

The Effect of Molecular Weight on the Cross-Linking of Two Different Molecular Weight LLDPE Samples

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Abstract : Polyethylene has wide usage areas such as blow molding, pipe, film, cable insulation. However, regardless to its growing applications, it has some constraints such as the limited 70C operating temperature. Polyethylene thermo setting procedure whose molecules are knotted and 3D-molecular-network formed, is developed to conquer the above problem and to raise the applicable temperature of the polymer. This paper reports the cross-linking for two different molecular weight grades of LLDPE by adding 0.5, 1, and 2% of DCP (Dicumyl Peroxide). DCP was chosen for its prevalence among various cross-linking agents. Structural parameters such as molecular weight, melt flow index, comonomer, number of branches, etc. were obtained through the use of relative tests as Gel Permeation Chromatography and Fourier Transform Infra Red spectrometer. After calculating the percentage of gel content, properties of the pure and cross-linked samples were compared by thermal and mechanical analysis with DMTA and FTIR and the effects of cross-linking like viscous and elastic modulus were discussed by using various structural parameters such as MFI, molecular weight, short chain branches, etc. Studies showed that cross-linked polymer, unlike the pure one, had a solid state with thermal mechanical properties in the range of 110 to 120C and this helped overcome the problem of using polyethylene in temperatures near the melting point.

Keywords : LLDPE, cross-link, structural parameters, DCP, DMTA, GPC

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