DIPARTIMENTO DI SCIENZE CHIMICHE

UNIVERSITÀ DEGLI STUDI DI PADOVA

Martedì 21 aprile ore 15.00
Aula F, Dipartimento di Scienze Chimiche

Seminario

Plasmon: from metal ore to nanocatalyst

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Dynamics of plasmons provide a powerful route to control light–matter interactions and generate reactive charge carriers on ultrafast timescales, enabling new mechanisms for photoredox catalysis. In this seminar, I will discuss how plasmon-enabled photosystems can overcome key limitations of conventional photocatalysts by combining efficient light harvesting, tunable charge-carrier generation, and straightforward catalyst recovery in scalable reaction formats. Our approach relies on converting gold grains into photoactive materials that drive single-electron transfer (SET) chemistry, allowing selective activation of strong C–H [1] and N–H bonds [2] under mild conditions. By integrating these plasmonic catalysts into photoelectrochemical geometries, we enhance charge separation and improve quantum efficiency, while continuous-flow operation supports practical and industrially relevant implementation. Using advanced laser-based spectroscopy [3] and X-ray free electron laser X-ray spectroscopy [4], we directly track the fate of photogenerated carriers and connect ultrafast plasmon dynamics to catalytic performance. Finally, I will present our first example of a non-resonant energy transfer process that enables a photochemical [2+2] alkene cycloaddition [5], highlighting how plasmonic materials can expand the scope of photoredox and energy-transfer catalysis beyond traditional molecular paradigms.

[1] D. V. Latchev et al., Angew. Chem. Int. Ed. (2025) e18818
[2] P. Sekar, et al. Nano Lett. 24 (2024) 8619
[3] G. Tagliabue, et al. Nat. Mater. 19 (2020) 1312
[4] A. Wach et al. Nat. Commun. 16 (2025) 2274
[5] A. Andreis et al. Commun. Mater. (*accepted*)

Prof.ssa Silvia Gross
Dipartimento di Scienze Chimiche

Il Direttore del Dipartimento
Prof. Stefano Mammi