

FTIR *in situ* investigations during the electrocatalytic oxidation of ethanol on PtSn/CeO₂-C

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Pt-Sn/C and PtSn/CeO₂-C electrocatalyst were prepared in a single step by an alcohol-reduction process using ethylene glycol as solvent and reducing agent and CeO₂ (15 wt%) and Vulcan XC72 (85 wt%) as supports. The performance for ethanol oxidation was investigated by cyclic voltammetry and *in situ* FTIR spectroscopy.

Highest current densities were achieved by the PtSn/CeO₂-C catalysts. FTIR results showed that the presence of CeO₂ on PtSn/C catalyst favors the C-C break bond leading to a higher ratio [CO₂]/[H₃CCOOH] of products during ethanol oxidation (Figure 1). The carbonyl band is hardly seen in the PtSn/CeO₂-C catalyst and its intensity increases in the order PtSn/CeO₂-C < PtSn/C < Pt/CeO₂-C. A large positive band about 1650 cm⁻¹ which is attributed to the vibration δ(HOH) of interfacial water decreases in the same order. The positive effect of CeO₂ addition in PtSn catalyst can be due the synergetic effect between Pt, SnO₂ and CeO₂. It favors not only the bifunctional mechanism but also the break of C-C bond in the adsorbed acetaldehyde molecule.

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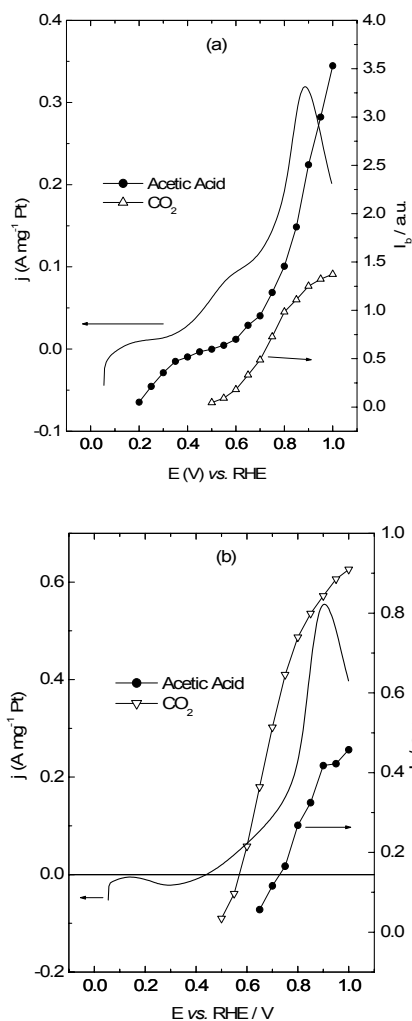


Figure 1. Cyclic voltammograms at 50 mV s⁻¹ compared to intensity of the FTIR bands of CO₂ and acetic acid in 0.5 mol L⁻¹ H₂SO₄ containing 0.5 mol L⁻¹ of ethanol for (a) PtSn/C and (b) PtSn/CeO₂-C electrocatalysts.