

## **Titania Assisted Metal-Organic Framework Matrix for Elevated Hydrogen Generation Combined with the Production of Graphene Sheets through Water-Splitting Process**

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**Abstract :** In this study, metal organic framework (Cr-MIL-101) and TiO<sub>2</sub> nanoparticles were utilized as two semiconductors for water splitting process. The coupling of both semiconductors in order to improve the photocatalytic reactivity for the hydrogen production in presence of methanol as a hole scavenger under visible light (sunlight) has been performed. The forementioned semiconductors and the collected samples after water splitting application are characterized by several techniques viz., XRD, N<sub>2</sub> adsorption-desorption, TEM, ED, EDX, Raman spectroscopy and the total content of carbon. The results revealed an efficient yield of H<sub>2</sub> production with maximum purity 99.3% with the in-situ formation of graphene oxide nanosheets and multiwalled carbon nanotubes coated over the surface of the physically mixed Cr-MIL-101-TiO<sub>2</sub> system. The amount of H<sub>2</sub> gas produced was stored when using Cr-MIL-101 catalyst individually. The obtained data in this work provides promising candidate materials for pure hydrogen production as a clean fuel acquired from the water splitting process. In addition, the in-situ production of graphene nanosheets and carbon nanotubes is counted as promising advances for the presented process.

**Keywords :** hydrogen production, water splitting, photocatalysts, Graphene

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