

Photoinduced reactions of Anthraquinone-2-sulfonate as model constituents in tropospheric aqueous aerosol

T. Schaefer, J. D. Raff*, H. Herrmann

Leibniz Institute for Tropospheric Research (TROPOS)
Atmospheric Chemistry Department (ACD)
Permoserstrasse 15, 04318 Leipzig

*School of Public & Environmental Affairs and Department of Chemistry
Indiana University
Bloomington IN 47405, USA

Abstract

Traditional models of secondary organic aerosol (SOA) formation are centered on absorption of semi-volatile organic compounds into preexisting aerosols. However, more recent insights suggest that aerosol aging is associated with chemical transformations initiated by photooxidation chemistry within the particle [1-4]. Unfortunately, the radical sources driving this chemistry remain highly uncertain due to an incomplete understanding of interacting organics in the aerosol particles. Here, we examine unique photochemical pathways to oxidant formation in SOA using anthraquinone-2-sulfonate (AQS) as a model photosensitizer. We present time-resolved absorbance spectra ($\lambda = 300\text{--}700$ nm) of the excited states and the reaction rate constants with molecular oxygen ($k_{298\text{ K}} = (5.1 \pm 1.1) \times 10^8 \text{ L mol}^{-1} \text{ s}^{-1}$) and other aerosol constituents. These results were obtained by using a laser flash photolysis-laser long path absorption setup. In addition, product analysis of the photo-induced oxidation reactions involving AQS were carried out using several analytical techniques (e.g., GC-MS).

Literature:

[1] M. E. Monge, *Proc. Nat. Acad. Sci. USA* **2012**, *109*, 6840–6844. [2] K. Z. Aregahegn, *Faraday Discuss.* **2013**, *165*, 123–134. [3] S. Rossignol, *Environ. Sci. Technol.* **2014**, *48*, 3218–3227. [4] C. George, *Chem. Rev.* **2015**, *115*, 4218–4258.