

Abstract Submitted
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Study of Damage and Recovery of Electron Irradiated Polyimide using EPR and NMR Spectroscopy SUNITA HUMAGAIN, The Graduate Center, CUNY and Hunter College, CUNY, JESSICA JHONSON, PHILLIP STALLWORTH, Hunter College, CUNY, DANIEL ENGELHART, National Research Council at Air Force Research Lab, USA, ELENA PLIS, Assurance Technology Corporation, USA, DALE FERGUSON, RUSSELL COOPER, RYAN HOFFMANN, Air Force Research Lab, Space Vehicles Division, USA, STEVE GREENBAUM, The Graduate Center, CUNY and Hunter College, CUNY — The main objective of this research is to probe radical concentrations in electron irradiated polyimide (PI, Kapton®) and to examine the impact on the electrical properties using EPR and NMR spectroscopy. PI is an electrical insulator used in space missions as a thermal management blanketing material, it is therefore critical for spacecraft designers to understand the nature of electron transport (electrical conductivity) within the bulk of the material. The recovery mechanism (radical evolution) of PI in vacuum, argon and air after having been subjected to 90 KeV electron irradiation, was studied. The formation and subsequent exponential decay of the radical concentrations was recorded using EPR. This signal decay agrees well with the recovery mechanism being probed by electrical conductivity measurements and implies a strong relation between the two. To investigate the distribution of radicals in the polymer, ^1H NMR relaxation time (T_1) were measured at 300MHz. Additional NMR experiments, in particular ^{13}C , were performed to search for direct evidence of structural defects.

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