

Proposte di TESI: Chiesa, Livraghi, Paganini, Salvadori

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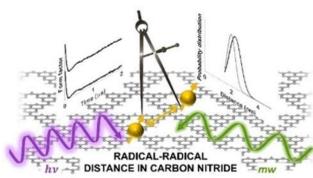
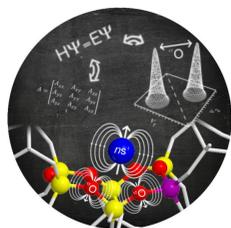
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Structure and Reactivity of Magnetic Atoms and Molecules

Chemical reactions are controlled by two fundamental parameters, energy and angular momentum – the spin – of reactants. Spin-states and spin density distribution play a crucial role in determining the structure and reactivity of heterogeneous, homogeneous and enzymatic catalysts.

The focus of this research is on understanding, through an experimental approach, how the spin properties impact on chemical reactivity and catalysis.



Recently, we have become particularly interested in determining the long-range spatial distribution of spin-bearing species in inorganic and bioinorganic systems and in monitoring the origin and fate of metastable species formed upon photoexcitation.

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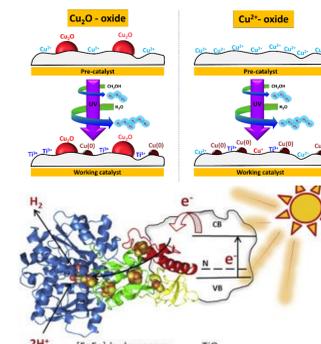
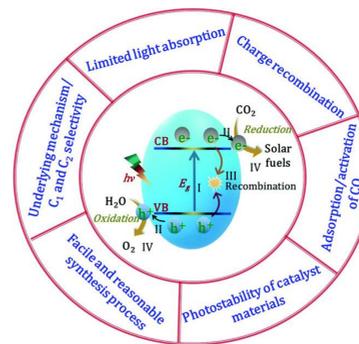
Chiesa M., Salvadori E., *et al.*, *Angewandte Chemie*, 2019, DOI: 10.1002/anie.201906488
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Mario Chiesa, Enrico Salvadori

Innovative Materials for Solar Energy Harvesting and Production of Solar Fuels

The research focuses on the synthesis and characterization of innovative semiconducting oxide-based photocatalysts and hybrid systems involving the use of biological (hydrogenases) or inorganic (noble metals, Cu_2O , C_3N_4 ...) co-catalysts for hydrogen production (water photo-splitting) and CO_2 conversion.

Main targets of the research are the evaluation of the solar fuel production capability and the investigation of the reaction mechanism occurring at the surface of the photocatalysts



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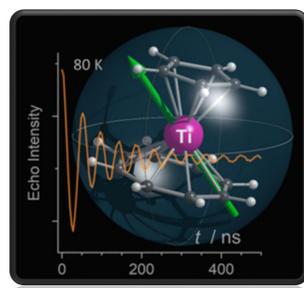
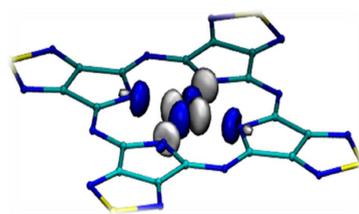
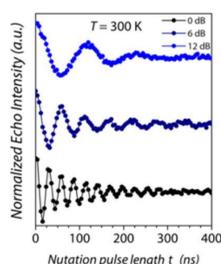
Paganini MC, Livraghi S. *et al.*, *Chemical Science*, 2020, DOI: 10.1039/d0sc02876b
 Paganini MC, *et al.*, *J. of Cleaner Production*, 2020, DOI: 10.1016/j.jclepro.2019.119762
 Livraghi S. *et al.*, *J. Mag. Res.* 2020 DOI: doi.org/10.1007/s00723-020-01226-w

Maria Cristina Paganini; Stefano Livraghi

Spin Dynamics in Molecular Spin Based Qubits

Transition metal ions display a diverse and rich chemistry greatly influenced by their open-shell structure. This impacts on chemical reactivity but also prompts scientific research and technological applications including the realization of devices harnessing the quantum nature of spins.

This collaborative project deals with the control of spin-dependent electronic properties. EPR spectroscopy - with emphasis on advanced pulse EPR techniques - is 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.



RECENT PUBLICATIONS ON THE TOPIC:

Chiesa M, Salvadori E., *et al.*, *Chemical Science*, 2022, DOI: 10.1039/D2SC04969D
 Salvadori E., Chiesa M., *et al.*, *Chemical Science*, 2022, DOI: 10.1039/D2SC03712B
 Chiesa M. Salvadori E., *et al.*, *JACS Au*, 2023, DOI: 10.1021/jacsau.3c00121

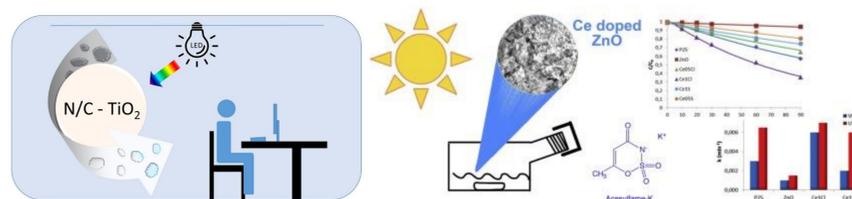
Mario Chiesa, Enrico Salvadori

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.

Different synthetic ways will be used and the synthesized materials with specifically tailored and engineered properties will be fully characterized via XRD, SEM, TEM, UV-Vis, BET and EPR spectroscopy.

Part of this work is carried out in collaboration with COLOROBIA consulting, a corporate of Gruppo Colorobbia specialized in technology services and development of new materials



RECENT PUBLICATIONS ON THE TOPIC:

Paganini MC *et al.*, *Chemosphere*, 2022, DOI:10.1016/j.chemosphere.2022.135017
 Paganini MC *et al.*, *J. of Photochem. Photobio. A: Chemistry*, 2022, DOI: 10.1016/j.jphotochem.2022.113775
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 Livraghi S. *et al.*, *Adv. Mater. Interfaces*, 2022 DOI: 10.1002/admi.202100532

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