

214c Molecular Design of Pems: Rigid Rod Liquid Crystalline Polyelectrolytes-Synthesis and Properties

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Rigid rod, liquid crystalline poly (phenylene sulfonic acids) were synthesized using Ullman coupling of dibromo aromatic sulfonates in sufficiently high molecular weight to cast free standing films. Graft copolymers were obtained by reacting aromatic moieties on the acid group, making sulfones. Biphenyl, t-butyl phenyl and 2,6-di t-butyl phenol were grafted. Conductivity at room temperature for the homopolymer and for many copolymers decreased very slowly with decreasing relative humidity, in some cases still above 10 mS/cm² at 22% RH. At 75°C, conductivity for one cross-linked biphenyl grafted polymer was >100 mS/cm down to 35% relative humidity. The polymers absorb much more water per acid group at low humidities than does Nafion®. Dimensional stability is very good- almost all swelling is perpendicular to the film. Only small amounts of t-butyl grafts are necessary to achieve water insolubility. Work is starting on comonomer and copolymer synthesis. Some data for these systems will be reported as well.