Synthesis and Characterization of Electrochemical Sensor Based on Polymeric /TiO₂Nanocomposite Modified with Imidazolium Ionic Liquid for Determination of Diclofenac

R. A. Farghali^{1,2}, Rasha A. Ahmed^{1, 3*}, Amal A. Alharthi¹

¹Taif University, Faculty of Science, Chemistry Department, Taif, Hawiya 888, Saudi Arabia

² Chemistry Department, Faculty of Science, Cairo University, Giza 12613, Egypt.

³ Forensic Chemistry Laboratories, Medico Legal Department, Ministry of Justice, Cairo, Egypt.

*E-mail:rashaauf@yahoo.com

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A novel , simple and sensitive polymeric nanocomposite electrochemical sensor based on polymeric / TiO₂ nanoparticles mixed with 1-butyl-3-methylimidazolium Chloride [BMIM]Cl ionic liquid and coated with a polymeric layer of poly(3, 4-ethylene-dioxythiophene) (PEDOT) was fabricated for diclofenac sodium (DCF) determination. The morphology and composition of the polymeric nanocomposite was characterized by means of scanning electron microscopy equipped with energy-dispersive X-ray spectroscopy (SEM-EDX) and transmission electron microscopy (TEM). X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) were also used. The cyclic voltammetry (CV), differential pulse voltammetry (DPV) and electrochemical impedance (EIS) spectra were recorded. All results sustained the electrochemical enhancement for the polymeric nanocomposite sensor, which ascribed to the beneficial effect of both TiO₂ nanoparticles and Imidazolium ionic liquid with the conducting behavior of the polymeric layer. Where, the peak currents for (DCF) at PEDOT/TiO₂/[BMIM]Cl/CPE show a great enhancement with a linear response in the concentration range from 5.0×10^{-6} – 1.0×10^{-4} mol L⁻¹. The limit of detection (LOD) was found to be 1.17×10^{-8} mol L⁻¹. Additionally, high selectivity of the polymeric nanocomposite sensor was noticed in presence of high concentration of ascorbic acid (AA) and uric acid (UA). Finally, the modified sensor was successfully applied for determination of (DCF) in its pure form, pharmaceutical samples of Voltic tablets and in urine samples with good agreement between the added and recovery.

Keywords: TiO₂ nanoparticles; ionic liquid; poly(3, 4-ethylene-dioxythiophene)PEDOT; Diclofenac sodium (DCF); electrochemistry

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