

## **Magnetic hybrid modified electrodes, based on magnetite nanoparticle containing polyaniline and poly(3,4-ethylenedioxythiophene)**

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### **Abstract**

In this paper, we report on the direct electrodeposition of magnetic hybrids based on magnetite nanoparticle containing poly(3,4-ethylenedioxythiophene) (PEDOT) and polyaniline (PANI) in the presence of magnetite and the special conducting electrolyte, potassium tetraoxalate. The optimal electropolymerization processes (monitored by scanning electron microscopy) were performed potentiostatically, and the incorporation of the iron oxide into the polymeric film was demonstrated by Diffuse Reflectance UV-Visible Spectroscopy (DR-UV-vis) and transmission electron microscopic measurements. Electrochemical quartz crystal nanobalance proved that both the neat PEDOT and the PEDOT/magnetite hybrid show anion exchange behaviour. Cyclic voltammetric features of the polymers and their hybrids exhibited an enhanced redox capacity of the composites. The difference in the effect of the scanning rate on this capacity increase in the two cases could be interpreted by the assumption that the presence of magnetite manifests dominantly in the enhanced intrinsic electroactivity of PANI, while in the case of the PEDOT composite, the extra charge is more connected to the charge surplus originating from the redox activity of the nanoparticles.

**Keywords:** Poly(3,4-ethylenedioxythiophene), Polyaniline, Magnetite, Nanocomposite, Supercapacitor, EMI shielding