



Photo2Bio - Photo-Organocatalytic CO₂ Valorisation into Bioactive Added-Value Molecules

The light-driven chemical conversion of carbon dioxide (using chiral catalysts) into added-value organic compounds is a hot topic in synthetic chemistry. The EU-funded Photo2Bio project will tap into advances in photoredox catalysis and organocatalysis to create a dual catalytic system that can simultaneously activate the organic substrate and carbon dioxide. The new catalysts based on active chiral molecules will generate new knowledge on catalytic asymmetric CO₂ fixation. The project will bring benefits not only to academia and industry but also to society. It will undertake initiatives to demonstrate how synthetic chemistry technologies contribute to reducing the greenhouse gas emissions that drive climate change, altering people's perception that chemistry is toxic and dangerous.

In my research proposal Photo2Bio, I introduce a conceptually new chemical paradigm for the organocatalytic asymmetric CO₂ fixation via synergistic catalysis. This strategy demonstrates its straight to the synthesis of amino acids and diverse complex molecular architectures using renewable sources: light and CO₂. The key features of this strategy is to develop a dual catalytic system which can simultaneous activate both coupling partner: the organic substrate and CO₂, thus combining two powerful fields of molecular activation: visible light photoredoxcatalysis and organocatalysis. After the development of the discovery phase - development of the dual catalytic system and application to the synthesis of biomolecules - a more applicative execution phase will take place, where organocatalytic magnetic nanoparticles (MN) will be implemented and functionalize to overcome the recovery and catalyst loading issues. This will open the way to environmentally benign industrial applications.

The successful development of proposal is ensured by the merging of diverse skills from hosting group at the University of Padova, led by Prof. Marcella Bonchio i) CO₂ valorisation, ii) photocatalyst; the ITM-CNR expert in MN Dr. Alberto Figoli: i) magnetic nanoparticle design and assembly and me: i) photoredox catalysis, ii) asymmetric synthesis and reaction development. Funding of the Photo2Bio will generate great benefit not only for academia and industry through the synthesis of chiral biomolecules but also for the society. At short term new sustainable way to bioactive molecules will be accessed; at a long term this will serve to prove the concept that chemistry useful and can solve global warming by the development of sustainable synthetic methods, thus changing the common people perception of chemistry as toxic and/or dangerous. This will be accomplished by a series of large audience initiative and discussions with scientists and common people.

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Total EU Contribution: Euro 183.473,28

Call ID: H2020-MSCA-IF-2019

Project Duration in months: 24

Start Date: 01/10/2020

End Date: 30/09/2022

Find out more: <https://cordis.europa.eu/project/id/891908>