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# Carbon supported hybrids nanostructures PtSn with $CeO_2$ nanorods for Direct Ethanol Fuel Cells

**Tuani Carla Gentil (PG),[1] Luanna S. Parreira (PQ),[2] Felipe M. de Souza (PG),[1] Victor S. Pinheiro (PG),[1] Júlio Nandenha (PQ),[3] Almir O. Neto (PQ),[3] Mauro C. dos Santos (PQ),[1]*.**

**tuani.gentil@ufabc.edu.br; mauro.santos@ufabc.edu.br**

*[1]Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, Rua Santa Adélia, 166, 09210-170 Santo André, SP, Brazil; [2]Instituto de Química, Universidade de São Paulo, Av. Prof. Lineu Prestes, 748, 05508-000 São Paulo, SP, Brazil. [3]Instituto de Pesquisas Energéticas e Nucleares (IPEN), CNEN/SP. Av. Prof. Lineu Prestes 2242, 05508-000, São Paulo - SP, Brazil.*

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## Highlights

$Pt_3Sn_1$_20%NR/C can be an interesting alternative for DEFC considering the cost of the electrocatalyst.
The presence of $CeO_2$ nanorods improve the electrocatalytic activity for CO oxidation.

## Abstract

New energetic sources have been the focus of current researches, including on fuel cells. This device has as its operating principle the conversion of chemical energy into electrical energy, making possible the use of renewable energy sources [1]. In the fuel cells operation are applied nanostructured electrocatalysts capable of oxidizing organic molecules such as ethanol [2]. This work was carried out using PtSn-based electrocatalysts with ceria nanorods ($CeO_2$), synthesized by chemical reduction method via sodium borohydride [2], and supported on carbon Vulcan XC 72 (20% w/w). The synthesized materials have the following mass metal ratios: Pt/C; $Pt_3Sn_1$/ C and $Pt_3Sn_1$_20%NR/ C, with % of the $Pt_3Sn_1$ load replaced by ceria nanorods in the last nanomaterial, in order to reduce the costs of noble metals such as platinum. The evaluation of the activity for ethanol oxidation is given by polarization and power density curves, according to **Figure 1**. From the polarization curve it was observed that the $Pt_3Sn_1$_20%NR/ presented higher open circuit potential value (572 mV), and power density higher than the Pt/C composite material. The $Pt_3Sn_1$/C material presented a higher value of power density related to the others, but $Pt_3Sn_1$_20%NR/C generated a power density for ethanol oxidation relatively close to the best activity material, by the supply of oxygenated species improved the electrocatalytic activity for CO oxidation, making its application possible.

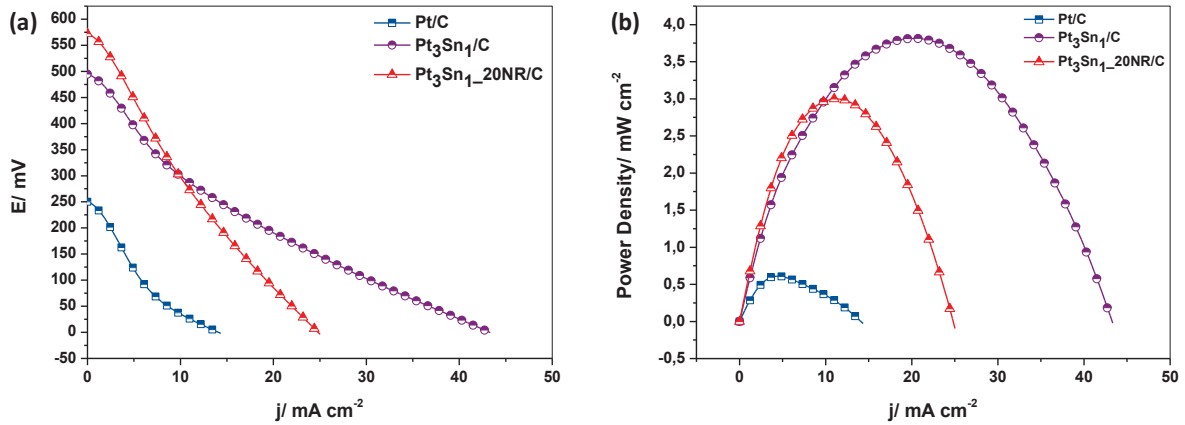


**Figure 1. (a)** Polarization and **(b)** Power density curves of a direct ethanol fuel cell, with an operating temperature of 80°C, 1 mL $min^{-1}$ flow of ethanol 2 mol $L^{-1}$ and 500 mL $min^{-1}$ oxygen flow, under a 2 bar pressure.

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