



UNIVERSITÀ DEGLI STUDI DI NAPOLI "FEDERICO II"

Dipartimento di Scienze Chimiche

Dottorato in Scienze Chimiche - XXXIV Ciclo

Research Doctorate (Ph.D.) in Chemical Sciences

34rd Cycle – Academic Year 2018/2019

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Project Information

1 - Title

Plasmon-enhanced CO₂ photoreduction at nano-heterogenous electrode

2 - Key words

CO₂ reduction - Solar fuel - Plasmonics - Photocatalysis - Computational Chemistry

3 - Abstract

This project addresses the electrocatalytic reduction of CO₂ to high value chemicals by efficient conversion of solar energy, which can mitigate both the issues of global warming and fossil fuel shortage. In this context, we will challenge the limits of current photoelectrochemical cells by designing a hybrid device with different constituent materials, each one purposely optimized to perform a single task among the many that lead from CO₂ to a solar fuel (i.e. methanol). Our key idea will be the use of light-absorbing metal nanoparticles for generating hot electrons via localized surface plasmon resonances. These will be coupled to dye-sensitized p-type semiconductors and hybrid catalysts to maximize (1) sunlight harvesting and (2) selectivity toward methanol. The application of cutting edge ab initio tools will support the design of such device by providing an unbiased understanding of materials properties and processes at the electrolyte-electrode interfaces.