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Reactions of acetone oxide stabilized Criegee intermediate with SO_2, NO_2, H_2O and O_3

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Atmospheric aerosol particles represent a critical component of the atmosphere, impacting global climate, regional air pollution, and human health. The formation of new atmospheric particles and their subsequent growth to larger sizes are the key processes for understanding of the aerosol effects. Sulphuric acid, H2SO4, has been identified to play the major role in formation of new atmospheric particles and in subsequent particle growth. Until recently the reaction of OH with SO_2 has been considered as the only important source of H2SO4 in the atmosphere. However, recently it has been suggested that the oxidation of SO_2 by Criegee biradicals can be a significant additional atmospheric source of H2SO4 comparable with the reaction of SO_2 with OH.
Here we present some results about the reactions of the acetone oxide stabilized Criegee intermediate, (CH3)2=OO, produced in the reaction of 2,3-dimethyl-butene (TME) with O_3.
The formation of the H2SO4 in the reaction of acetone oxide with SO_2 was investigated in the specially constructed atmospheric pressure laminar flow reactor. The Criegee intermediate was generated by ozonolysis of TME. The H2SO4, generated by addition of SO_2, was directly monitored with Chemical Ionization Mass Spectrometer (SAMU, LPC2E). Relative rates of reactions of acetone oxide with SO_2, NO_2, H_2O and ozone were determined from the dependencies of the H2SO4 yield at different concentrations of the reactants.
Atmospheric applications of the obtained results are discussed in relation to the importance of this additional H2SO4 formation pathway compared to the reaction of OH with SO_2.