REFLECTANCE PROPERTIES OF IRRADIATED SIMULATED COMETARY ICES

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In the prevailing icy conglomerate model of the cometary nucleus, the outer surface is processed by galactic cosmic rays in the Oort cloud. Most ices composed of CH_4, along with H_2O and/or NH_3, studied in our laboratory redden and darken upon charged particle irradiation from a high frequency corona discharge at 77 K. Spectral reflectance relative to a $BaSO_4$ standard in the wavelength interval 0.39 μm to 0.70 μm was measured for incidence angle, $i = 0°$ and emission angle, $\varepsilon = -4°$. CH_4-containing ice at 77 K was modified at a dose $\sim 10^{11}$ erg cm^{-2} over a period of ~ 1 hour. Progressive darkening followed continued irradiation. The ratio of the red to blue reflectance [$R(\lambda = 0.70\ \mu m)/R(\lambda = 0.40\ \mu m)$] changed from 0.9 to ~ 1.4. Using techniques of ellipsometric polarimetry, we are investigating the detailed optical properties (complex refractive index) of these ices before and after irradiation. These results may then be compared with the properties of cometary coma particles predicted by recent light scattering models to determine which classes of laboratory-produced materials best match the population of dark, reddish particles which seem to be prevalent in some cometary comae.

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