

**Synthesis, Characterization, and
Molecular Weight Studies
of Soluble Conducting Polymers**

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Soluble conducting polymers including poly(3-hexylthiophene), poly(3-octylthiophene), poly(3-decylthiophene) and poly(3-dodecylthiophene) are synthesized by both cyclic voltammetry and constant potential electrolysis. Acetonitrile and tetrabutylammonium tetrafluoroborate are used as the solvent and dopant, respectively. Both doped and undoped forms of all four polymers are characterized by Nuclear Magnetic Resonance (NMR), Fourier Transform Infrared Spectroscopy (FT-IR), Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA). Molecular weights are studied with Gel Permeation Chromatography (GPC) on solutions of polymers in toluene. Effect of time, potential and substituent groups' length on polymerization and on physical and thermal properties of the polymers are investigated. Chain stiffness and radius of gyration are studied by small angle neutron diffraction (SAND).