Photo-Electrochemical Properties of ZnO and TiO2 Layers the Ionic Liquids Environment

Dytrych, Pavel
2013

PHOTO-ELECTROCHEMICAL PROPERTIES OF ZnO AND TiO_2 LAYERS IN THE IONIC LIQUIDS ENVIRONMENT

P. Dytrych[a], P. Kluson[a], P. Dzik[b], M. Morozova[a], O. Solcova[a]

[a] Institute of Chemical Process Fundamentals of the ASCR, v. v. i., Rozvojova 135, Praha 6, Czech Republic

[b] Faculty of Chemistry of Brno University of Technology, Purkynova 118, Brno, Czech Republic

A novel class of ionic liquids based on quaternary ammonium salts with bistriflamide anion showed very interesting properties in the field of stereoselective hydrogenation in homogenous phase. Ionic liquids are well known as "green solvents" for many polar organic compounds. Their important property is a relatively high conductivity, which can be utilised in electrochemical applications. This study is dealing with an analogical set of IL´s (ionic liquids) with various conductivities and electrochemical properties of thin ZnO and TiO_2 layers in IL ´s used as electrolyte.

Both types of thin layers were prepared by sol-gel method and deposited on conductive transparent ITO glass by a new deposition technique - inkjet printing. Thin TiO_2 layers were created on the conductive substrate by means of the templated sol-gel technique. As a molecular template a reverse micelles system was used. The sol-gel method was based on hydrolysis followed by polycondensation of titanium alkoxide (TIOP) in the core of reverse micelles, where a small amount of water was involved. The micelle was formed by surfactant Triton X 102 in the nonpolar environment of cyclohexane [1]. Thin layers of ZnO were prepared by non-templated sol-gel method based on zinc acetate with diethanol amine (1:1) in isopropanol. After adjustment of the solutions viscosity, layers were printed on the ITO glass. Thin layers of ZnO were then calcinated at 500 °C for 5 hours, 450 °C for 4h was chosen for TiO_2 layers.

A series of structural (XRD, Raman, FTIR, *etc.*) and analytical (EDX, *etc.*) methods were employed for characterisation of prepared layers. Correlations between the conductivity, viscosity of ionic liquids and photo-electrochemical properties of ZnO and TiO_2 layers were found to be in a good agreement with theory.

References

[1] M. Morozova, P. Kluson, J. Krysa, P. Dzik, M. Vesely, O. Solcova, Sens. Actuator B-Chem.,160 (2011) 371.