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Nanocomposite of polyacrylamide-rGO-Ag-PEDOT/PSS hydrogels by photo polymerization method

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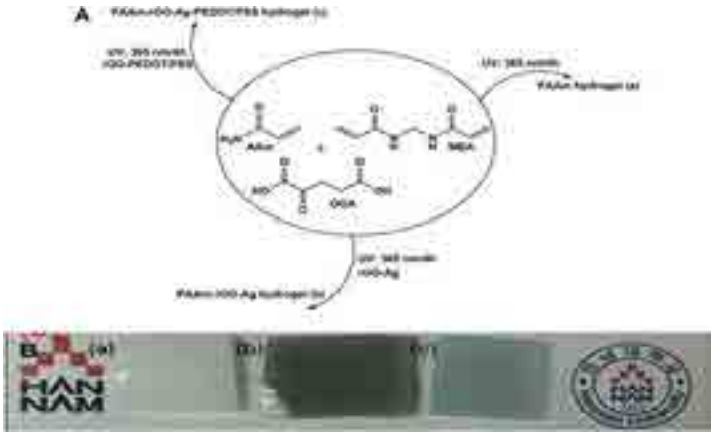
Hydrogels, distinct from solid materials are composed of a hydrophilic polymer network and large amount of water. Hydrogels can undergo significant changes in their physicochemical properties with variation of temperature, pH, light, biomolecules, salts, electric field, pressure, and so on. This special soft wet structure of hydrogels has enabled them to be used as biocompatible materials for a variety of applications, such as biosensors, bioseparation, drug release vehicles and tissue engineering scaffolds and hence being paid a lot of attention for several decades by researchers from material science, biomedical science and polymer science. We present a novel approach to the fabrication of advanced polymeric nanocomposite hydrogels from polyacrylamide (PAAm) by incorporation of graphene-silver-polyethylenedioxythiophene-polystyrene sulfonate (rGO-Ag-PEDOT/PSS) by photopolymerization method. Infrared spectroscopy was employed to characterize the structure of the hydrogels. The internal network structure of nanocomposite hydrogels was investigated by scanning electron microscope. Swelling, deswelling and mechanical properties of the hydrogels were investigated. The compressive strength of nanocomposite hydrogels reaches maximum of 1.71 MPa when the ratio of rGO-Ag-PEDOT/PSS to PAAm was 0.3 wt%, which is 1.57 times higher than that of PAAm hydrogels (1.09 MPa). For the first time, PAAm and its series of nanocomposite hydrogels have been successfully synthesized by in situ photopolymerization method. Graphene oxide was fully exfoliated into individual sheets. The tensile strength of PAAm hydrogel improved with the addition of rGO-Ag-PEDOT/PSS nanocomposite. The electrical conductivity of the PAAm-rGO-Ag-PEDOT/PSS nanocomposite hydrogel was found to be 3.91×10^{-5} S cm^{-1}. With the improved mechanical, thermal and electrical properties, may broaden the applicability of the nanocomposite hydrogels in various fields including drug release, bio-sensors, actuators, enzyme immobilization and molecular separation.



Biography

Kuk Ro Yoon is a Professor of Chemistry, Hannam University, South Korea. He has contributed to developing of surface-initiated polymerization (SIP) has plenty of uses to make functional organic surfaces by chain radical reaction of organic monomers.

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