

Physical property of irradiated High Density Polyethylene

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Since the irradiation induced crosslinking phenomenon of polymer was discovered by Charlesby in the early 1950's, the effect of radiation on the structure and properties of polymers has arisen considerable attention. As it can significantly improve physical properties, irradiation has been employed in commercial applications, such as in the manufacture of cable insulation and polymer foams. This investigation of the effects irradiation on high density polyethylene (HDPE) is important to improve its commercial application and to understand the changes of structure of HDPE. The purpose of the present work is to investigate effects of the γ -irradiation on the physical properties of HDPE irradiated at a dose of up to 100 KGy.

The raw polyethylene utilized in this work, was produced by Honam petrochemical corporation, Korea , Mw = 9.45×10^4 (HDPE-1) and 4.39×10^5 (HDPE-2), respectively. The samples, about 150 mm wide and 2 mm thick, were cut for sheets obtained by compression molding in a laboratory Carver press at 180 °C. The samples were prepared by quenching into water and slowly cooling in oven. Gamma irradiation was conducted on the HDPE samples at room temperature to doses of 10, 40, 70, and 100 KGy, respectively. and in nitrogen atmosphere using a ^{60}Co source. Irradiated specimens were subjected to differential scanning calorimetry, tensile characterization and creep resistance.

As the irradiation dose increases HDPE-2 had a lower creep rate and a higher tensile strength than HDPE-1. The tensile strength and creep property of slowly cooled HDPE samples was much higher than that of quenched samples with irradiation dose.