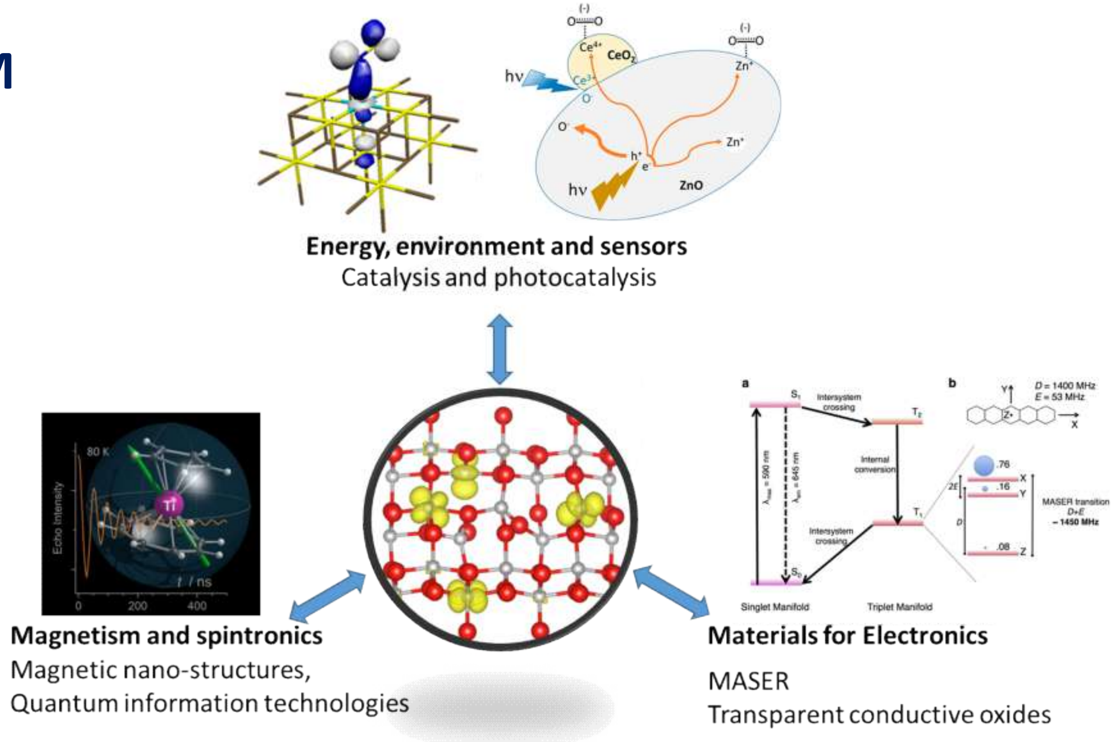
INORGANIC MATERIALS AND MAGNETISM

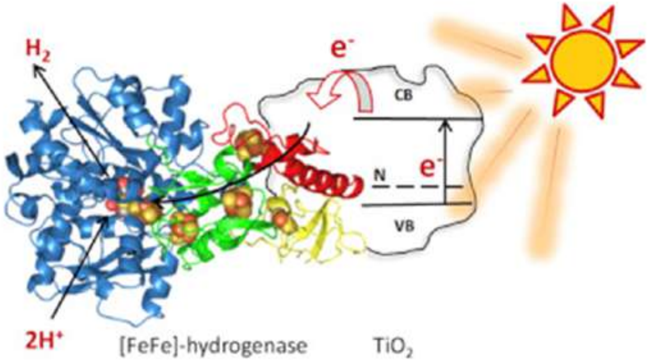


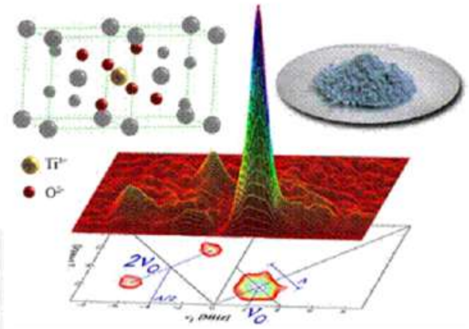
The research activity of the group focuses on the **synthesis and characterization of inorganic materials** with emphais on **atomic and molecular spin carriers** at the surface and the interface. Spin plays a crucial role in chemistry and materials sciences and the field has matured from a collection of spectroscopic curiosities to a dynamic and fast-moving enterprise that impacts mainstream research in the fields of catalysis and photocatalysis, biochemistry and materials science. Currently, the main areas of research include: **materials for energy, environment and sensors**; **magnetic systems for quantum sensing and quantum information**; and **materials for electronics**. Many of these projects involve interdisciplinary collaborations.
The key experimental technique is **electron paramagnetic resonance** in conjunction with standard characterization techniques such as UV-Vis-NIR spectroscopy, X-ray diffraction, surface and volumetric analysis.

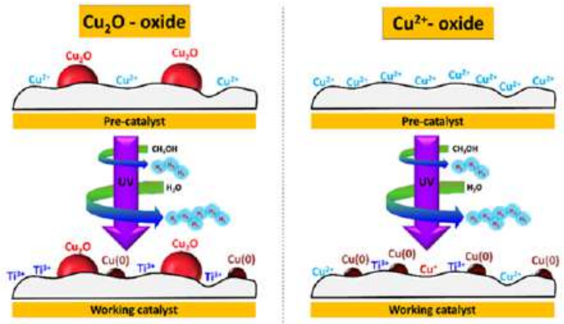
Contacts: mario.chiesa@unito.it mariacristina.paganini@unito.it enrico.salvadori@unito.it

Supervisor: **M.C. Paganini** mariacristina.paganini@unito.it **Available from: immediately**

Energy Harvesting and H_2 Production from Water Splitting





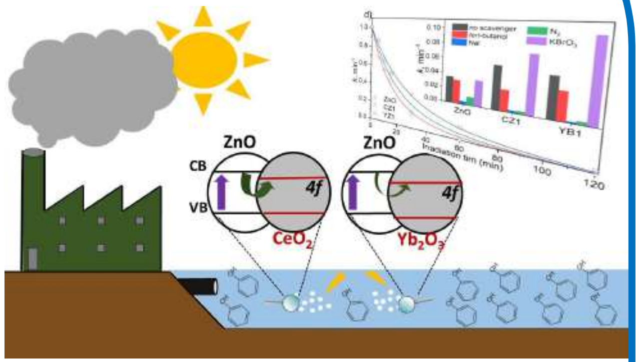


The research focuses on the synthesis and characterization of innovative semiconductor oxide-based photocatalysts and hybrid systems involving the use of biocatalysts (hydrogenases) for hydrogen production (water photo-splitting).

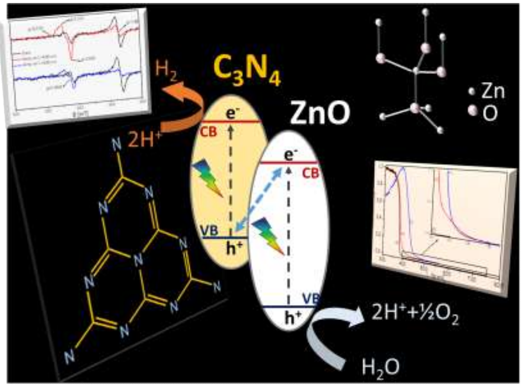
Collaboration with: G. Gilardi, F. Valetti Dip. DBIOS, G. Pacchioni Università di Milano Bicocca

Supervisor: **M.C. Paganini** mariacristina.paganini@unito.it **Available from: immediately**

Solar Chemistry & Photocatalysis. Environmental Applications



Photocatalysis is an innovative and powerful method for the abatement of environmental contaminants. In particular the removal of emerging pollutants from water and air is one of the most important challenge of the next future. Semiconducting oxides, such as ZnO, CeO_2, C_3N_4 and their blends, are promising and robust platforms that are currently under investigation.



A range of synthetic methods will be used: sol-gel, hydrothermal, MW assisted, wet impregnation methods. Synthesized materials with specifically tailored and engineered properties will be fully characterized via XRD, SEM, TEM, UV-Vis, BET and EPR spectroscopy. The latter is used to monitor the fate of charge carriers which play a crucial role in the photocatalytic process.

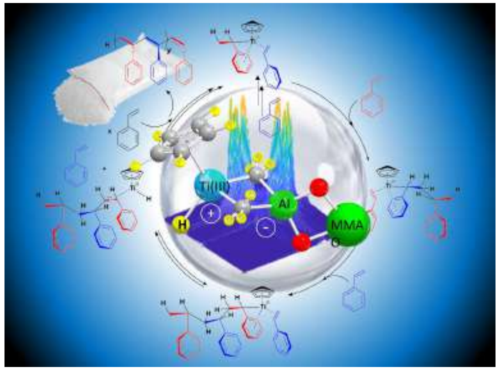
Collaboration with: P. Calza, G. Magnacca

Supervisor: M. Chiesa, E. Salvadori
Mario.chiesa@unito.it, enrico.salvadori@unito.it

Available from: early 2021

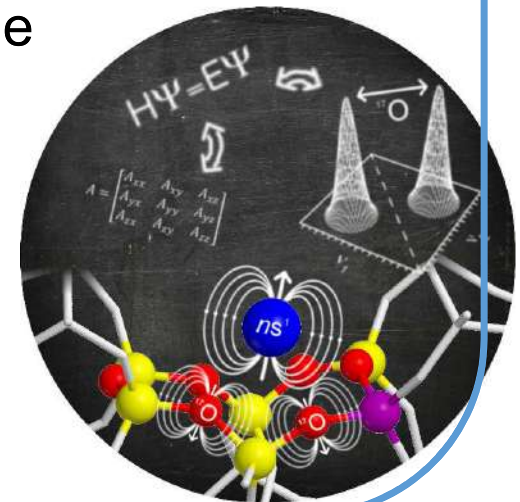
Structure and Reactivity of Catalytic Active Sites in Heterogeneous, Homogeneous and Enzymatic Catalysts

Chemical reactions are controlled by two fundamental parameters, energy and spin of reactants. Spin plays a crucial role in determining the structure and reactivity of heterogeneous, homogeneous and enzymatic catalysts.



The focus of this project is to use spin states and spin densities to derive structure-function relationships of active sites and how these impact on chemical reactivity and catalysis.

This work is part of the international project dedicated to unvailing the role of spin in catalysis. More infos on www.paracat.eu



Collaboration with: Universities of Cardiff, Antwerp, Zaragoza and Leipzig

Supervisor: M. Chiesa, E. Salvadori

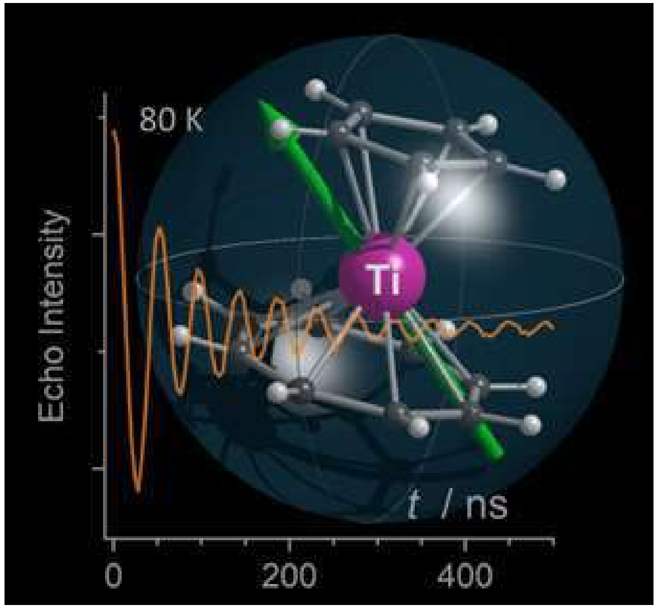
Mario.chiesa@unito.it, enrico.salvadori@unito.it

Available from: early 2021

Spin Dynamics in Molecular Spin Based Qubits

Due to their open *d*-shell, transition metal (TM) ions display a diverse and chemistry. This paves the way to numerous research avenues and technological applications, including the realization of devices operating on quantum states. Electronic spins in different environments are currently investigated as potential qubits, *i.e.* the logic units of quantum computers.

This collaborative project deals with different aspects related to the control of spin-dependent electronic properties. EPR spectroscopy, with emphasis on advanced pulse EPR techniques are used to probe the nature of spin states and electron spin relaxation properties, which are key for the implementation of specific quantum systems for emerging quantum and spintronic devices.



Collaboration with: University of Florence (Prof. R. Sessoli)