Materiais Nanoestruturados e o Aumento de Atividades Catalíticas

Nanostructured Materials toward Enhancement of Catalytical Activities

M. C. Santos*

[1] LEMN – CCNH – UFABC – Rua Santa Adélia, 166, Bairro Bangu, Santo André –SP – CEP 09210-170

Abstract: In this work, materials based on core-shell W@Au type structures and nanoflowers of α – Managanese Dioxide Nanoflowers were found to have promise for use as electrocatalysts on the *in-situ* production of H_2O_2 by means of the oxygen reduction reaction (ORR). We describe herein the synthesis and characterization of these materials and then present a study of electrocatalytic activity towards ORR by the electrogeneration of H_2O_2 employing these materials supported on Vulcan XC-72R and Vulcan 72 carbon corresponding to 1 % loading and 3 % loading respectively. The use of the nanomaterials W@Au/C and MnO_2 Nanoflowers/C materials led to higher activity compared to pure carbon and commercial Pt/C. Exhaustive electrolysis using a W@Au/C 1% and MnO_2 Nanoflowers/C 3% gas diffusion electrodes (GDE) were employed to verify the real amount of H_2O_2 electrogenerated comparing with a Vulcan XC-72R and Vulcan XC 72 GDE. We verified that the materials are able to generate much more H_2O_2 than carbon. These results can be explained based on synergistic interactions presented by the W@Au/C 1% material and also by both conductivity and hydrophilicity differences provided by the nanostructures supported on carbon. Manganese oxide (MnO_2) nanomaterials represent promising low-cost alternative electrocatalysts for the hydrogen peroxide (H_2O_2) production by the oxygen reduction reaction (ORR). However, the synthesis of uniform and well-controlled MnO_2-based materials displaying improved performances remain challenging. These variations in the electrocatalytic activities as a function of the MnO_2 loading correlated well with the variations in the concentration of oxygen vacancy sites in the catalysts due to MnO_2-C interactions, in which higher concentrations of oxygen vacancies led to improved electrocatalytic performances. We believe the results described herein shed new light on the understanding of the hole played by oxygen vacancies over the electrogeneration of H_2O_2 by the ORR, having important implications for the design of novel MnO_2-based electrocatalysts with superior activities

Acknowledgments:
CNPq, Fapesp (2015/10314-8) and Capes

References:

[1] Antonin *et. al, Electrochimica Acta* 231 (2017) 713-720
[2] Aveiro *et al.*, *A. Catal. B: Environmental.* (2017). *Submitted*

* **main author e-mail:**mauro.santos@ufabc.edu.br