

METAL-DOPED CdS/MoS₂ HETEROJUNCTIONS FOR PHOTOCATALYTIC DEGRADATION OF ORGANIC POLLUTANT

N. Kamoschos^{1,*}, E. Paraschoudi¹, F. Bairamis¹, I. Konstantinou^{1,2} and D. Tasis^{1,3}

¹ Department of Chemistry, University of Ioannina, 45110 Ioannina, Greece

² University Research Center of Ioannina (URCI), Institute of Environment and Sustainable Development, Ioannina 45110, Greece

³ University Research Center of Ioannina (URCI), Institute of Materials Science and Computing, Ioannina 45110, Greece

*Correspondence: k4520fd@yahoo.gr

ABSTRACT

The present work describes the synthesis of metal-doped CdS/MoS₂/MoO₃ heterojunctions, prepared by a two-step microwave-assisted solvothermal approach. The samples were characterized by X-ray diffraction spectroscopy (XRD), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), Raman analysis as well as diffuse reflectance spectroscopy (DRS). The photocatalytic activity was assessed against the decomposition of 4-nitrophenol, in the presence of oxalic acid as sacrificial agent. At macroscopic scale, the hybrids demonstrated a certain level of phase separation, implying an inhomogeneous distribution of cocatalyst nanoparticles within the main semiconductor matrix. XPS analysis revealed that the main molybdenum-based species found was MoS₂, whereas MoO₃ was formed also. DRS measurements showed no actual shift of the absorption edge of hybrids, when compared with the corresponding one of bare CdS nanoparticles. The different photocatalytic activities may be attributed to differences in the relative population of heterojunctions and to the variable ratio of the molybdenum-based species (disulfide/trioxide) within each hybrid. Comparison with analogous studies suggests that the chemical speciation of the third component is critical towards the development of photocatalytic systems carrying a large population of heterojunctions.

KEYWORDS: hydrothermal synthesis, nitrophenol, CdS/MoS₂, photocatalysis, photoelectron spectroscopy

RELATED BIBLIOGRAPHY

- [1] I. Tzanidis, F. Bairamis, L. Sygellou, K.S. Andrikopoulos, A. Avgeropoulos, I. I. Konstantinou, D. Tasis. (2020). *Chem. Eur. J.* 26: 6643-6651
- [2] K. Kostelenos, F. Bairamis, N. Kamoschos, L. Sygellou, K. Andrikopoulos, I. Konstantinou, D. Tasis. (2021). *Chem. Eur. J.* 27: 15806-15814.
- [3] N. Kamoschos, F. Bairamis, K. Andrikopoulos, I. Konstantinou, D. Tasis. (2022). *Mater. Sci. Semicond. Proc.*, submitted.