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Probing Molecular Weight Growth and Decomposition of Organic Particles in Planetary Atmospheres Using Vacuum Ultraviolet Photoionization Mass Spectrometry

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The heterogeneous chemical transformations of organic aerosols in planetary atmospheres is governed by complex free radical chemistry. Free radical reaction pathways lead to both molecular weight growth and decomposition of the aerosol. In Earth's atmosphere, developing a molecular level understanding of aerosol oxidation chemistry requires deeper insight into the role of peroxy and alkoxy radicals and their subsequent termination and chain cycling pathways. We employ synchrotron-based vacuum ultraviolet photoionization mass spectrometry, two dimensional gas chromatography and stochastic simulations to better elucidate how molecular structure and thermodynamic phase control these free radical oxidation pathways. These studies are aimed at providing better molecule-based parameterizations of aerosol formation and decomposition pathways in models of planetary atmospheres.

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