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Molecular structure impacts on secondary organic aerosol formation from glycol ethers

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1 **Molecular Structure Impacts on Secondary Organic** 2 **Aerosol Formation from Glycol Ethers**

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8 **Abstract**

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

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