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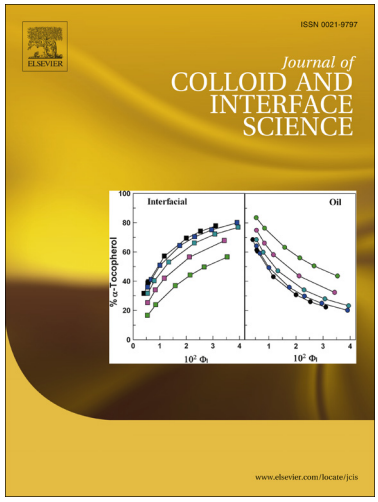

Regular article

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Functionalization of graphene with self-doped conducting polypyrrole by click coupling

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Abstract

The synthesis of self-doped conducting polypyrrole-grafted graphene sheets (GS-PPy) for non-volatile memory applications is reported. First, the alkyne-modified graphene sheets (GS-alkyne) were covalently functionalized with a water-soluble polymer containing numerous anionic SO_3^- dopants by a copper-catalyzed click reaction. Then, polypyrrole was covalently grafted onto the functionalized graphene sheets by chemical oxidative polymerization to produce GS-PPy hybrids. The GS-PPy hybrids showed a uniform coating of PPy on the GS sheets, good dispersion in aqueous solutions, high electrical conductivity, and red-shifted absorption peak in the UV/Visible spectra. The non-volatile memory device composed of a Al/(GS-PPy/poly(vinyl alcohol))/Al structure, produced by spin coating of the aqueous GS-PPy/poly(vinyl alcohol) solution, showed a good write-once read-many times memory behavior, which was due to good electrical and optical absorption properties of the GS-PPy hybrids. The findings of this study provide a potential solution for the fabrication of water-soluble graphene-based hybrids for non-volatile resistive-memory-based applications.

Keywords: Polypyrrole, Graphene, Hybrids, Click chemistry, Nonvolatile memory

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