SOA formation from and chemistry of glycol ethers

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Recent work indicates the growing importance of volatile chemical products (VCPs), particularly as air pollution regulations drive down the contribution of vehicular-based emissions. It is important to characterize the effects of VCPs on atmospheric secondary organic aerosol (SOA) and its formation to better resolve discrepancies between SOA observations and models. This work looks at ethoxyethanol (2-EE) as a model compound representing glycol ethers, VCPs used as industrial solvents, cleaning supplies, and paints. Using a 19 $m^3$ environmental smog chamber, SOA yields of 2-EE is probed over a range of NO mixing ratios to better understand SOA formation as a function of NO. In low-$NO_x$ conditions, the unimolecular hydrogen shift reaction to the 2-EE peroxy radicals is shown to be important, making this autoxidation competitive with bimolecular pathways. The autoxidation pathway effectively leads to the formation of high O:C ratio oxidation products and may also lead to the formation of an epoxy radical; compounds that will readily partition to SOA. Preliminary data indicate the SOA yields increase as the 2-EE $RO_2$ bimolecular lifetime increases. Thus it appears the autoxidation pathway is effective at forming higher yields of SOA than under conditions previously studied. This work is relevant to urban environments like the Los Angeles Basin where $NO_x$ levels and other vehicular emissions continue to decrease but where VCPs are continuing to play an important role in air quality.