SYNTHESIS OF LINEAR MICROPOROUS POLYIMIDES AND THEIR HYDROGEN STORAGE PROPERTIES

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ABSTRACT

A series of phthalimide based microporous polymers were successfully prepared by conventional nucleophilic substitution reaction of several newly synthesized tetrafluoro-monomers with commercially available 5,5',6,6'-tetrahydroxy-3,3,3',3'-tetramethylspirobisindane. FTIR, ^{1}H NMR, and elemental analyses were used to identify the proposed structures of the polymers. The synthesized polymers are of high molecular weight as demonstrated by Gel Permeation Chromatography (GPC). Thermogravimetric analysis shows that the prepared polymers were stable up to 300 ^{o}C. From the porosity analysis it is clear that the prepared polymers are analogous to polymers of intrinsic microporosity (PIMs) with high surface area (350-800 m^2/g). The *t*-plot analysis shown that the major contribution to the specific surface area is arising from the micropore surface area with narrow size distribution of ultramicropores as confirmed by the Horvath-Kawazoe (H-K) analysis. The hydrogen storage capacity of the prepared PIM-SI-(**1**-**7**)s were promising (up to 1.26 wt%, 77 K, at 1.13 bar) with high isoteric heats of H_2 adsorption (8.5 kJ/mol)**.** The results of this study demonstrate that controlling the appropriate monomer content via the three-dimensional structure can provide a uniform microporous morphology in the target polymers.

KEYWORDS: Microporous Polymers, Polyimides, Membrane, Hydrogen Adsorption