Chapter  6

SUMMARY AND CONCLUSIONS
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Blends of polyethylene are widely used for optimising the properties and processability of individual polymers. This study on low density polyethylene/linear low density polyethylene blends has been undertaken because of their commercial importance. Mechanical properties of LLDPE are superior to those of LDPE, while LDPE surpasses LLDPE in processability. Hence blending LDPE and LLDPE would be an excellent means of generating a spectrum of polymers with useful properties.

Rheological evaluation of the blends was done using a capillary rheometer and a Brabender torque rheometer. Flow curves (shear stress vs shear rate) of the blends were generated using the capillary rheometer. The power law index values were also calculated. Corrections of rheological functions as per Rabinowitsch and Bagley were made to generate the true flow curves. The temperature dependence of viscosity was evaluated from the activation energy for viscous flow. The elastic effects of the blends were evaluated from the Bagley pressure correction and the dieswell values. The
extrudate surface characteristics of the blends were also investigated. In most cases the rheological functions varied smoothly between the values of the constituent polymers indicating that the polymers could be mixed in any proportion for optimising the processing behaviour. LLDPE shows higher melt viscosity, pseudoplasticity index, melt elasticity and higher tendency for surface irregularities indicating that addition of LDPE to LLDPE is a good means of improving its processability.

The rheological evaluation of the blends was also done in Brabender torque rheometer. In this case the torque recorded by the rheometer was taken to be proportional to shear stress, rpm of the rotors as proportional to shear rate and torque/rpm as proportional to the viscosity. While the rheological data obtained from the torque rheometer was generally in agreement with those obtained from the capillary rheometer, it facilitated additional calculations such as energy required for plasticisation.

The mechanical properties of the LDPE/LLDPE blends also showed a clear pattern, the properties improving with LLDPE content. This further shows that
blends of LDPE/LLDPE can be advantageously used depending upon the specific requirements. Modification of the blends with dicumyl peroxide was found to be a promising method for improving the compatibility of LDPE/LLDPE blends further, since the dominating reaction upon modification was found to be that of crosslinking. The DCP modified blends showed improved properties such as higher abrasion resistance, higher solvent resistance etc. at the expense of marginal decrease in the mechanical modulus. This is obviously due to the loss in crystallinity of the blends on modification with DCP. DCP modification also enhances the melt viscosity.

A promising method for improving the toughness and stress crack resistance of the blends was found to be addition of elastomeric modifiers such as EPDM and SEBS. SEBS was found to be the best modifier in improving the elongation at break of the 50/50 blends remarkably without any deterioration in the tensile strength.