ITI HiFunMat Master Internship Proposal

☐ M 1 ☒ M 2

Solar light driven photocatalysis for the synthesis of H_2 solar fuel by reforming of plastics

Internship supervisor

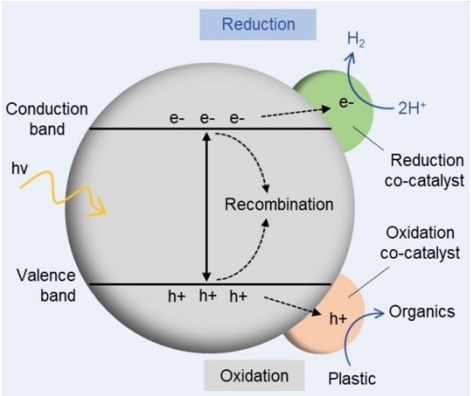
Name, first name	KELLER, Nicolas
E-mail, Telephone	nkeller@unistra.fr – 03 68 85 28 11
Laboratory	ICPEES – Institut de Chimie et Procédés pour l'Energie, l'Environment et la Santé, UMR 7515 CNRS/Université de Strasbourg, 25 rue Becquerel
Collaboration with a HiFunMat member (*please indicate their name*)	☒ No ☐ Yes :

Student profile looked for

Master program (*more than one box can be ticked)*	☒ Material science and engineering ☒ Chemistry ☐ Physics
Other indications if necessary	

Internship description

Plastics, as one of the most influential invention of the 20th century, has been widely applied in our daily life. Currently, about 360 million tonnes are produced each year. However, only a small portion of the produced plastics is recycled after use, and around 80% of all plastics is directly incinerated, thereby contributing extensively to the CO_2 release and global warming, or discarded as wastes in landfills or in the natural environment, with high negative environmental impacts. Additionally, solar hydrogen (H_2) is a versatile energy carrier and a promising source of (sunlight-derived) clean energy to tackle vital energy challenges stemming from the combustion of fossil fuels.



Reforming of plastics into H_2 and organic by solar light-driven photocatalysis

The internship will aim at studying **the ability of the photocatalysis technology to produce H_2 as solar fuel from plastic wastes at ambient temperature using simulated solar light as sole energy input**. Indeed, heterogeneous photocatalysis is a low energy-input technology able to drive catalytic transformations of molecules at ambient temperature, that uses the redox properties developed at the surface of a semiconductor material under solar light for conducting reduction and oxidation reactions.

The work will concentrate on the design of innovative heterogeneous photocatalysts associating different semiconductor materials (TiO_2, g-C_3N_4, etc.) and decorated with metal nanoparticles as co-catalyst. It will be focused on both synthetic and physico-chemical characterization aspects, as well as on the evaluation of the photocatalytic behavior of the materials synthesized.

Depending on the progress of the work, the ability of solar light photocatalysis to produce high added-value organic chemicals as side-products of the hydrogen generated will also be studied by means of several analytical techniques.