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HEC Capped Silver Nanoparticles - Synthesis, Characterization and Its Application

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Abstract

The development in the field of nanotechnology and nanoscience has attracted much attention over the past decade. This is because of the wider application of nanotechnology material in various kinds of field. At present, metal nanoparticles have been intensively investigated because of their extensive usage. In recent year, the use of metal nanoparticles such as iron, silver and nickel have been paid considerable attention because of the wider application of nanoparticles in different fields (Xu et al., 2007). Previously, nanoparticles have been produced mainly by chemical solution processes. This process used some chemicals that has possibility to act as a reducing agent, capping agents, and organic solvents that can produce nanoparticles. The issue was, those chemicals used are at severe risk, not only for the biological aspects but also risk for the environment (Hu et al., 2008). Thus, more scientist and researchers are starting to focus on integration of 'green chemistry' principle in producing nanoparticles. Therefore, synthesis of silver nanoparticles (figure 1) is non-harmful and designed environmentally friendly in this research. Hence, hydroxylethyl cellulose (HEC) is introduced in this project. HEC is a cellulose derivatives that can play a major role in reducing the metal ion to metal nanoparticles. HEC can react as both reducing and stabilizing agent in metal solution and change it to nano scale particles while water was used as a solvent. The metal chosen to change into metallic nanoparticles was silver. This metal has a wider application in industries. In this project, HEC was used to synthesize silver metal into metallic nanoparticles and characterize the morphology formed by using HR-TEM, SEM and UV-Vis. Besides, researchers found that metallic nanoparticles are showing good antibacterial properties because of the growing microbial resistance against metal ions, antibiotics and the development of resistant strains (Rai et al., 2008 and Pal et al., 2007). In relevant to this scenario, it was found that the silver nanoparticles synthesized from HEC showed good antibacterial activity. The antibacterial activity was conducted using five types of bacteria which are *Escherichia coli* (E.coli), *Pseudomonas aeruginosa* (P.aeruginosa), *Staphylococcus aureus* (S.aureus), *Bacillus subtilis* (B.subtilis) and *Enterococcus faecalis* (E.faecalis) (figure 2). Finally, the research initiates safe, cheap and environmentally friendly study.

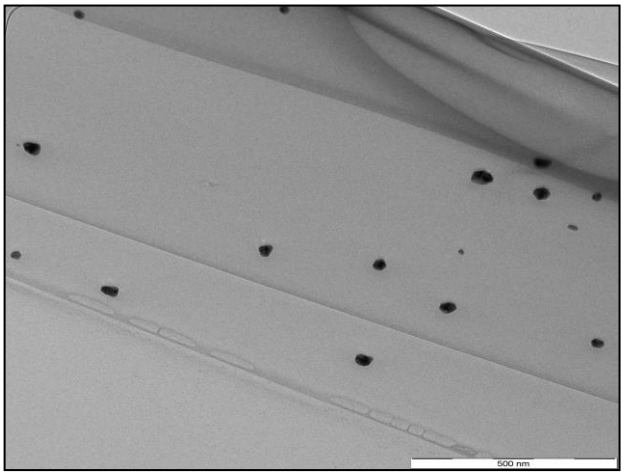

Figure 1: Silver nanoparticles synthesized using HEC

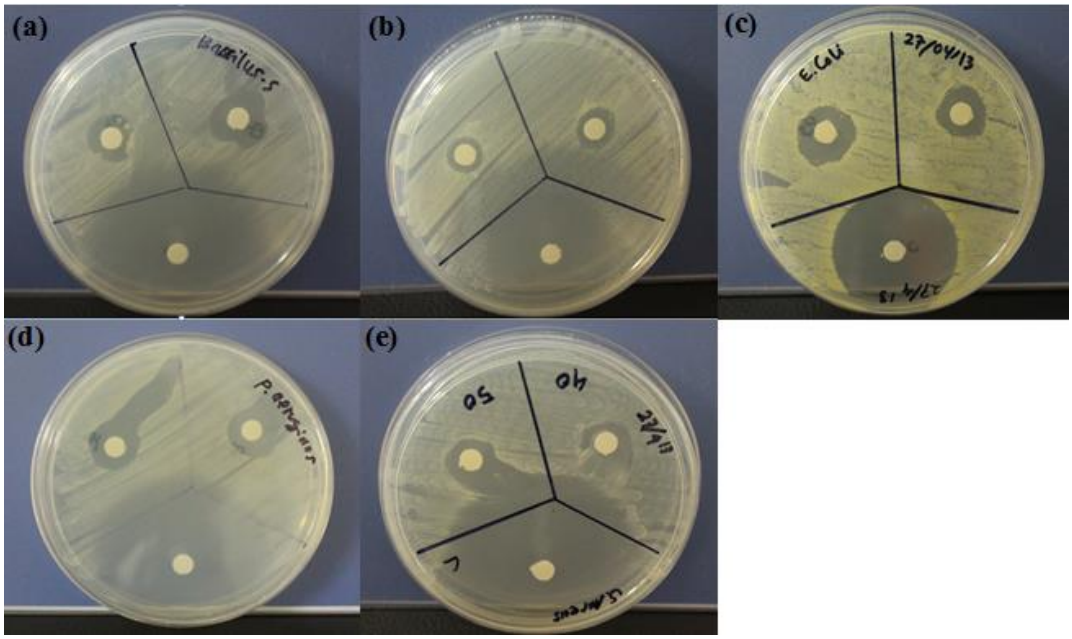

Figure 2: Antibacterial assay of five types of bacteria (a) *Bacillus subtilis* (b) *Enterococcus faecalis* (c) *Escherichia coli* (d) *Pseudomonas aeruginosa* and *Staphylococcus aureus*

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