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Gas transport properties of novel aromatic poly- and copolyamides bearing bulky functional groups

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Abstract

The synthesis and properties of novel aromatic poly- and co-polyisophthalamides bearing -OH, -tert-butyl (TERT) and 3,5-bis(trifluoromethyl) benzoyl (BTFB) groups are reported. All synthesized aramides are highly soluble in aprotic solvents, thermally stable up to 400 °C and present good film forming ability. The combination at random of -OH group with TERT or BTFB groups in copolymers **CPA 1** and **CPA 2** is highly effective for improving gas permeability (P) for all tested gases (CO_2 , O_2 , N_2 , CH_4) and selectivity (α) for CO_2/CH_4 and CO_2/N_2 . Copolymer **CPA 2b** containing OH and BTFB groups exhibited high gas permeability and good selectivity ($P_{\text{CO}_2} = 60.17$ and $P_{\text{CH}_4} = 2.67$, $\alpha = 22.53$) in comparison with analogous polyamides and some polyimides. These results are well correlated with both the increase in fractional free volume (FFV) and interchain d -spacing.

Keywords: aramides; functional groups; chemical modification; esterification; gas permeability

1. INTRODUCTION

Over the years, aromatic polyamides or aramides have been widely studied due to their outstanding thermal and mechanical resistance [1-5]. The properties arise from their aromatic structure and amide linkages, which result in rigid-rod polymer chains that interact with each other via strong hydrogen bonding. These bonds often create effective

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