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Kinetic and product studies of Criegee intermediate reactions with halogenated and non-halogenated carboxylic acids and their implications in the troposphere

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Criegee intermediates are important species formed during the ozonolysis of alkenes. Direct measurement and modelling studies have shown that reactions of stabilized Criegee intermediates with species like SO_2 and NO_2 may have a significant effect in tropospheric chemistry.[1, 2] Reaction rates of Criegee intermediates with simple carboxylic acids like HCOOH and CH_3COOH have been shown to be near the collision limit and may be a significant sink for these otherwise stable species in the atmosphere.[3, 4] Results obtained from our time-resolved Cavity Ring-Down Spectroscopy (CRDS) apparatus[5] for reactions of the Criegee intermediates, CH_2OO and $(CH_3)_2COO$ with various halogenated (CF_3COOH, CF_3CF_2COOH, $CClF_2COOH$ and $CHCl_2COOH$) and non-halogenated (HCOOH and CH_3COOH) carboxylic acids will be presented, together with Structure Activity Relationship (SAR) based on these observations. Structure characterization of the products from these reactions using the Multiplexed PhotoIonization Mass Spectrometry (MPIMS) apparatus[1,3] as well as implications for Secondary Organic Aerosol (SOA) formation, assessed using the global atmospheric model STOCHEM, will also be discussed.

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