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Secondary organic aerosol formation from primary aliphatic amines with NO₃ radical

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Abstract. Primary aliphatic amines are an important class of nitrogen containing compounds emitted from automobiles, waste treatment facilities and agricultural animal operations. A series of experiments conducted at the UC-Riverside/CE-CERT Environmental Chamber is presented in which oxidation of methylamine, ethylamine, propylamine, and butylamine with O₃ and NO₃ have been investigated. Very little aerosol formation is observed in the presence of O₃ only. However, after addition of NO, and by extension NO₃, large aerosol mass yields (~44% for butylamine) are seen. Aerosol generated was determined to be organic in nature due to the small fraction of NO and NO₂ in the total signal (<1% for all amines tested) as detected by an aerosol mass spectrometer (AMS). We propose a reaction mechanism between carbonyl containing species and the parent amine leading to formation of particulate imine products. These findings can have significant impacts on rural communities with elevated nighttime PM loadings, when significant levels of NO₃ exist.

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