

# Synthesis of Chitosan Nanoparticles from Shrimp Shell, Characterization, and Its Application as Adsorbent of Metal, i.e. Pb<sup>2+</sup> and Fe<sup>3+</sup> Ions in Water Medium

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## ABSTRACT

The objective of this study is synthesis chitosan nanoparticles from shrimp shells, characterization, and optimization their ability as an adsorbent of Pb<sup>2+</sup> and Fe<sup>3+</sup> ions in water medium. Synthesis of chitosan nanoparticles is done through several stages, namely deproteinase, demineralization, deacetylation, and resizing chitosan into nanoparticles. Deproteinase by using 2 N NaOH solution (a ratio of 1:6 w/v) while stirring at 90 °C for 1 hour. Demineralization by using 1 N HCl solution (a ratio of 1:12 w/v) while stirring at room temperature for 1 hour. Deacetylation by using 50% NaOH solution (a ratio of 1:10 w/v) at 120 °C for 3 hours. Deacetylation was performed by three times. Product of these process is called chitosan. Chitosan nanoparticles are obtained by adding a solution of 1% CH<sub>3</sub>COOH and a few drops of NH<sub>3</sub> concentrated at 90 °C into chitosan powder to form a white gel is then washed to pH neutral and dried. Characterization of chitosan include analysis of deacetylation degree by using FTIR and analysis of particle size by using Particle Size Analyzer (PSA). Optimization of chitosan as an adsorbent include contact time and pH. Concentration of lead is determined using Atomic Absorption Spectroscopy (AAS). The results showed chitosan synthesis product has a size of ~600 nm, so that it can be expressed as nanoparticles with a degree of deacetylation of 62.80%. Chitosan nanoparticles as adsorbent optimum at pH 3 and a contact time of 2 hours with an adsorption capacity of 13.25 mg/g. Based the study, can be obtained that the deacetylation degree of chitosan nanoparticles i.e. 68.57% (deacetylation 1 time), 62.69% (deacetylation 2 times), and 52.72% (deacetylation 3 times), while characterization of particle size of chitosan nanoparticles was relatively homogeneous, i.e. ~ 600 nm. Chitosan nanoparticles as adsorbent of both Pb<sup>2+</sup> and Fe<sup>3+</sup> ions optimum at pH 3 and a contact time of 2 hours with an adsorption efficiency of more than 99% (Pb<sup>2+</sup> ions 13,25 mg/g; Fe<sup>3+</sup> ions 3,97 mg/g).

Kata Kunci: *chitosan, nanoparticles, shrimp shell, Pb<sup>2+</sup>, Fe<sup>3+</sup>, adsorbent, synthesis*