

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. This research holds exciting prospects for the creation of eco-friendly and highly efficient innovations, with extensive implications for the environmental and industrial sectors.

Keywords: Cadmium sulphide nanoparticles Co-precipitation method Sodium lauryl sulphate (SLS) Nanoparticle stabilization X-ray diffraction (XRD)

<https://doi.org/10.1016/j.procbio.2024.01.005>

<https://www.sciencedirect.com/science/article/abs/pii/S1359511324000047>