

SURFACE MODIFICATION OF g-C₃N₄ FOR EFFICIENT HYDROGEN PRODUCTIONI. Papailias^{1,*}, N. Todorova¹, T. Giannakopoulou¹, P. Dallas¹, N. Ioannidis¹, C. Trapalis^{1,*}¹ Institute of Nanoscience and Nanotechnology, NCSR “Demokritos”, Athens, Greece* i.papailias@inn.demokritos.gr, c.trapalis@inn.demokritos.gr

ABSTRACT

Over the recent years, the increasing awareness for environmental protection and energy saving has encouraged an intensive research on methods that utilize the abundant solar energy [1]. Among the various sustainable energy sources and technologies, semiconductor photocatalysis has proven to be one of the most attractive for solar fuel production and energy storage [2]. Between the photocatalysts that have been explored, graphitic carbon nitride (g-C₃N₄) has emerged as one of the most promising for H₂ production. Due to its low efficiency in bulk form though, many methods have been applied in order to improve the optical properties and photocatalytic activity. Among them, exfoliation via chemical and thermal treatment appears to be very effective and easy to perform. In this work, g-C₃N₄ was exfoliated by high-yield chemical and thermal treatment methods, and a thorough comparative investigation was performed.

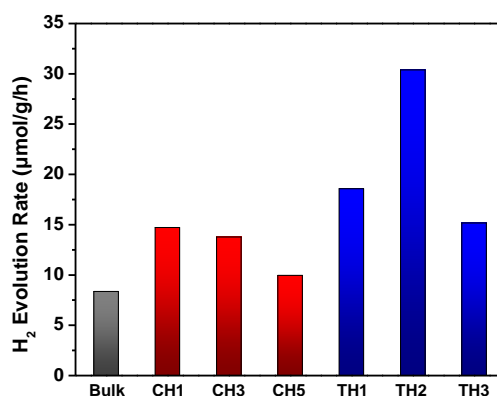


Figure 1. H₂ evolution rate of bulk, chemically (CH) and thermally exfoliated (TH) g-C₃N₄ under visible light irradiation.

To test the photocatalytic activity of the materials, H₂ production experiments were performed under visible light irradiation using Pt as a co-catalyst (Figure 1). It was established that the surface defects of the photocatalyst can have a negative effect on the photocatalytic activity, as they occupy potential active sites of the photocatalyst and hinder the charge carriers' transport through the semiconductor network [3]. Furthermore, the surface defects may act as charge recombination centers and compete with the electron transfer from g-C₃N₄ to the photo-deposited Pt [4]. Overall, the enhancement of photocatalytic activity originated from the synergistic effect between the increased SSA and the decrease of surface defects.

KEYWORDS: Photocatalysis, g-C₃N₄, Exfoliation, Hydrogen production, Visible light.

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