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Effects of the side groups of the spirobichroman-based diamines on the chain packing and gas separation properties of the polyimides

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Abstract

Three spirobichroman-based diamines, FSBC, SBC and MSBC, with different substituted groups ($-\text{CF}_3$, $-\text{H}$, and $-\text{CH}_3$) were synthesized. The diamines were reacted with 4,4'-hexafluoroisopropylidene bisphthalic dianhydride (6FDA) to form 6FDA-FSBC, 6FDA-SBC, and 6FDA-MSBC polyimides, respectively. The organosolubilities, molecular weights (M_n), densities, glass transition temperature (T_g), thermal stabilities, fractional free volume (FFV), d-spacing and gas separation properties of the spirobichroman-based polyimides were systematically studied. The three spirobichroman-based polyimides had high M_n and T_g , excellent thermal stabilities, and good solubilities in a wide range of organic solvents. 6FDA-FSBC exhibited the highest gas permeability which could be attributed to its insufficient chain packing conditions resulting from the incorporation of spirobichroman backbone

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