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The Chemical Composition of Simulated Titan Aerosols

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Abstract

The UV photolysis of gas mixtures containing C_2H_2, C_2H_4 and HCN, diluted in N_2 and CH_4 was studied experimentally. At the onset of irradiation, a pale yellow aerosol appeared, similar to Titan's haze [1]. The chemical composition of the haze particles and of their gas-phase precursors was determined [2]. In the solid-phase, a plethora of aromatics and condensed aromatics (PAHs) were observed such as toluene, phenyl acetylene, naphthalene, biphenyl, phenanthrene and benzopyrene. A considerable fraction of linear polyvinyls was also formed, which was cross-linked to form a matrix whose composition could not be analyzed. In the gas-phase, diacetylene, vinyl acetylene and divinyl were detected as well as benzene, phenyl acetylene and styrene, all of which are precursors of the solid-phase species. The mechanism of formation of the main gas-phase and solid-phase species is addition of acetylene and ring closure. During Titan's lifetime, a layer of aerosols ~40 m thick could have accumulated on the surface, mixed with a similar height of liquid C_2H_6 and C_3H_8.

References

[1] Bar-Nun, A., Kleinfeld, I., Ganor, E. (1988) *JGR*, 93, 8383-8387.

[2] Jacovi, R., Bar-Nun, A., Laufer, D. (2006) *DPS meeting #38, #27.08; Bull. Am. Astronom. Soc.*, 38, 528.