

Noble-Metal-Free Core-Shell Plasmonic MOFs as Photocatalysts for Green Hydrogen Production

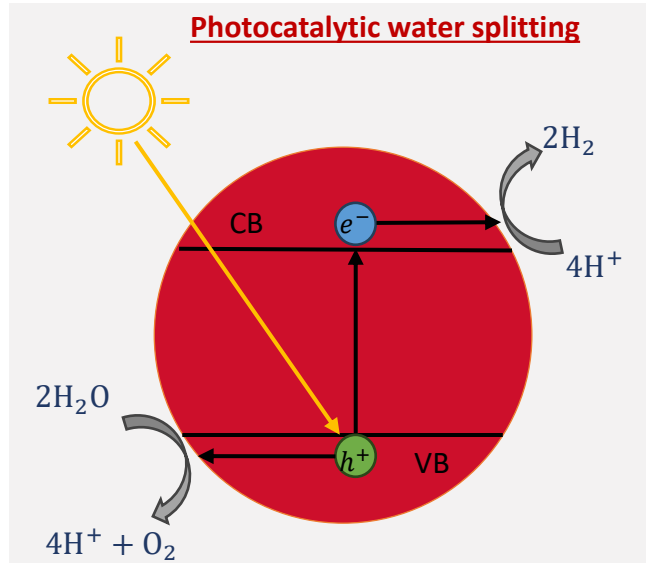
Introduction

Metal-Organic Frameworks (MOFs) are semiconductor-like materials composed of metal nodes and organic ligands. These materials have the potential to be good candidates for photocatalytic water splitting by themselves and through further enhancement [1].

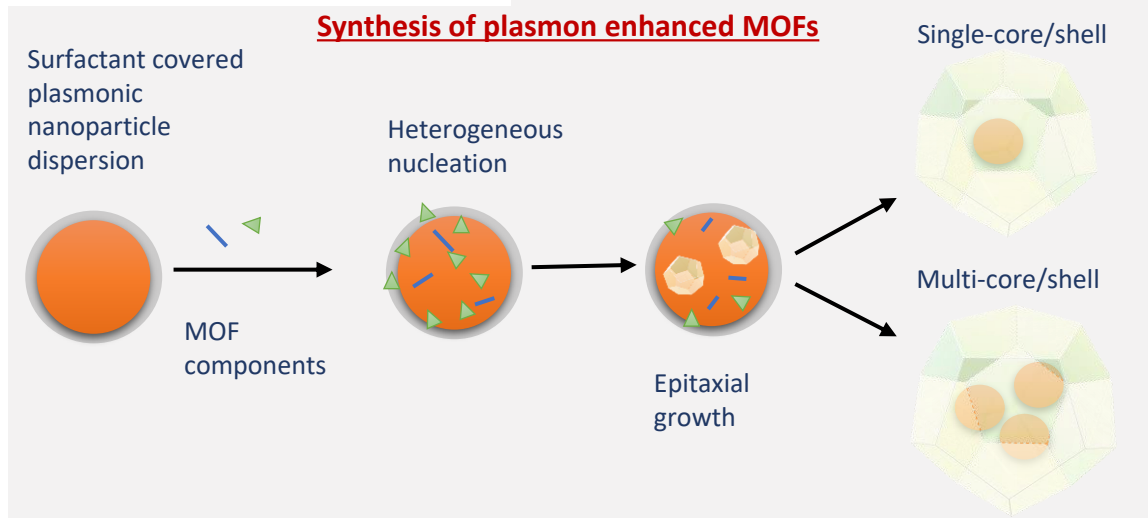
The use of plasmonic enhancement for photocatalysts, focus largely on using conventional noble metals such as Ag or Au. This is due to their good optical response in the visible-near infrared region [2]. These metals, however, are scarce and have high cost, which is problematic for large scale production. The use of alternative plasmonic materials capable of surface resonance in the visible-near infrared region is therefore important to investigate [3].

Primary objective

- Investigate and characterize plasmon enhanced MOFs based on alternative plasmonic materials
- Compare hydrogen production to plasmon enhanced MOFs based on conventional noble metal.



Synthesis of plasmon enhanced MOFs



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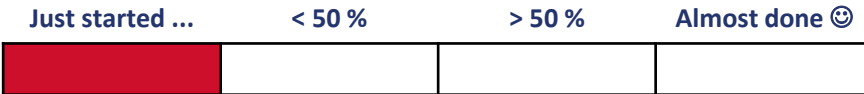
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Estimated progress of the PhD project:



Reference

[1] Sergio Navalón, Amarajothi Dhakshinamoorthy, Mercedes Álvaro, Belén Ferrer, and Hermenegildo García. Metal-organic frameworks as photocatalysts for solar-driven overall water splitting. *Chemical Reviews*, 123(1):445–490, 2023. PMID: 36503233

[2] Alberto Naldoni, Urcan Guler, Zhuoxian Wang, Marcello Marelli, Francesco Malara, Xiangeng Meng, Lucas V. Besteiro, Alexander O. Govorov, Alexander V. Kildishev, Alexandra Boltasseva, and Vladimir M. Shalaev. Broadband hot-electron collection for solar water splitting with plasmonic titanium nitride. *Advanced Optical Materials*, 5(15):1601031, 2017.

[3] Rou Li, Xianfeng Wang, and Ming Chen. Non-noble metal and nonmetallic plasmonic nanomaterials with located surface plasmon resonance effects: Photocatalytic performance and applications. *Catalysts*, 13(6), 2023.