One-Dimensional Nanostructured Catalytic Systems for the Gas-Phase Photocatalytic Conversion of Carbon Dioxide

Timeline | 2021 to 2024

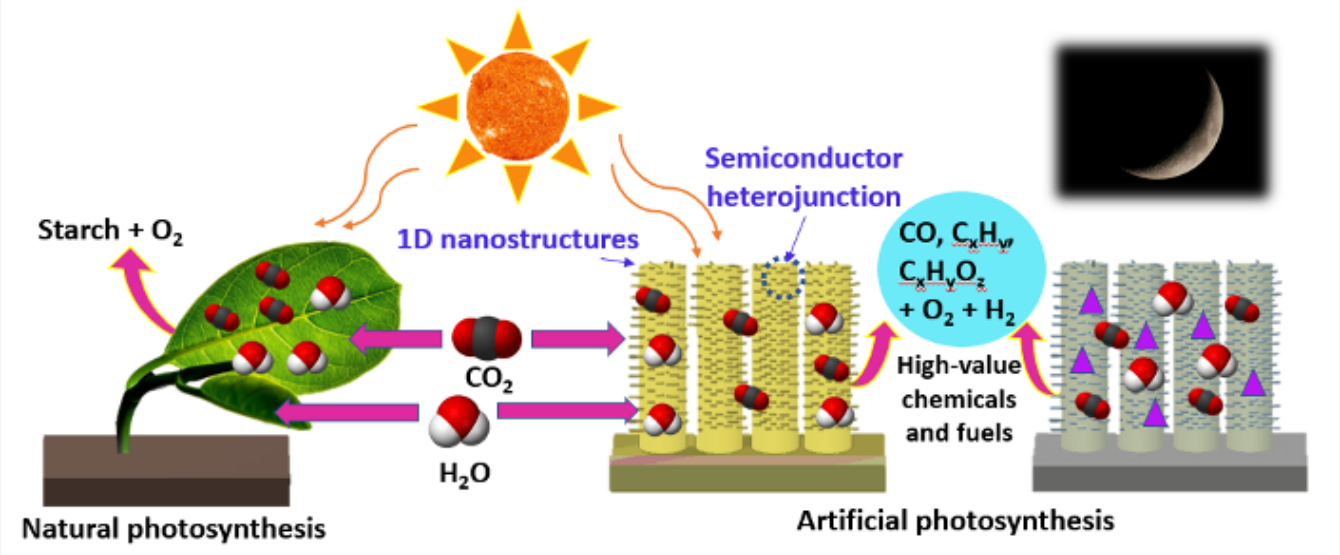
Budget | 305,100 €

ICIQ People | Katherine Villa
Advanced photocatalytic materials for energy and environmental applications

Call | La Caixa Junior Leader Incoming 2020

SUMMARY

The alarming increase of CO_2 levels, due to anthropogenic and industrial activities, has become a serious environmental issue nowadays. A plausible solution to minimize the negative impact of CO_2 emissions is by developing carbon-neutral approaches, i.e., reduction of CO_2 into valuable compounds. This research project deals with the development of efficient photocatalytic systems for the gas-phase conversion of CO_2 in the presence of water under sun-like irradiation. The main goal is to fabricate supported photocatalysts with one-dimensional (1D) heterostructures for enhancing light harvesting and electron mobility properties, which will result in higher photocatalytic performances than those obtained with bulk semiconductors. Moreover, the decoration of these photocatalytic systems with quantum dots and luminescent materials will provide them with advanced light conversion abilities, e.g., NIR-light response and light energy storage/release. Such new features will be crucial not only to promote their photoactivation in the full range of the solar spectrum (UV-vis, near-infrared) but also to maintain their photoactivity under intermittent light/dark cycles in a similar way to natural photosynthetic systems. This project will use my expertise and know-how on materials science, photocatalysis, and renewable energy, counting as well on a multidisciplinary expertise from the host institution, to develop the next generation of photocatalytic materials for addressing CO_2 contamination through its valorization as feedstock for the generation of clean energy fuels and high-value chemicals.



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