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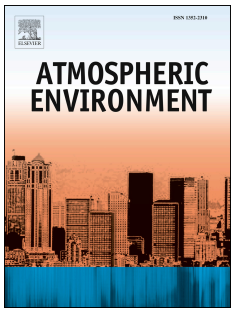

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Molecular Structure Impacts on Secondary Organic Aerosol Formation from Glycol Ethers

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Abstract

Glycol ethers, a class of widely used solvents in consumer products, is often considered exempt as volatile organic compounds based on their vapor pressure or boiling points by regulatory agencies. However, recent studies found that glycol ethers volatilize at ambient conditions nearly as rapidly as the traditional high-volatility solvents indicating the potential of glycol ethers to form secondary organic aerosol (SOA). This is the first work on SOA formation from glycol ethers. The impact of molecular structure, specifically –OH, on SOA formation from glycol ethers and related ethers are investigated in the work. Ethers with and without –OH, with methyl group hindrance on –OH and with –OH at different location are studied in the presence of NO_X and under "NO_X free" conditions. Photooxidation experiments under different oxidation conditions confirm that the processing of ethers is a combination of carbonyl formation, cyclization and fragmentation. Bulk SOA chemical composition analysis and oxidation products identified in both gas and particle phase suggests that the presence and location of –OH in the carbon bond of ethers determine the occurrence of cyclization mechanism during ether oxidation. The cyclization is proposed as a critical SOA formation mechanism to prevent the formation of volatile compounds from fragmentation during the oxidation of ethers.