The process of producing polyesters involves the known initial steps of esterification of at least one dicarboxylic acid with at least one glycol, followed by polycondensation to form high molecular weight polyester. The polyester polymers are prepared from monomers in a melt-phase.

In the practice of the present invention, a polyester composition is prepared which may be produced by condensing a dibasic acid, such as a dicarboxylic acid or a lower alkyl ester thereof with a glycol. Among the dicarboxylic acids and their lower alkyl diesters which may be employed to form a melt spun fiber or a molded polyester article are terephthalic; isophthalic; phthalic; naphthalene dicarboxylic; biphenylene dicarboxylic acid, bibenzoic acid, tetrahydroterephthalic acid, tetrahydroisophthalic acid, tetrahydrophthalic acid, hydronaphthalene dicarboxylic acid, cyclohexanedicarboxylic acid, cyclopentyldicarboxylic acid, cyclooctyldicarboxylic acid, succinic; glutaric acid; sebacic; adipic; azelaic; bibenzoic; pimelic acid, malonic acid, fumaric acid, itaconic acid, their monoesters, their diesters, and mixtures thereof, and bis-p-carboxy-phenoxyethane. Highly useful naphthalene dicarboxylic acids include the 2,6-, 1,4-, 1,5-, or 2,7- isomers but the 1,2-, 1,3-, 1,6-, 1,7-, 1,8-, 2,3-, 2,4-, 2,5-, and/or 2,8- isomers may also be used. Dibasic acids may contain from about 3 to about 40 carbon atoms and include isophthalic, adipic, glutaric, azelaic, sebacic, fumaric, dimer, cis- or trans-1,4-cyclohexanedicarboxylic, the various isomers of naphthalenedicarboxylic acids and the like. Preferred dibasic acids include terephthalic acid, isophthalic acid, naphthalene dicarboxylic acid, cyclohexane dicarboxylic acid and mixtures thereof. The dibasic acids may be used in acid form, acid anhydride form or as their esters such as the dimethyl esters. One or more of these acids and/or their lower alkyl esters is reacted with one of more glycols which include glycols having from about 2 to about 50 carbon atoms, preferably from about 3 to about 10 carbon atoms and include ethylene glycol, propylene glycol, 1,3-propanediol, 1,4-butanediol, 1,6-hexanediol, diethylene glycol, 1,4-cyclohexanediol, 1,4-cyclohexanedimethanol, neopentyl glycol; 1,8-octanediol, 1,10-decanediol, 1,12-

dodecanediol, diethylene glycol, triethylene glycol, tetraethylene glycol, dihydroxy-terminated higher oligomers of ethylene glycol, dimer of trimethylene glycol, trimer of trimethylene glycol, dimer of tetramethylene glycol, trimer of tetramethylene glycol, dihydroxy-terminated higher oligomers of tetramethylene glycol, and mixtures thereof. Preferred glycols include ethylene glycol, 1,4-cyclohexane dimethanol diethylene glycol and mixtures thereof. The 1,4-cyclohexanedimethanol may be in the cis or the trans form or as cis/trans mixtures. Since one or more esters may be reacted with one or more glycols, the polyesters are not limited to homopolyesters but also includes mixed polyesters such as copolyesters as well as copolymers with other monomers.

Polymers that are particularly useful in this process include poly(ethylene terephthalate), poly(ethylene naphthalenedicarboxylate), and copolyesters containing up to about 50 mole % of modifying dibasic acids and/or glycols. Of the polyesters within the contemplation of this invention, preferred are those containing at least a major amount of polyethylene terephthalate, the most preferred are those containing at least 80 mol% terephthalic acid and 80 mol% ethylene glycol on a 200 mol% basis. Polyethylene terephthalate is formed from a polymer produced by the polymerization of bis-(2-hydroxyethyl) terephthalate which is itself formed as an intermediate by one of two different methods. One method for producing bis-(2-hydroxyethyl) terephthalate is by direct esterification of terephthalic acid with ethylene glycol as described in U.S. Pat. No. 3,050,533 which is incorporated herein by reference. In this method the by-product of the reaction is water which is distilled from the reaction product. A second method for producing bis-(2-hydroxyethyl) terephthalate is by transesterification of dialkyl ester of terephthalic acid, preferably dimethyl terephthalate, with ethylene glycol. Preferably, two molecular proportions of ethylene glycol react with one molecular proportion of the dialkyl terephthalate. More preferably, more than two molecular proportions of ethylene glycol per molecular proportion of the dialkyl terephthalate are used since under these conditions the initial transesterification reaction occurs more rapidly and completely. The