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Highly Permeable Polyimide Membranes with a Structural Pyrene Containing *tert*-butyl groups: Synthesis, Characterization and Gas Transport

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Abstract

Three new polyimides with high gas permeability based on a new dianhydride 3,8-di(4-*tert*butylphenyl)pyrene-1,2,6,7-tetracarboxylic DP*t*, containing *tert*-butyl moieties are reported. Chemical structures of the resulting dianhydride monomer and polyimides were confirmed by FTIR and ^{1}H-NMR. All polyimides show high thermal stability with onset decomposition temperatures above 490°C, and glass transition temperatures above 340 °C. The incorporation of a pendant *tert*-butyl group into the polymer provided high gas permeability with moderated selectivity. The polyimide formed from DP*t* and 2,4,6-trimethyl-*m*-phenylenediamine, DP*t*-TMPD, showed 2035 Barrer CO_2 permeability which could be attributed to its inefficient chain packing from the incorporation of *tert*-butyl groups that increased the polymer *FFV*. The obtained gas permeability coefficients and gas selectivities are similar to those reported for PIM-PI polymers.

Keywords