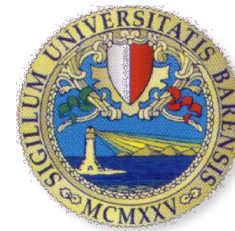




Istituto di Chimica dei Composti
OrganoMetallici - ICCOM



Scuola di Dottorato di Ricerca in
Scienze Chimiche e Molecolari

AVVISO DI SEMINARIO

il Dott. Francesco Vizza

Direttore ICCOM-CNR

terrà un seminario dal titolo:

“Nanotecnologie in elettrocatalisi per la produzione di energia e chemicals”

mercoledì 19 aprile 2017, alle ore 15:30

in Aula 5

Dipartimento di Chimica

Prof. Pietro Favia

Coordinatore della Scuola di Dottorato

Nanotechnology in Electrocatalysis for Energy and Chemicals

The selective production of chemicals from renewable resources with contemporaneous release of energy or hydrogen, is perhaps one of the most desired targets of sustainable chemistry. In our laboratory, we have demonstrated that this can be achieved using renewable alcohols, by means of two electrochemical devices: direct alcohol fuel cells (DAFC) and electrolyzers. In either case, an aqueous solution of the fuel in the anode compartment is oxidized on a nanostructured electrocatalyst that promotes selectively the partial oxidation of the anolyte with high stability and fast kinetics. We have found that anode electrocatalysts based on nanosized Pd particles, alone or promoted by Ni-Zn phases as well as by CeO₂ or TiO₂, are able to accomplish this goal in alkaline environment when used in conjunction with commercially available cathode electrocatalysts and solid or liquid electrolytes. In an electrolyzer, containing an anode electrocatalyst similar to that employable in a DAFC, the electrolyte may be either an anion exchange-membrane or a solution of an alkali metal hydroxide (NaOH or KOH, for example) and the alcohol is converted to the corresponding alkali metal carboxylate, while hydrogen gas is produced at the cathode upon water reduction.

Recently, we have introduced a new type of DAFC, denoted as Organometallic Fuel cell (OMFC), operating in alkaline media where the anode catalyst is a molecular metal complex. In this device the organometallic complex [Rh(OTf)(trop2NH)(PPh₃)] was shown to catalyze selectively the oxidation of alcohols to carboxylates.

Francesco Vizza

Francesco Vizza is Director Protempore and Research Director at ICCOM-CNR, Florence, Italy. Author of 170 peer-reviewed publications in qualified international journals, 33 patents, 2 monographs, 10 chapters in specialized books, 200 presentations at International and National Chemical Meetings.

Bibliometric data (Web of Science 20/03/2017): h-index 43; sum of times cited 5327; citing articles: 3252; average citation per item >32. Francesco Vizza is also scientific director of the Laboratory of Advanced Energy Materials (LAEM@ICCOM) which involves 7 researchers, 2 PhDs and 1 Postdoc.

Research Interests: Electrocatalysts for Fuel Cells (DAFC and PEMFC); Electroreforming for hydrogen production from renewable resources (alcohols); Electrocatalysts for solar fuel production; Electrocatalysts for the reduction of CO₂ to fuels and chemicals; Direct electrochemical oxidation reaction of alcohols at medium to high temperature (150-200 °C); Development of photocatalysts for H₂ evolution; Catalysts for hydrogen evolution by controlled hydrolysis or thermolysis of metal hydrides; Recovery of metals from waste lithium batteries; Organometallic Fuel cells (OMFC) and Organometallic Electro-reformers (OMER).

Selected recent publications

- 1) "Highly active nanostructured palladium-ceria electrocatalysts for the hydrogen oxidation reaction in alkaline medium" Nano Energy 2017, 33, 293–305.
- 2) "Pd/C-CeO₂ anode catalyst for high performance platinum free anion exchange membrane fuel cells". Angew. Chem. Int. Ed. 55 (2016) 6004 - 6007: DOI: 10.1002/anie.201600647R1.
- 3) "Lactic Acid from Glycerol by Ethylene-Stabilized Platinum-Nanoparticles" ACS Catal., 6 (2016) 1671-1 DOI: 10.1021/acscatal.5b02914.
- 4) "Nanotechnology makes biomass electrolysis more energy efficient than water electrolysis" Nature Commun 2014, 5, 4036 DOI: 10.1038/ncomms5036.

Recent Patents:

- 1) "Apparatus for the production of Gas" US 2015/0284246 A1; WO 2014/115178 A1; PCT/IT2013/000022
- 2) "Gas generator, in particular for gaseous hydrogen" US 2015/0284246 A1; WO 2014/097334 A1; PCT/IT2012/000397
- 3) "Device for the generation of hydrogen, apparatuses that contain the device and their use" WO 2015/021242 A1; PTWO 11254 filling date 16-09-2014.

Recent books:

- 1) Lavacchi, A; Miller, H.A.; Vizza, F. "Nanotechnology in Electrocatalysis for Energy" Nanostructure Science and Technology 170, Springer Science +Business Media New, York, 2014, DOI: 10.1007/978-1-4899-8059-5_1