ABSTRACT:

The effects of electron beam irradiation of (ethylene vinyl acetate) EVA containing 18% vinyl acetate was studied. The EVA sample was then irradiated by using 3 MeV electron beam machine at doses ranging from 120 to 360 kGy in air at room temperature and analyzed for mechanical, thermal and electrical properties. It was revealed by DSC analysis that the crystallinity of the electron-beam radiated EVA decreased slightly as verified by a marginal reduction in the densities and heats of melting. Thermal degradation of EVA occurred through two steps as shown by the thermogravimetric curve with maximum rates of 350 and 450°C, respectively. The results obtained from both gel content and hot set tests showed that under the irradiation conditions employed, the EVA sample cross-linked by the electron beam irradiation, and the degree of cross-linking in the amorphous regions was dependent on the irradiation dose. A significant improvement in the tensile strength of the neat EVA samples was obtained upon electron-beam radiation up to 210 kGy with a concomitant decline in elongation of break. Various electrical properties of EVA such as surface and volume resistance, breakdown voltage and dielectric constant were studied as a function of radiation dose. It was revealed that the surface resistance and volume resistivity of the EVA reaches a maximum at a 190 kGy dose of radiation. No considerable change of breakdown voltage and dielectric constant was observed with increasing irradiation dose. These studies suggest that radiation-cured EVA is more thermally and mechanically stable than pure EVA. Similarly, the results from the electrical properties revealed that surface and volume resistance are higher than pure EVA.