

**SINTESIS DAN KARAKTERISASI NANOPARTIKEL KITOSAN
DENGAN METODE ULTRASONIKASI SERTA APLIKASINYA
SEBAGAI BIOKOAGULAN/BIOFLOKULAN DALAM PROSES
PENGOLAHAN AIR**

SKRIPSI

Diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains
Program Studi Kimia



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**PROGRAM STUDI KIMIA
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ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
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**Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat
memperoleh gelar Sarjana Sains pada Program Studi Kimia Fakultas
Pendidikan Matematika dan Ilmu Pengetahuan Alam**

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui kondisi terbaik sintesis dan karakteristik nanopartikel kitosan (NPCS) serta aplikasinya sebagai biokoagulan/bioflokulan dalam proses pengolahan air. Tahapan penelitian meliputi tahap sintesis NPCS melalui metode ultrasonikasi (variasi waktu ultrasonikasi 5, 20 dan 60 menit), karakterisasi NPCS menggunakan *Particle Size Analyzer* (PSA), *Fourier Transform Infrared Spectroscopy* (FTIR), *X-Ray Diffraction* (XRD), *Scanning Electron Microscopy-Energy Dispersive X-Ray* (SEM-EDX), dan uji kinerja NPCS melalui nilai efisiensi penurunan turbiditas (EPT). Hasil penelitian menunjukkan bahwa waktu ultrasonikasi 60 menit merupakan kondisi terbaik untuk sintesis nanopartikel kitosan dengan ukuran partikel rata-rata terkecil (218,2 nm) dan polidispersitas 0,479. NPCS hasil sintesis menunjukkan pergeseran puncak pada 2 tetha yang lebih kecil dan penyempitan lebar puncak pola difraksi X-ray NPCS. Peningkatan intensitas serapan gugus fungsi O-H; N-H; dan C-O-C dan adanya *red shift* pada serapan -OH dan -NH serta struktur morfologi bulat teraglomerasi ditunjukkan oleh NPCS. Konversi dari kitosan menjadi nanokitosan tidak diikuti dengan perubahan komposisi unsur dan tidak teramatinya puncak serapan baru FTIR mengindikasikan bahwa ultrasonikasi merupakan metode fisik dalam sintesis NPCS. NPCS potensial untuk diaplikasikan sebagai material pengolah air (biokoagulan/bioflokulan) dengan efisiensi penurunan turbiditas (EPT) maksimum sebesar 53,41% pada dosis NPCS 400 ppm.

Kata kunci: Biokoagulan/bioflokulan, Karakterisasi, Kitosan, NPCS, Sintesis, Ultrasonikasi

ABSTRACT

The objective of this study was to determine the best condition of synthesis and characteristics of chitosan nanoparticles (NPCS) and their application as biocoagulant/bioflocculant in water treatment process. The stages of the research included of NPCS synthesis through ultrasonication (variation of ultrasonication time 5, 20 and 60 minutes), NPCS characterization using Particle Size Analyzer (PSA), Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD), Scanning Electron Microscopy - Energy Dispersive X-Ray (SEM-EDX), and NPCS performance test through the value of turbidity reduction efficiency (EPT). The results showed that the ultrasonication time of 60 minutes was the best condition for the synthesis of chitosan nanoparticles with the obtained smallest average particle size of (218.2 nm) and polydispersity of 0.479. The synthesized NPCS showed a smaller peak shift at 2 tetha and narrowing of the peak width of the NPCS X-ray diffraction pattern. Increased absorption intensity of O-H; N-H; and C-O-C functional groups and the presence of red shift in the -OH and -NH absorption as well as the agglomerated spherical morphological structure shown by NPCS. Conversion from chitosan to nanocitosan was not followed by changes in its elemental composition and not observing the new FTIR absorption peak indicated that ultrasonication was a physical method in the synthesis of NPCS. NPCS has the potential to be applied as a water treatment material (biocoagulant/ bioflocculant) with a maximum efficiency reduction in turbidity (EPT) of 53.41% at 400 ppm of NPCS.

Keywords: *Biocoagulant/bioflocculant, Characterization, Chitosan, NPCS, Synthesis, Ultrasonication*

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