Synthesis and Properties of Thermotropic Liquid Crystalline (LC) Copolyesters

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A series of thermotropic liquid crystalline copolyesters based on p-hydroxybenzoicacid(HBA) and poly(ethylene terephthalate)(PET), and having constant amounts of both terephthalic acid (TPA) and 2,6-dihydroxy naphthalene (2,6-DHN) were prepared by melt polymerization.

High molecular weight copolyesters were prepared by the acidolysis of poly(ethylene terephthalate) with carboxylic acids and polycondensation through the acetate and carboxyl groups. The monomer compositions were varied to determine the limits of composition that give high mechanical performance and melt processibility. LC-copolyesters with an inherent viscosity in the range of 0.7 to 1.0 IV were obtained. The glass transition temperature, degradation temperature, density and crystallinity of the LC-copolyesters apparantly increase with increasing mesogenic unit content. The co-polyester chain structure is not completely random. The heterogeneous structure consisting of a PET-rich phase and a phase in mesogenic units was observed by SEM after chemical etching.

Highly anisotropic melts observed on a hot stage of a polarizing light microscope indicates the presence of a nematic mesophase. The thermotropic

liquid crystalline copolyesters exhibit well developed and highly oriented fibrillar structure when extruded. The PET units lower the melting and/or stick temperature and between 10 to 20 mole % of PET content is a critical level to achieve their temperature in the range of 250 °C or lower. The copolyesters containing in the range of 5 to 10 mole % of PET units exhibited the highest mechanical properties and thermal transition temperature, and have a melting point near 290 °C and processing temperature within 330 °c.