

The characteristics of recyclable thermo-plastic based on polyethylene blends for extruded cables

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Due to the poor recyclability and high energy consumption of XLPE, it is very acute to develop new environmental-friendly insulation materials. The binary polyethylene blend HDPE+LLDPE has been considered as one of the potential non-crosslinked environmental-friendly insulation materials with comparable electrical and mechanical performances.

In this investigation, the properties of binary polyethylene blend systems which contain HDPE and LLDPE have been measured and discussed. The blends are blending by torque rheometer in different proportions. Tensile and electrical tests have been taken on these blends with different proportions. From the results, a blend system which has the most excellent comprehensive performance has been chosen: 70%wt LLDPE-30%wt HDPE (31 MPa in tensile strength, 829% in breaking elongation, $3.2 \times 10^{15} \Omega \cdot m$ in volume resistivity and 94kV·mm⁻¹ in breakdown strength of 63.2% cumulative probability). It is also pretended that crystallinity of the blends increase and amorphous is dispersed evenly in crystalline phase by taking differential scanning calorimetry(DSC) and microscopic observation after corroding in boiling n-heptanes, therefore the blends have superior performance. Furthermore, water-treeing test of the chosen blend shows that the chosen material can suppress water-treeing. In summary, the recyclable thermo-plastic blends have great potential in using for extruded cables and can develop new direction of green insulation materials for power cables.

