G02.18

Mechanical Properties of Uncrosslinked and Chemically Crosslinked Low and Super Tough High-Density Polyethylene /Ethylene Vinyl Acetate Copolymer Binary Blends

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Mechanical properties of binary blends of low and super tough high-density polyethylene (PE) with ethylene vinyl acetate copolymer (EVA), prepared by melt blending process over full composition range and chemically crosslinked with 0 to 3 wt.% tert.-butyl cumyl peroxide (BCUP), are reported in this paper. Changes of mechanical properties, including the stress at break, Young' modulus, yield strength and elongation at break, with blending ratio, crosslinking and temperature had been dominated by opposing effects of extent of crystallinity, crosslinking degree and morphology of the blends. Investigation of the mechanical properties of the uncrosslinked PE/EVA blends showed that with increasing of EVA content the modulus and hardness decreased. The elongation at break for the LDPE/EVA blends increased by increasing of EVA content, while a reversed trend was observed for the super tough HDPE/EVA blends. A good correlation could be established between mechanical (elongation at break) and morphological properties. The blends with a higher level of compatibility (LDPE/EVA) showed less deviation from additive rule of mixture in mechanical properties. The deviation becomes more pronounced for HDPE/EVA blends in the phase inversion region while an opposite trend was observed for LDPE/EVA blends with co-continuous morphology. The stress at break, Young's modulus, yield strength and elongation at break generally decreased with increase in BCUP content for the pure components. By increasing the temperature for slightly crosslinked PE (low BCUP content) the elongation at break was increased but, by increasing the crosslinking level an opposite trend was observed. The blends showed the similar behaviour as of the pure components but deterioration in the properties were more pronounced because the gel fraction (crosslink density) was higher for the sample of higher EVA content due to higher number of tertiary type of carbons, which readily take part in crosslinking reaction.