

Analysis of Potential Radical Chemistry on Kuiper Belt Objects

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Kuiper Belt Objects (KBOs) are of high interest following the New Horizons encounter with the Pluto system and the extended mission to 2014MU69. We aimed to clarify questions raised concerning the possible presence of organic radicals formed from photolysis on the surface of KBOs and other Trans-Neptunian Objects, and obtain laboratory spectra of these radicals for comparison to remote sensing data. We explored the photochemical generation of methyl radical from matrix-isolated CH_3I in an attempt to create sufficient amounts of the methyl radical to obtain spectra in the near infrared. Both Ar and N_2 matrices were studied, as well as varying guest:matrix ratios. Hydrogen lamp irradiation was found to be more effective than mercury lamp irradiation. The irradiation time was a significant factor when we switched matrices: methyl radical depleted rapidly in the N_2 matrix with prolonged irradiation (~10 hours) whereas it survived for over 48 hours in some experiments with the Ar matrix. Reaction of the methyl radical with the N_2 matrix to form HCN was observed. Future experiments will focus on alternate methods of radical generation in order to increase the yield of trapped radical.