

# Caffè Scientifico di Fisica della Materia

ore 12:00 – aula riunioni 1° piano V.le B. Pichat 6/2

## Probing Charge Transfer Phenomena in V doped TiO<sub>2</sub>

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Charge transfer phenomena play a key-role in photo-catalysis and photo-chemistry. A deep understanding of electron photo-dynamics is essential to developed efficient knowledge-based devices for green energy production. We exploited differential illumination HERFD-XAS and transient absorption spectroscopy to investigate what really happens to a V-doped TiO<sub>2</sub> photo-catalyst for hydrogen production under visible light exposure. Thanks to the chemical selectivity of XAFS we could follow separately the behavior of V dopants and Ti cations, highlighting an interesting inter-play between the two atomic species. It was possible to clearly observe the exchange of electrons from the dopants to the host matrix cations. With a steady state model, it was also possible to estimate the lifetime of the excited state. The value we obtained (around 1ms) suggests that dopant-injected electrons can remain trapped near Ti atoms for a very long time. This of course has non-negligible consequences for the photo-catalytic efficiency of the sample. The procedure we used is completely general and can be successfully applied to detect any kind of long-living charge transfer phenomena in a wide range of possible devices.