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SIMULATION OF THE TOTAL IONIZING DOSE FOR THE ORGANIC PHOTOVOLTAIC MATERIAL (PCBM) IN SPACE RADIATION ENVIRONMENTS AND EQUIVALENT FLUX OF DAMAGE TO SOLAR CELLS (EFFLUX)

Abstract

In the present work a study of the PCBM ($C_{72}H_{14}O_2$) is shown, which isconsidered an electron-accepting material, due to the energy released at fill the lowest unoccupied molecular orbital (LUMO), for which the balance of total energy is the ratio between the electron affinity of the acceptor and the ionization potential of the donor, so it is necessary to know the damage that can be generated due to ionization in the electron acceptor material. Currently the PCBM is under study for organic solar cells and its potential use in deep space exploration missions, such as the trip to Mars. The present work focuses on simulations with the SPENVIS software for the theoretical radiation conditions on the International Space Station (ISS) during a one-year space mission to assess the damage of displacement per dose (Dd) in the PCBM generated by exposure to galactic cosmic rays (GCR) and solar particle events (SPE), based on a physical amount called non-ionizing energy loss (NIEL), which is the speed at which the energy is transferred from the particle irradiated to the target lattice through non-ionizing events. The Total non-ionizing dose absorbent is known as dose per displacement damage(Dd) and this quantity is analogous to the ionizing dose. Finally, a total ionizing dose for the thickness of the layers of: 76, 140, 176 [μm]. In the results shown the total dose of ionizing radiation was greater than 0.017 and the dose less than 0.008 Gy, so that the effects generated by radiation more significant changes in the PCBM are associated with changes in the transmission of light in the visible and near infrared region in the LUMO orbitals so they can be reported by the loss of transmission loss due to flux equivalent of protons (EFFLUX) trapped, in turn the PCBM shows a decrease in its operation up to 223 MeV.