

**PRODUCTION AND UTILIZATION
OF CROSSLINKED CHITOSAN
BIOPOLYMER
AS
FLOCCULANT BEADS FOR TREATMENT OF
MUNICIPAL WASTE WATER**

PhD (DISSERTATION)

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ABSTRACT

Chitosan triphosphate (CS-TPP) has been prepared and applied in the treatment of municipal waste water. Chitin and chitosan were prepared according to Hackman's and Fujita's methods. The achieved yield percents were 16.1% and 83.98% (based on chitin) respectively. The molecular weight of prepared chitosan was estimated to be almost 1.7×10^6 Daltons, its degree of deacetylation was 91%. The CS-TPP beads were prepared by ionic crosslinking between the positively charged amino groups on chitosan and negatively charged counter ion, triphosphate. The phosphorous content of CS-TPP beads was found to be 17.83% at pH 4.2. The adsorption capacity and flocculation activity of the CS-TPP beads were evaluated by measuring the extent of adsorption and flocculation of metal ion (Cu^{2+}) from waste water under equilibrium conditions at room temperature. The sorbent for Cu^{2+} followed Langmuir isotherm model in which the sorption capacity ($1373 \text{ mg Cu}^{2+} / \text{g}$ of sorbent) was able to determine at the optimum pH 4.5 and at the contact time of 50 min. As regard to flocculation, the relative flocculation activity was found to be 472.23 for Cu^{2+} with minimum flocculant dosage of 50 ppm at pH 4.5. The flocculant nature of CS – TPP beads in the treatment of municipal waste water showed that the optimal flocculant activity took place at pH 7.1 with a flocculant dosage of 60 ppm at ambient temperature (27°C). The flocculant CS –TPP beads also showed higher removal efficiencies of turbidity, BOD, COD, DO and heavy metals. The relative order of magnitude of metal ion flocculation by flocculant beads in waste effluent by AAS was found to be $\text{Pb}^{2+} > \text{Cu}^{2+} > \text{Cd}^{2+} > \text{Fe}^{2+} > \text{Zn}^{2+} > \text{Ca}^{2+} > \text{Mg}^{2+}$. This investigation can be described as an effective flocculation process that can be achieved for treatment of municipal waste water.

Keywords: CS-TPP, flocculant, municipal waste water.