Visible-Light-Enhanced Electrocatalytic Activity of a Polypyrrole/Magnetite Hybrid Electrode toward the Reduction of Dissolved Dioxygen, Janaky C, Endrödi B, Berkesi O, Visy C, JOURNAL OF PHYSICAL CHEMISTRY C, 114 (2010) 19338-19344.

Abstract

Conducting polymers are getting more and more interest as both supporting matrixes and electrocatalysts in the oxygen reduction reaction (ORR). A polypyrrole-magnetite nanocomposite layer has been synthesized by using potassium tetraoxalate as the conducting electrolyte. FT-IR measurements proved that chemical modification of the iron oxide by a reaction between the nanoparticles and the salt-leading to an iron oxalate layer on their surface-endows a negative charge to the particles, which leads to their penetration into the polymeric film as a part of the charge compensation. The new hybrid material showed significant photoelectrocatalytic behavior in the ORR. The ratio observed between the stabilized stationary currents under and without illumination is 2.0 for this hybrid. Separate studies on the electrochemical decomposition of H_2O_2 also indicated an enhanced catalytic activity of the polypyrrole/magnetite hybrid compared with the neat polymer. The results may open new opportunities in the next generation of solar fuel cell applications.