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GEH-O-01



Ethanol oxidation at Pt-based alloys and UPD modified Pt/C catalysts

Amalija V. Tripković, Jelena D. Lović, Ksenija Dj. Popović
*ICTM-Institute of Electrochemistry, University of Belgrade,
Njegoševa 12, P.O.Box 473, 11000 Belgrade, Serbia*

Activity of two alloys, Pt₃Sn/C and Pt₃Ru₂/C, was compared with the activity of Pt/C modified with corresponding amounts of Sn_{UPD} (~25 %) and Ru_{UPD} (~40 %) in overall oxidation of ethanol. Pt₃Sn/C, Pt₃Ru₂/C and Pt/C catalysts were characterized by XRD. To establish the activity and stability of the catalysts potentiodynamic, quasi steady-state and chronoamperometric measurements were performed. Both alloys are more active than Sn_{UPD} or Ru_{UPD} modified Pt/C catalysts. Electronic effect determining dominantly the activity of Pt₃Sn/C is the main reason for its higher activity compared to Pt₃Ru₂/C. Since Sn_{UPD} and Ru_{UPD} do not provoke any significant modification of electronic environment, both modified Pt/C catalysts are less active than corresponding alloys. More pronounced difference in activity between Pt₃Sn/C and Sn_{UPD} modified Pt/C than between Pt₃Ru₂/C and Ru_{UPD} modified Pt/C is caused by electronic effect in Pt₃Sn/C. High activity of Pt₃Sn/C modified with small amount of Sn_{UPD} (~10%) can be explained by combining the electronic effect, causing less strongly bonded adsorbate on Pt sites and easier mobility of Sn_{UPD}, with enhanced amount of oxygen-containing species on Sn sites resulting finally in reinforcement of bifunctional mechanism.

GEH-O-02



Electrochemical hydrogen insertion kinetics in electrochemically prepared WO₃ film

Laura Sziráki, Lilla Bóbics, Ernő Kuzmann*, Győző Láng
*Eötvös L University, Institute of Chemistry, Budapest, Hungary,
Chemical Research Center, HAS, Budapest, Hungary

Anhydrous, orthorhombic tungsten trioxide films of about 1.5 μm thick were grown by novel bipolar current pulsing technique in 1 M H₂SO₄ solution. We aimed to elucidate the complexity of the ion insertion process into WO₃ film in aqueous acid media. Combined CV, galvanostatic intermittent titration, and X-ray diffractometric measurements were carried out for the identification of phase transformations during the electrochromic hydrogen insertion/extraction reaction. The observed structural irreversibility of the H insertion process due to H_xWO₃ → WO_{3-x}(OH)_x transformation was incorporated into the electrochemical impedance (EIS) model being successfully applied for the CNLS fitting procedures.