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Synthesis and properties of novel thiophene-based liquid crystalline conducting polymers

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Conjugated polymers are of great interest, since they can exhibit switchable optical properties and electrical conductivity. Among these conducting polymers, polythiophene has attracted great attention because they are stable and can be relatively easily functionalized.

Liquid-crystalline phases are stable condensed phases in which molecules pack together with an order that is transitional between crystalline solid and the disorder of an isotropic liquid. An achievable method to control the conductivity of conjugated polymers could be to attach mesogenic side groups to them. Conjugated polymers with a liquid crystalline functionality can present both electrical conductivity and self-organizing properties. The field of liquid crystalline conducting polymers is of increasing importance, with the potential to achieve wide commercial applications.

In this work, differential scanning calorimetry (DSC), hot-stage polarized optical microscopy, x-ray diffractometry (XRD), gel permeation chromatography (GPC), cyclic voltammetry and conductivity measurements have been used to study novel liquid-crystalline polythiophenes.

Liquid-crystalline polythiophenes were prepared chemically and deposited as thin-film coatings on indium-tin oxide (ITO) glass by spin- or solution-coating. Cyclic voltammetry was used to study electrochemical guest ion uptake and its reversibility. A computer-controlled potentiostat/galvanostat and a standard calomel reference electrode (SCE) were used. GPC was used to estimate the average polymer molecular masses and to study their distribution. Using DSC, it was possible to study phase changes and to observe the small energy changes involved. The electrical conductivities of the polymer films were measured by 2- or 4-probe methods.

Biography

Danesh Roudini completed his MSc (Electrochemically Synthesized Polypyrroles and their Ion Mobility Characterization) at Kingston University, UK. He is currently a PhD student in the Materials Research Center at Kingston University, UK. He presented his MSc work in the 43rd IUPAC World Polymer Congress in 2011.

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