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# Triptycene-containing Poly(benzoxazole-*co*-imide) Membranes with Enhanced Mechanical Strength for High-Performance Gas Separation

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**ABSTRACT:** Herein, a series of novel triptycene-containing thermally rearranged poly(benzoxazole-*co*-imide) membranes (TPI-PBOs) with enhanced mechanical properties and gas separation performance are reported. The effects of chemical structures and poly(benzoxazole-*co*-imide) composition on the fractional free volume, polymer chain packing, microcavity size and size distribution, mechanical properties, and gas transport properties have been comprehensively investigated. Due to the incorporation of triptycene-containing non-TR-able polyimide segments, the resulting poly(benzoxazole-*co*-imide) films exhibited good mechanical properties even after being treated at 450 °C. The incorporation of bulky and rigid triptycene units led to significantly improved fractional free volume and gas transport properties compared to previously reported poly(benzoxazole-*co*-imide)s. Several triptycene-containing poly(benzoxazole-*co*-imide) films displayed excellent gas separation performance for H<sub>2</sub>/CH<sub>4</sub>, H<sub>2</sub>/N<sub>2</sub>, and CO<sub>2</sub>/CH<sub>4</sub> gas pairs that exceeded the 2008 upper bounds.

**Keywords:** poly(benzoxazole-*co*-imide), triptycene, thermal rearrangement (TR), mechanical properties, gas separation membrane

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