Development of TiO_2/MOF Nanostructured Composites Towards Photocatalytic Hydrogen Conversion

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The emergence of hydrogen as a potential green and renewable fuel has provided an ideal solution to address the global challenges towards clean forms of energy. Solar-driven, photocatalytic water splitting is one of the most promising and sustainable methods for H_2 production and has received considerable attention due to its simplicity and cost-effective design [1]. In the constant search for potential photocatalytic systems, porous metal-organic frameworks (MOFs) display large promise [2], as their high porosity, stability and hybrid inorganic-organic nature are important assets towards the formation of stable heterostructured composites with improved photocatalytic activity.

In this work, we report the preparation of several TiO_2/MOF nanostructured composites (Figure 1) and the investigation of their photocatalytic hydrogen conversion performance, using MIL-101 (Cr) as the MOF template. The materials have been characterized through an extensive series of techniques including X-Ray diffraction measurements, SEM/EDS studies, as well as gas sorption experiments with accurate porosity measurements, demonstrating the incorporation of TiO_2 within the framework. Photocatalytic experiments for hydrogen production by water splitting were then carried out in the solar light radiation spectrum using a solar simulator. The evolved gas was analysed using a Shimadzu gas chromatographer (GC) to evaluate their photocatalytic activity.

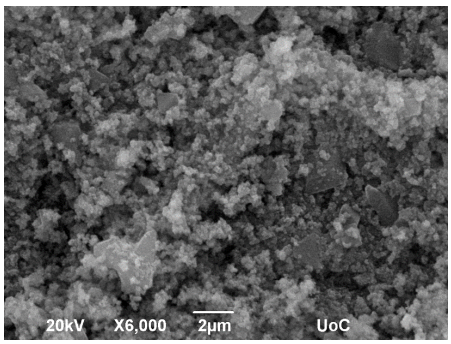

Figure 1: Representative SEM image of the synthesized TiO_2/MIL-101 nanostructured composites in this work.

References

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