

Laboratory Studies of Early Earth Tholin Particles

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In efforts to resolve the “Faint Young Sun” paradox, it has been suggested that early Earth may have had a reduced atmosphere similar to that present on the Saturn moon Titan. The N_2/CH_4 atmosphere of Titan is known to produce so called “tholin” particles. If similar particles were present on early Earth, they may have provided a UV shield to allow greenhouse gasses to build up. We are performing laboratory experiments to probe the formation and composition of tholin-like particles that might have formed in the early Earth atmosphere. We are using a novel analysis technique based on detection of tholin particles using an aerosol mass spectrometer (AMS). Using the AMS, we are able to determine the number, size and chemical composition of the tholin particles in real time without first collecting and concentrating them. Our studies focus on characterizing the particles as a function of input trace gas composition. We are varying CH_4 concentrations from 10% CH_4 in N_2 to less than 1000 ppmv CH_4 . We are also examining the influence of CO_2 on the particle characteristics. In the current paper, the results of our ongoing studies will be presented and implications for early Earth discussed.