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Energetic Distribution of States in Irradiated Low-Density Polyethylene from UV-Vis-NIR Spectroscopy[1] ZACHARY GIBSON, BENJAMIN BRADSHAW, JR DENNISON, Utah State University, ELENA PLIS, Georgia Tech Research Institute, Atlanta, GA, DANIEL ENGELHART, Assurance Technology Corporation, Carlisle, MA, RYAN HOFFMANN, Air Force Research Laboratory, Space Vehicles Directorate — Optical spectroscopy has been used to characterize the energetic density of states of low-density polyethylene (LDPE) and determine its optical band gap, E_g, and Urbach Energy, E_U (a measure of the width of the energetic distribution of localized states within the mobility gap of disordered materials). LDPE is a prototypical highly disordered insulating material; its properties are of practical interest due to its myriad of applications from spacecraft charging to high voltage DC power cable insulation, where it can be susceptible to ionizing and UV radiation. To determine the effects of radiation on the density of states, UV-Vis-NIR transmittance spectra (200-2500 nm wavelength) were measured for pristine and irradiated samples. Total ionizing doses of 1 MGy and 4 MGy from a monoenergetic 100 keV electron beam were studied. To more accurately determine the absorption coefficient (and therefore E_U), the reflectance is also required. Reflectance and transmittance were measured for pristine LDPE and these data were then used to scale the measurements of the irradiated samples. Comparison with other methods to determine the energy density of states of LDPE are discussed.

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Zachary Gibson
Utah State University

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