

Accepted Manuscript

Title: Green Synthesis of Silver and Copper Nanoparticles using Ascorbic acid and Chitosan for Antimicrobial Applications

Author: N. Mat Zain A.G.F. Stapley G. Shama



PII: S0144-8617(14)00559-1
DOI: <http://dx.doi.org/doi:10.1016/j.carbpol.2014.05.081>
Reference: CARP 8948

To appear in:

Received date: 28-3-2014
Revised date: 22-5-2014
Accepted date: 30-5-2014

Please cite this article as: Zain, N. M., Stapley, A. G. F., and Shama, G., Green Synthesis of Silver and Copper Nanoparticles using Ascorbic acid and Chitosan for Antimicrobial Applications, *Carbohydrate Polymers* (2014), <http://dx.doi.org/10.1016/j.carbpol.2014.05.081>

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Green Synthesis of Silver and Copper Nanoparticles using Ascorbic acid and Chitosan for Antimicrobial Applications

N. Mat Zain^{a,b}, A. G. F. Stapley^{a*}, G. Shama^a

^a**Department of Chemical Engineering, Loughborough University, Loughborough, Leicestershire, LE11 3TU, United Kingdom.**

^b**Department of Chemical Engineering, Universiti Malaysia Pahang, Highway Tun Razak, 26300 Kuantan, Pahang, Malaysia.**

*Corresponding author: Tel: +44 (0)1509 222525, Fax: +44(0)1509 223923

Email addresses: shikin@ump.edu.my (N. Mat Zain), A.G.F.Stapley@Lboro.ac.uk, G.Shama@Lboro.ac.uk

Abstract

Silver and copper nanoparticles were produced by chemical reduction of their respective nitrates by ascorbic acid in the presence of chitosan using microwave heating. Particle size was shown to increase by increasing the concentration of nitrate and reducing the chitosan concentration. Surface zeta potentials were positive for all nanoparticles produced and these varied from 27.8 to 33.8 mV. Antibacterial activities of Ag, Cu, mixtures of Ag and Cu, and Ag/Cu bimetallic nanoparticles were tested using *Bacillus subtilis* and *E. coli*. Of the two, *B. subtilis* proved more susceptible under all conditions investigated. Silver nanoparticles displayed higher activity than copper and mixtures nanoparticles of the same mean particle size. However when compared on an equal concentration basis Cu nanoparticles proved more lethal to the bacteria due to a higher surface area. The highest antibacterial activity was obtained with bimetallic Ag/Cu nanoparticles with minimum inhibitory concentrations (MIC) of 0.054 and 0.076 mg/L against *B. subtilis* and *E. coli* respectively.

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