Πρόσκληση σε Δημόσια Παρουσίαση της Διδακτορικής Διατριβής της

κ. Ειρήνης Κουτσουρούμπη

με θέμα:

2D/2D Layered Nano-Heterostructures of Transition Metal Dichalcogenides (MS_2, M = Mo, Sn) and Graphitic Carbon Nitride (g-C_3N_4) for Photocatalytic Hydrogen Production and Environmental Remediation

(Σύμφωνα με το άρθρο 41 του Ν. 4485/2017)

Παρασκευή 30 Ιουλίου 2021 και ώρα **11:00**

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Η παρουσίαση θα διεξαχθεί με τηλεδιάσκεψη στον παραπάνω σύνδεσμο, σύμφωνα με το άρθρο τρίτο, παρ. 1 της με αριθμ. 115744/Z1/4.9.2020 Κοινής Υπουργικής Απόφασης (Β΄3707).

Abstract

Highly efficient and cost-effective photocatalysts are among the most prominent targets in the field of clean energy production and environmental remediation. To understand the photochemical charge transfer mechanisms at the nanoscale, it is essential to develop highly effective catalysts. This dissertation focuses on the successful development of a new synthetic strategy for preparing 2D/2D layered nano-heterostructures of transition metal dichalcogenides (MS_2, M = Mo, Sn) and graphitic carbon nitride (g-C_3N_4) for photocatalytic fuel production and environmental remediation applications. In this context, the rational design of new photochemical systems has led us to the synthesis of layered heterostructures by depositing MoS_2 nanosheets with variable lateral sizes on the surface of g-C_3N_4. These composite structures were studied as cathodic catalysts for photocatalytic

generation of hydrogen from water under UV and visible light irradiation. In general, the photochemical water splitting to produce hydrogen is a very attractive and promising solution to the energy crisis and climate change problem. This process involves the reduction of water protons to molecular hydrogen on the surface of a semiconductor catalyst. On the other hand, aquatic environmental concerns are mainly due to the water pollution caused by highly toxic and carcinogenic metal ions, such as hexavalent chromium (Cr(VI)). For this reason, we were able to synthesize Ni-doped MoS_2/g-C_3N_4 as well as SnS_2/g-C_3N_4 nano-heterostructures demonstrating high photocatalytic activity in the reduction of Cr(VI) to the much less toxic form of chromium, Cr(III). A noteworthy point of these catalytic systems is that all photochemical reduction reactions were performed in aqueous Cr(VI) solutions without the presence of sacrificial reagents as electron donors. All of the above heterojunctions can facilitate high separation and transfer rate of the photoinduced charge carriers, exhibiting improved catalytic behavior over their macroscopic counterparts in hydrogen production as well as hexavalent chromium reduction. The photocatalytic reactions were performed by using cost effective and environmentally-friendly reagents and utilizing renewable energy sources to solve key energy and environmental challenges.