CICLO DE SEMINARIOS 2010

SMAT-C Soft Matter Research and Technology Center

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"TUNING THE PROPERTIES OF CATALYSTS FOR MAXIMUM ACTIVITY IN ELECTROCHEMICAL REACTIONS. IMPACT IN ENERGY CONVERSION AND SENSORS"

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Macrocyclic complexes have been used extensively as catalysts for a great variety of electrochemical reactions 1-5 and found applications in the development of sensors for many target molecules1-5 In this presentation we will focus our discussion on the electrocatalytic properties of these compounds when they are confined on electrode surfaces using different strategies and the reactivity indexes of these complex that determine their reactivity. To obtain active electrodes for a great variety of electrochemical reactions, these molecules can be confined on the surfaces graphite, carbon electrodes, and electrodes modified with carbon nanotubes. They can also be confined on gold surfaces which are modified with self-assembled monolayers (SAMs) of thiols. Electrodes modified with these complexes can serve as electrochemical sensors of a variety of substances and their sensitivity can be increased by the use of carbon nanotubes. The redox potential of the catalysts is an crucial reactivity index2,3. Correlations between electrocatalytic activity and the redox potential of the catalysts are non-linear for several reactions investigated (see Figure). The redox potential of the metal complexes can then be "tuned" using substituents (R groups) on the ligand to achieve maximum activity for a given reaction. We have derived a mathematical expression that describes the behaviour depicted in the figure for symmetrical an unsymmetrical volcanoes for several reactions including the oxidation of thiols: 2-mercaptoethanol, marcaptoacetate, aminoethanethiol, l-cysteine and for the oxidation thiocyanate, glucose, hydrazine and for the reduction of O2.

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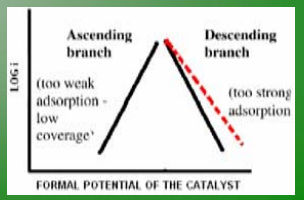

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MARTES 24 AGOSTO, 14:00 HORAS

Sala Conferencias, Tercer Piso – Departamento de Física
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