SYNTHESIS OF NANOSTRUCTURED $Zn_XIn_2S_{3+X}$-BASED SYSTEMS FOR PHOTOCATALYTIC APPLICATIONS

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ABSTRACT

The increasing energy demand has given the impetus to find alternative energy conversion systems that will be characterized by high efficiency, low cost, and environmental friendliness. Recently, materials with the general formula of $Zn_xIn_2S_{3+x}$ (x=1-5) have been on the rise due to their great semiconducting and photocatalytic capabilities as their band gap has been reported to be 2.46-2.86 eV.[1] This means they can utilize the visible part of the abundant sunlight effectively for energy conversion on a variety of photocatalytic applications, and thus making the process green and cost-efficient. The scope of this work is the synthesis and characterization of pristine semiconducting nanostructures of the abovementioned formula as well as their respective hybrids with CdS, at various compositions. Specifically, a simple hydrothermal method has been applied where the hybrids were constructed stepwise.[2] The first step includes the synthesis of CdS nanoparticles while the second step the synthesis of $Zn_xIn_2S_{3+x}$ nanoparticles onto CdS. The composition of $Zn_xIn_2S_{3+x}$ in the samples in ascending order are 0, 1, 4, 16, 50, 84, 96 and 100%. The samples were characterized with XRD analysis, and their photocatalytic capabilities were evaluated. In particular, they were tested for the production of hydrogen peroxide and the degradation of Orange G organic dye. Such hybrids demonstrated efficient photocatalytic activity in both processes.

KEYWORDS: $Zn_xIn_2S_{3+x}$, Semiconductor, Photocatalysis, Hydrothermal

REFERENCES

[1] Wu Y, Wang H, Tu W, Wu S, Chew JW. (2019). *Appl. Catal. B: Environ.,* 256, 117810.

[2] Karamoschos N, Tasis D. (2022). *Energies,* 15, 6202.