

# Chitosan Nano-composite containing Undecatungstosilicate via Cobalt Substitution: Characterization and Evaluation of their Biological Activity

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## ABSTRACT

Encapsulation of polyoxometalates into chitosan have drawn tremendous attraction of researchers in biomedical science. Chitosan (CS) is widely studied for its significant biomedical applications. In this study we have synthesized a nano-composite by encapsulating a cobalt substituted lacunary undecatungstosilicate  $[\text{CoSiW}_{11}\text{O}_{39}(\text{H}_2\text{O})]^{6-}$ , into biocompatible chitosan. The combination of polyoxometalate with chitosan is not merely physical mixture but indeed it is nano-composite formed by electrostatic interaction between anionic polyoxometalate and cationic chitosan. The resulting nano-complex, (CoSLPOM-CS) was characterized by FT-IR, UV-Vis spectra, energy dispersive X-ray (EDX), scanning electron microscopy (SEM), atomic force microscopy (AFM) and Dynamic light scattering (DLS). FTIR and UV-Vis spectra analysis confirms the successful encapsulation of cobalt substituted lacunary polyoxometalate into chitosan. The antibacterial activity of CoSLPOM, chitosan and CoSLPOM-CS were tested against bacterial strains of *B. subtilis* gram (+) ve and *P. aeruginosa* gram (-) ve. The CoSLPOM-CS showed enhanced antibacterial activity as compared to bare CoSLPOM and chitosan. The nano-complex, CoSLPOM-CS was further investigated for drug delivery and it exhibited excellent drug loading efficiency.

KEYWORDS: Chitosan, Nanocomplex, Drug Delivery, Antibacterial assay