

## Synthesis and Characterization of Sulfonated Polyimides According to the Length of Aliphatic Segments

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A series of six-membered sulfonated polyimides with aliphatic linkages (SPIA) was successfully synthesized using 1,4,5,8-naphthalenetetracarboxylic dianhydride, 4,4'-diaminobiphenyl 2,2'-disulfonic acid as the sulfonated diamine, and aliphatic non-sulfonated diamines having different chain length. These SPIAs were evaluated for thermal stability, IEC, water uptake, proton conductivity and hydrolytic stability. Also proton conductivity and hydrolytic stability of the SPIAs were compared with fully aromatic polyimide having similar molecular weight and IEC. All the SPIAs exhibited high thermal stability. The IEC of SPIAs increased and the water uptake of SPIAs increased with decrease in the chain length of the aliphatic diamine. This was attributed to the increase in sulfonic acid content with decrease in the molecular weight of the aliphatic diamine in a particular weight of the polymer. The SPIAs showed higher proton conductivity than Nafion117 at high temperatures and higher proton conductivity than fully aromatic polyimide at all temperatures. All the SPIAs exhibited good hydrolytic stability.