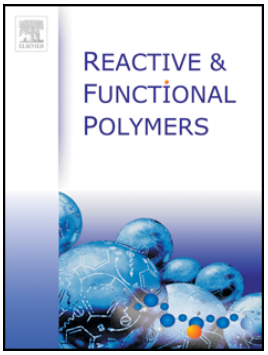

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Diverse composites of metal-complexes and PEDOT facilitated by metal-free vapour phase polymerization

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Abstract

Oxidative polymerization for the manufacture of conducting polymers such as poly(3,4-ethylenedioxy- thiophene) has traditionally employed iron(III) salts. Demonstrated in this study is vapour phase polymerization of 3,4-ethylenedioxythiophene using a metal-free oxidant, ammonium persulfate, leading to films with an estimated conductivity of 75 S/cm. Additionally, a route for embedding active transition metal complexes into these poly(3,4-ethylenedioxythiophene)/-poly(styrene-4-sulfonate) (PEDOT/PSS) films via vapour assisted complexation is outlined. Here, the vapour pressure of solid ligands around their melting temperatures was exploited to ensure complexation to metal ions added into the oxidant mixture prior to polymerization of PEDOT. Four composite systems are discussed, *viz.* PEDOT/PSS embedded with tris(8-hydroxyquinolinato)cobalt(III), tris(2,2-bipyridine)cobalt(II), tris(1,10- phenanthroline)cobalt(II) and tris(8-hydroxyquinolinato)aluminium(III). Using these composites, electrochemical reduction of nitrite to ammonia with a faradaic efficiency of 61% was reported.

Keywords: Conducting polymers, vapour pressure, reduction, nitrite, ammonia

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