

Some photophysical aspects of the atmospheric fate of acetone

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Acetone is one of the most abundant organic molecules in the atmosphere; consequently, the photolysis of this compound is an important source of HOx (OH and HO₂) radicals in the upper troposphere. Recently, photolysis studies at different wavelengths coupled with gas-chromatographic analysis was applied to determine the photodissociation quantum yield of acetone. At longer wavelengths the quantum yield of acetone consumption has been found to decrease with decreasing temperature and to decrease with increasing pressure.

To strengthen our understanding of the background of the photochemical experiments some photophysical properties of acetone were redetermined: absorption and luminescence spectra, singlet and triplet lifetimes, and transition dipole moments have been measured. It was found [1] that the energy transfer process by O₂ to give O₂(¹Δ_g) is of minor importance in quenching the singlet excited state of acetone, while it is the dominant deactivation process for the triplet state. The singlet quenching reaction has a negative activation energy: $-(7.3 \pm 1.9)$ kJ mol⁻¹, indicating a relative increase of the significance of the process with decreasing temperature.

[1] I. Szilágyi, G. Kovács, M. Farkas, G. L. Zügner, A. Golab, S. Dóbbé, A Demeter, *React. Kinet. Catal. Lett.* Akadémiai Kiadó, Budapest **2009**, *96* (2), 437–446.