sup> The following rate constants for OH radical oxidation reactions of the oxygenated organic compounds at T = 298 K have been obtained: acetone  $k = (7.3 \pm 1.0) \cdot 10^7 \text{ L mol}^{-1} \text{ s}^{-1}$ , 1-hydroxypropan-2-one  $k = (1.1 \pm 0.1) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$ , 1,3-dihydroxypropan-2-one  $k = (1.4 \pm 0.1) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$ , 2,3-dihydroxypropanal  $k = (1.3 \pm 0.1) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$ , butane-1,3-diol  $k = (2.4 \pm 0.1) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$ , butane-2,3-diol  $k = (1.9 \pm 0.1) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$  and hexane-1,2-diol =  $(4.4 \pm 0.4) \cdot 10^9 \text{ L mol}^{-1} \text{ s}^{-1}$ . The T-dependencies of the rate constants have also been studied. With the obtained rate constants and their T-dependencies atmospheric aqueous-phase lifetimes of these compounds were calculated.

[1] L. Zhu, J. M. Nicovich and P. H. Wine, *Aquatic Sciences*, 2003, **65**, 425-435.

[2] T. Schaefer and H. Herrmann, *Phys. Chem. Chem. Phys.*, 2018, **20**, 10939-10948.