Pd/C-ITO electrocatalysts for glycerol electro-oxidation

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Abstract

Pd/C-ITO electrocatalysts were synthesized by borohydride method in different ratios. These materials were characterized for X-ray diffraction (XRD), transmission electron microscopy (TEM), chronoamperometry and direct alkaline glycerol fuel cell (DAGFC). Presence of Pd, SnO₂ and indium phases was detected for XRD. TEM images for Pd/C-ITO electrocatalysts showed particle size range 6 nm and agglomeration for all material synthesized. Pd/C-ITO (50:50) electrocatalyst presented best results for chronoamperometry measurements, on the other hand, for DAGFC Pd/C-ITO (85:15) was the better, at open circuit potential of about 0.96 V and the maximum power density about 17 mW cm⁻².

Introdução

Among different types of fuel cells, direct alkaline alcohol fuel cells (DAAFCs) have the advantages of low operating temperature and ease of liquid fuel handling¹. Recently, the electro-oxidation of glycerol have been receiving special attention due specific chemical characteristics. As well known, electrocatalytic material are the most important and expensive component in DAAFCs. Some works have been devoted to electro-oxidation of glycerol using Pd electrocatalytic as alternative to Pt in terms of cost and availability. In addition, conductive supports, which can replace the carbon black, in an attempt of improving the dispersion, activation and stability of the metal particles on the carbon surface for increasing the electro conductivity have been studied²,³. In this context, the purpose of this study was to characterize Pd electrocatalytic supported on a physical mixture carbon Vulcan XC72 and indium tin oxide (ITO) and, evaluate their catalytic activity in a direct alkaline glycerol fuel cell (DAGFC).

Resultados e Discussão

XRD presented Pd, SnO₂ and indium oxides phases (Fig. 1). TEM images for Pt/C-ITO electrocatalysts showed particle size ranging 6 nm (Fig.2). Pd had a great affinity for materials containing higher amounts of oxides.

Figure 1. XRD pattern of Pt/C-ITO.

Figure 2. TEM images of Pd/C-ITO.

Electrochemical experiments shown Pd/C-ITO 50:50 was the most active material for glycerol oxidation (Fig.3a) while for DAGFC Pd/C-ITO 85:15 had largest activity (Fig 3b).

Figure 3. a) Chronoamperometry curves Pd/C-ITO in 1M KOH solution; b) Polarization curves of DAGFC.

Conclusões

Pd/C-ITO (50:50) was the most active material due the sinergetic effect between support and electrocatalytic. However, in DAGFC Pt-ITO (85:15) shown major current density.

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