SEARCH FOR PARTNERS

SPANISH COMPANY in solar energy production, water purification or suppliers of technology for these industries

PROJECT

Immobilization of photo catalysts on 3D-printed substrates for energy and environmental applications

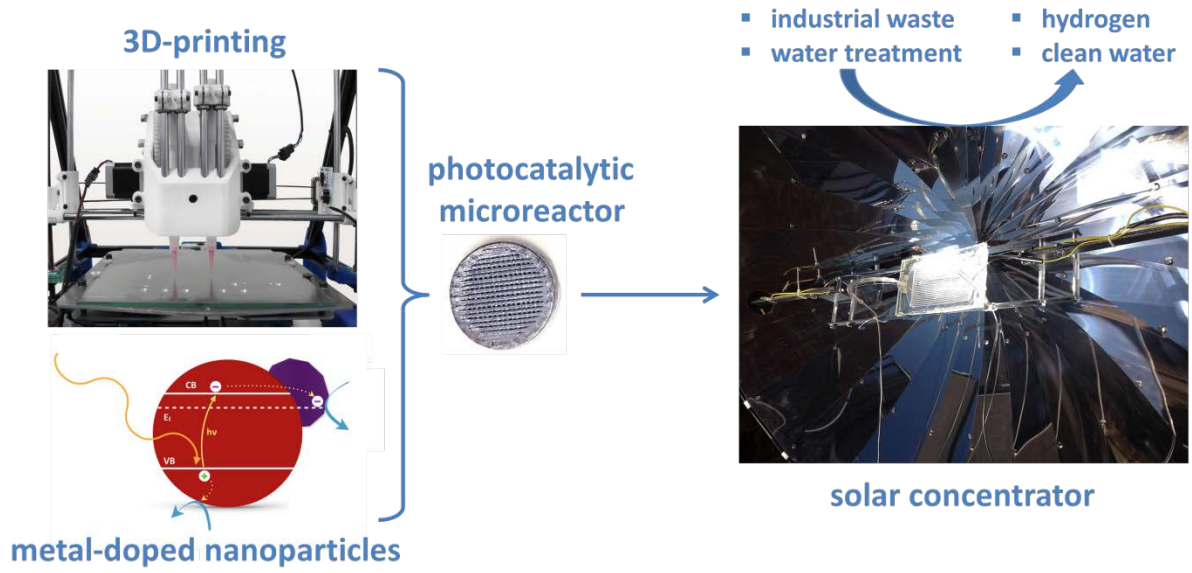
Abstract

Photocatalysts are widely used in a variety of processes, spanning from water remediation and air purification to the generation of sustainable fuels, among others. For industrial application, these processes should operate in a continuous mode, and the use of slurry reactors, the most common technology nowadays, results in poor photon transfer and, therefore, low efficiency. Therefore, the immobilization of photocatalysts on solid substrates represents an interesting approach to improve both mass transfer and photon delivery, resulting in higher quantum yields.

The solid substrates can either be micro channeled reactors with high surface-to-volume ratio or honeycomb structures. The use of additive manufacturing, such as 3D printing, constitutes a versatile and custom-made approach to design photo structures with a variety of geometries and characteristics, which are unaffordable with the conventional methods used today.

On the other hand, the flexibility of additive manufacturing makes the use of solar collectors and solar concentrators an interesting, cheap, and efficient

technology to carry out photochemical processes in large industrial environments or for on-site applications.



Work packages

WP 1: **Development of photocatalytic pastes.** In order to 3D-print the photocatalytic structures it is necessary to prepare pastes with the physical properties required. These pastes typically contain a semiconductor (i.e. TiO_2) and metal nanoparticles to enhance the formation of active electron-hole pairs, which depend on the application.

WP 2: **Design of the photocatalytic structures for each application targeted.** Depending on the photocatalytic process, the operational conditions should be optimized (i.e. residence time, photon flux, thickness of the photocatalytic layer, etc.). To that end, several experiments need to be conducted at a laboratory scale and a strategy for the additive manufacturing needs to be implemented.

WP 3: **Implementation of the photocatalytic structures into solar concentrators/solar collectors.** Both the scale-up and scale-out will depend on the application (water treatment, hydrogen production, air purification, etc.), which in turn will affect the dimensions and characteristics of the final device.

WP 4: **Prototyping and testing in a pilot plant environment.** This is the final step and it is required to validate the manufacturing of the photocatalytic devices and evaluate their performance in a real environment for commercialization.

Spanish Company profile, Partners and budget

Real partners:

- Moroccan Foundation for Advanced Science Innovation and Research, MAScIR, https://www.mascir.com/, Materials and Nano Materials Department. Their role shall be development of part of experiments described in WP2 and proofs of concept described in WP3 in Optics and Photonics field.
- Moroccan Company (TBA)
- Institut de Tècniques Energètiques, UPC, https://inte.upc.edu/es. Their role shall be development of basic research described in WP1 and WP2, and design and collaborate in proofs of concept described in WP3 in Optics. Also lead the Consortium to a prototyping design as described in WP4
- Spanish Company (TBA). Expected profile for Spanish Company is water treatment or solar energy or suppliers of both industries, especially high tech companies.

Budget expected for the project is about 900.000€ (9,6 million dirham aprox.)

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