



AVVISO DI SEMINARIO

Il giorno giovedì 18 Giugno 2026, ore 11:30.
nell'Aula Grassano del Dipartimento di Fisica

Il Prof. Francesco Parrino

*Dipartimento di Ingegneria Industriale
Università di Trento*

Terrà un seminario dal titolo

**“Electron or energy transfer
in TiO₂ Photocatalysis...
that is the question”**

Proponente: Prof.ssa Claudia Bizzarri

Abstract

Electron transfer is generally invoked to explain most of the reported photocatalytic reactions. However, upon interaction of an electronically excited species (e.g. irradiated TiO_2) with another in its ground state, both electron or energy transfer could in principle take place. These events are mechanistically and conceptually related, but they evolve differently along the reaction coordinate depending on several factors.

This contribution will provide some paradigmatic examples showing how surface modification could address the photocatalytic activity towards prevailing energy transfer based reactions. For instance, even if with evident differences, surface modifications of TiO_2 with silane moieties or with carbon dots induce similar structural and photoinduced functional features of the resulting photocatalytic material. In both cases, surface modification changes locally the crystal field of the titanium atoms and stabilize Ti^{3+} defects in the sub-surface region. The amount of these paramagnetic centers appears to be correlated with the formation rate of singlet oxygen, while electron transfer to superoxide is suppressed.

Surface modification is therefore a useful tool to exploit energy transfer driven reactions. For instance, energy transfer driven isomerization of caffeic acid has been found to occur effectively in the presence of modified TiO_2 . More importantly, the preferential formation of singlet oxygen at the surface of the irradiated modified semiconductor is an indirect proof of the occurrence of energy transfer driven reactions. This has been exploited for the epoxidation of limonene and for the design of oxygen getting nanocomposites.

Even if more direct evidences are required to corroborate these results, the presentation will show that it is possible to control the nature of the oxidizing species in photocatalytic processes by simple surface engineering, with extremely intriguing consequences in the field of green organic chemistry.

SHORT CV

Francesco Parrino graduated at the University of Palermo in 2005 in Chemical Engineering cum laude and got a PhD in Inorganic Chemistry in 2009 at the Friedrich-Alexander University of Erlangen-Nürnberg (Germany). He is currently Associate Professor of Chemistry and Thermodynamics of Materials at the Department of Industrial Engineering, University of Trento (Italy). His research activity deals with the preparation and characterization of photocatalysts for the degradation of pollutants and for the green synthesis of valuable organic molecules. His scientific production conjugates mechanistic and fundamental aspects of heterogeneous photocatalysis with engineering issues for industrial applications. He has authored more than 130 joint papers and book chapters, three patents, and several communications in international conferences on these topics.

