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Evaluation of tin-doped indium oxide synthesized by Pechini polymeric precursor route as eletrocatalyst support for ethanol electrooxidation

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The generation of electric energy with low environmental impact and efficiency is a motivation for the development of fuel cells systems which traditionally are fed by gaseous hydrogen. The interest for the use of methanol and ethanol has also been considered in order to reduce the infrastructure required to store and supply the fuel. However, the low alcohol electrooxidation kinetics is a problem. In the case of polymeric membrane fuel cell, platinum is the state-of-the art electrocatalysts used to solve this drawback. Carbon black is always employed as platinum support, but problems related to low corrosion resistance and poisoning by absorption of CO species reduces the fuel cell performance with time. In order to improve electrocatalysts efficiency, some metal oxides have been proposed as candidate for oxidation resistant catalysts support. Inspired by the good electrical conductivity of tin doped indium oxide (ITO) for some applications such as liquid crystal displays, ITO has been considered as platinum support. In the present work, ITO powders (10wt% SnO2 – 90wt% In2O3) were synthesized by the Pechini method. Produced powders were characterized by TG/DTA analysis, X-ray diffraction, energy-dispersive X-ray spectroscopy and scanning electron microscopy. Pt supported on ITO was prepared by borohydride reduction method. Pt deposited on commercial ITO and on carbon black (Vulcan) were also prepared for comparison purposes. Electrochemical behavior of ethanol electrooxidation reaction (EOR) was performed using cyclic voltammetry and chronoamperometry techniques. Results showed that ITO powders prepared with the molar ratio citric acid/metals 1:1, followed by calcination at 600oC, are porous and soft aggregate composed by nanoparticles with cubic structure and established nominal composition. This material allowed an electrochemical behavior similar to commercial ITO due to its particle size and suitable agglomerate porosity for ethanol electrooxidation reaction.