Title: Sodium lauryl sulphate-mediated synthesis: Unravelling the optimization path for enhanced stability and optical properties of cadmium sulphide nanoparticles.

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Abstract: This research paper explores the synthesis of cadmium sulphide nanoparticles using sodium lauryl sulphate as a stabilizing agent through the co-precipitation method. The structural properties were investigated using X-ray diffractometry, while optical properties were analysed through UV–visible absorption spectroscopy. High-resolution transmission electron microscopy and energy-dispersive X-ray spectroscopy were employed to study the morphology and elemental mapping of the nanoparticles. The co-precipitation synthesis, synergized with sodium lauryl sulphate assisted stabilization, affords a scientific vantage point into the intricate mechanisms through which sodium lauryl sulphate intricately tailors the optical and stability profiles of nanoparticles. Additionally, the effects of different concentrations of sodium lauryl sulphate were examined to determine the optimal concentration for desired properties. The optimal concentration of 1.5 g yielded cadmium sulphide nanoparticles with desirable characteristics, featuring a band gap of 2.07 eV. The findings presented herein contribute significantly to advancing our understanding of sodium lauryl sulphate capped cadmium sulphide nanoparticles and highlight their potential application in enhancing photocatalyst efficiency.

Keyword: Nanoparticles, Surfactant-assisted Synthesis, Agglomeration, Nanostructure.

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