

## **NANOSTRUCTURED PHOTOELECTROCHEMICAL SYSTEMS FOR SOLAR ENERGY CONVERSION AND ENVIRONMENTAL PHOTOREMEDIATION**

### *GOALS*

The group is involved in the development and dynamic characterization of molecular systems and materials useful for capturing converting and storing solar energy, by mainly exploiting the charge generation and separation at nanostructured semiconductor junctions. Radiant power can be either directly converted in electric power in solar cells sensitized by molecular dyes or by other lower gap semiconductors or stored in the form of chemical energy, by generating solar fuels through photoinduced water splitting/CO<sub>2</sub> reduction reactions. An interesting emerging application of photoelectrochemical reactions in aqueous media is devoted to the oxidative degradation of organic pollutants of recent concern which can be successfully carried out through redox reactions triggered by high energy charge carriers.

### *INSTRUMENTS AND METHODS*

The research activity is focused on the characterization of molecular systems and semiconductor materials and demands the understanding of their dynamic functioning in photoelectrochemical cells. The main methods for the investigations of the charge transfer dynamics are based on the analysis of the current-potential characteristics of the solar devices, on electrochemical impedance spectroscopy, on time resolved optical spectroscopy and on EPR spectroscopy. The structural and morphological characterization of electrodes and materials produced and modified mainly through hydrothermal/wet processing are carried out through scan probe microscopies, X ray diffraction, micro-Raman. Some of these instrumentations are available within the research group (Atomic Force Microscopy) while other techniques are exploited through internal collaborations (X Ray Diffraction, SEM) or external collaborations (high resolution SEM and TEM, micro Raman, XPS)

### *MAIN SUBJECTS*

Inorganic chemistry, Photochemistry, Photocatalysis, Electrochemistry, Photoelectrochemistry

### *RESEARCH GROUP*

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Roberto Argazzi

### *COLLABORATIONS*

The group is involved in various collaboration with other research groups within the department (i.e. Analytical Chemistry for chromatography and mass spectrometry) and with other universities and research institutions at the national levels. Established collaborations are with Università statale di Milano and Milano-Bicocca, Università di Padova, Università di Trento, Università di Roma Tor Vergata/CHOSE, Università di Messina, Università di Trieste, ENI-Istituto Donegani, Università di Torino and Università di Bologna. At the moment various collaborative researches are carried out with the University of North Carolina at Chapel Hill (NC, USA), Université de Lorraine (Nancy, France), Queen Mary University (London, UK), École polytechnique fédérale de Lausanne, EPFL (Lausanne, Switzerland), University of Salzburg (Salzburg, Austria) and Institute of Chemical Research of Catalonia, ICIQ (Tarragona, Spain).