

Title: Effects of temperature on plant growth and arsenic removal efficiency of *Pteris vittata* in purifying arsenic-contaminated water in winter: A two-year year-round field study

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Abstract: Chitosan [nanoparticles](#) are synthesized by the reverse micellar technique using heptane as solvent and hexamine as [surfactant](#). [XRD](#), [FTIR](#), and SEM/EDAX analyses are performed to investigate the structural and morphological behavior of chitosan [nanoparticles](#). [XRD](#) shows the crystalline nature of the materials with peaks appeared at $2\theta = 17.8^\circ$, 25.5° , 31.2° , 36.4° , 44.7° , and 48.5° . The average [crystallite size](#) of obtained chitosan [nanoparticles](#) is 25 nm. The identification of functional groups in both pure chitosan and chitosan [nanoparticles](#) are compared using [FTIR analysis](#). Noticed at wavenumbers 3435 cm^{-1} and 3460 cm^{-1} corresponds to the stretching vibration of the $-\text{NH}_2$ and $-\text{OH}$ functional groups. SEM shows the uniform morphology of the materials and [EDAX](#) shows the presence of various elements (carbon, nitrogen, oxygen, [aluminum](#) and chlorine) in both the materials. The electrochemical behavior of the nanoparticles was analyzed by [cyclic voltammetry](#) analysis and galvanostatic charging/discharging. Electrochemical faradaic performance identifies chitosan nanoparticles as effective electrode materials in pseudo capacitors.

Keywords: Chitosan nanoparticles; Reverse micellar technique; X-ray diffraction (XRD); Fourier transform infrared spectroscopy (FTIR); Scanning electron microscopy (SEM); EDAX; Crystallite size

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