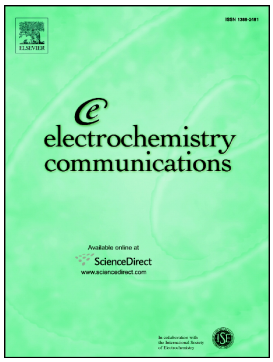

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Macroporous platinum electrodes for hydrogen oxidation in ionic liquids

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Abstract

Macroporous platinum structures have been prepared by electrodeposition in the interstitial spaces between a 500 nm polystyrene sphere template, onto platinum and glassy carbon electrodes. The structures were analysed with scanning electron microscopy and confocal microscopy. These electrodes are employed for the electrochemical oxidation of hydrogen in the room temperature ionic liquid 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ($[C_2mim][NTf_2]$). The behaviour on the porous electrodes showed obvious thin-layer characteristics in the cyclic voltammetry, with a strong tendency for hydrogen to accumulate and remain in the pores after being removed from the cell. Plots of peak current vs concentration (10–100% H_2) were linear, but currents continued to increase over time. The sensitivities (gradients) of the calibration plots were the highest for the platinum porous structures (compared to the bare, or nanoparticle-modified surfaces). Due to the accumulation of gas, such modified electrodes could be employed as leak-detectors for very low concentrations of hydrogen.

Keywords

Macroporous platinum; electrodeposition; gas sensing; hydrogen oxidation; voltammetry; room temperature ionic liquid.