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Radiation Induced Cross-Linked Carboxymethyl Starch for Removal of Metal Contaminants from Water

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This work describes the synthesis of low-cost chelating material derived from starch for adsorption of heavy metal ions from aqueous solution. The first part of the work deals with the chemical modification of corn starch with sodium monochloroacetate to obtain the carboxymethyl starch (CMS). Following carboxymethylation, the CMS was cross-linked using electron beam radiation (EB-radiation), resulting in a cross-linked carboxymethyl starch (CCMS). The modified starch derivative was characterized for degree of substitution (DS) using back titration method. Carbod groups introduced in the modified starch was confirmed by FT-IR analysis. Morphological study of the modified starch was carried out using WAXS analysis. In the second part of the work the CCMS was evaluated for the removal of metal contaminants from water.

Characterization of Solid State Dye-Sensitized Solar Cells Employing Polymer Electrolyte Cationic Dyecation

장성호

Solid state dye-sensitized solar cells (DSSCs) have shown the solar-to-electricity conversion efficiency up to 5% employing polymer electrolyte comprising poly (ethylene oxide) (PEO) poly(acrylic acid) (PAA) or poly(ethylene glycol dimethylether) (PEGDMDE)(x/y) where x is Li, K and 1–methyl-3-propanediol (MIP) cations. Those dye-ridden cations in electrolyte had a large influence on the electron transfer across the mesoscopic nanocrystalline TiO2 layer and thus on the overall energy conversion efficiency. It was suggested that the importance of the ionic diffusion on the electron recombination and the charge transfer rate at the counter electrode were assoive. Interestingly, the effects of the lifetime of electrons and the charge transfer resistance at the counter electrode side on the overall energy conversion efficiency in the solid state DSSCs were compensated each other, resulting in similar overall conversion efficiency.


장성호

A new series of liquid crystal–embedded quasi–solid-state electrolytes were developed for obtaining high efficiency of quasi–solid-state dye-sensitized solar cells (DSSCs). The quasi–solid-state electrolytes were composed of kiodie and triclinic redox species embedded in polyacrylonitrile (PAN) as a polymer matrix and liquid crystals (E7 or ML-0249). The liquid crystal–embedded quasi–solid-state electrolytes exhibited ion conductiviy of 4.7×10−7 S/cm and showed higher efficiency than the only PAN–based electrolyte. Highest efficiency of 6.21 and 6.99% was obtained for the quasi–solid-state DSSCs for E7 to PAN and ML-0249 to PAN, respectively. These high efficiencies of quasi–solid-state DSSCs are due to the effective formation of pathway through liquid crystal orientation for the transport of redox species.

Polymer/TiO2 Nanocomposite Electrodes for Flexible Dye Sensitized Solar Cells

고성재

Flexible dye–sensitized solar cells (DSSCs) based on plastic substrates have attracted much attention due to extensive applications such as ubiquitous, but very stable digital mobile electronic memory devices.

Universal Block Copolymer Lithography for Metallization, Semiconductors, Ceramics and Polymers

장성호, 김석광, 김태호, 송건우, 서광홍, 장성호, 이재영, 이병선, 천동천, 김석광, 니클, 미세공학, 광학, KAST

Block copolymers are soft and different components such as metals, semiconductors, ceramics, and polymers can be used for lithographic fabrication. The periodic separation of metals, semiconductors, ceramics, and polymers can be achieved by using different types of block copolymers and different lithographic techniques. In this study, we have developed a new block copolymer to fabricate fine patterns with different materials on plastic substrates. This block copolymer is composed of a metal block, a semiconductor block, a ceramic block, and a polymer block. These materials can be separated by using different types of lithographic techniques. We have successfully fabricated fine patterns with different materials on plastic substrates using this block copolymer.