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Towards TiO_2-conducting polymer hybrid materials for lithium ion batteries.

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Streszczenie

Nanocomposites of TiO_2 (anatase) with polypyrrole (Ppy) or poly(3,4-ethylenedioxythiophene) (PEDOT) were prepared *via* electrochemical routes. The deposition process of the conducting polymer films was performed in the presence of perchlorate, p-toluenesulphonate (TOS) or bis(trifluoromethylsulphonyl)imide (TFSI) anions in propylene carbonate (PC). The obtained electrode materials were characterized using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and scanning electron microscopy (SEM). An improvement of lithium ion intercalation/de-intercalation properties of titanium(IV) oxide as a result of its interfacing with the polymers is evidenced. This effect was strongly dependent on the thickness of the polymer layer and closely related to the polymer facility for transporting of lithium ion. Polypyrrole properties, in contrast to the PEDOT case, are very sensitive to selection of the substrate material (Pt or Pt/TiO_2) during electropolymerization. Polypyrrole deposited on a rough surface exhibits an improvement in its ion exchange abilities. The impact of underlying TiO_2 layers on Ppy properties has an indirect (synergic) influence on the effectiveness of lithium ion intercalation into the oxide too. The properties of the composites were discussed also in view of the comparative electrochemical quartz crystal microbalance (EQCM) study focussing on ion transport properties of Ppy and PEDOT.

Słowa kluczowe

Titanium(IV) oxide (anatase), polypyrrole, Poly(3, 4-ethylenedioxythiophene), Nanocomposites, Lithium ion intercalation, EQCM, CV, EIS, SEM

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