THE EFFECT OF pH ON AMINO ACIDS BINDING TO SILVER NANOPARTICLES

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ABSTRACT

The study of interaction between biologically molecules and nanoparticles has attracted many interest because of potential application in adverse area. In order to improve their bio-specificity, biologically active molecules such as amino acids, peptides and protein are usually attached to nanoparticles. This report here describes the interaction between silver nanoparticles and amino acids. The control of binding degree of amino acids to silver nanoparticles is achieved by the pH change the reaction environment. The pH values have been adjusted by adding hydrochloric acid (HCl) or sodium hydroxide (NaOH) to the stock solution prepared. The characterization of the amino acids binding to silver nanoparticles at different pH condition are done by using UV-Vis Spectrophotometer and IR spectroscopy. The pH dependent binding studies of different charge amino acids, namely L-glutamic acid, L-phenylalanine, Alanine and Lysine with silver nanoparticles have been reported. From UV-Vis obtained data, association constant (K) were calculated. The association constant indicates the binding properties of amino acids to silver nanoparticles. Our result showed that, acidic condition shows higher K value for almost all the amino acids except for glutamic acid which has higher K value at neutral condition. For FTIR, the presence of N-H vibration at $3100cm^{-1}$ confirm the formation of complex molecules.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

The wide applicability of nanoparticles in numerous areas such as catalysis, electronic, chemistry, medicine as well as energy have attracting many interest especially in commercial demand. The synthesis and characterization of metal nanoparticles have been greatly investigated since they were used in glasses, pigments and in both medical diagnostic procedures (D. Zare, 2010). Similar to gold nanoparticles, ionic silver was initially used to stain the glass for yellow. Recently, there is also an effort to incorporate silver nanoparticles into medical devices including bone cement, surgical instrument, surgical mask and others. Moreover, Samsung has created a material called Silver Nano which use silver nanoparticle in house appliances (Vicky V. Mody, 2010).

Biofunctionalized nanoparticles becoming main focus in many research nowadays. The best agent for the functionalization of nanoparticles are amino acids because of the presence of different functional group (Aswathy Ravindran, 2012). To expand their potential application, biologically active molecules such as amino acids, protein and peptides usually attached to nanoparticles. The surface chemistry of silver particulate determined by the synthesis method. Nanostructures can be generated by ionic self-assembly of two oppositely charged species. The presence of electrostatic force between oppositely charged molecules aggregate into important nanostructures (Amrit Puzari, 2012). The binding of various amino acids at different pH value affect the complex formation between nanoparticles and amino acids (Sandesh R. Tetgure A. U., 2015). The pH value change the reaction environment as well as ionic strength of the nanoparticles. This research study is to investigate the effect of amino acids binding to silver nanoparticles at different pH condition.