Preparation Platinum Nanoparticles Using Chitosan

陳農恩、?耀國

E-mail: 9511321@mail.dyu.edu.tw

ABSTRACT

This study is using the ability of chiotsan to absorb metal ion and reductant by NaOH to make platinum nanoparticles. Above all, the sixteen formulas of alkaline chitosan suspensions were prepared by dropping the various concentrations of chitosan acetate solutions into the various concentrations of NaOH aqueous with high-speed homogenizing, respectively. Then, the hexachloroplatinate aqueous solution were respectively acceded to alkaline chitosan suspension solutions, alkaline chitosan-Pt composite suspensions were synthesized. Which molar ratio of chitosan repeat unit number to Pt4+ were 1:1 (CS1/Pt), 3:1 (CS3/Pt), 5:1 (CS5/Pt) and 7:1 (CS7/Pt) and pH values were 12.3, 13.5, 13.8 and 14.3. UV-visible molecular absorption spectrometry revealed that to increase the concentration of NaOH and the molar ratio of chitosan repeat unit number can promote the reaction rate of reduction of platinum ion. After, dialysis was used to remove free ions from the alkaline composite suspensions, using atomic absorption spectrophotometer (AAS) to analysis the yields of platinum. We can know to increase the molar ratio of chitosan repeat unit number can increase the yields of platinum, to increase the concentration of NaOH can decrease the yields of platinum. Analytical electron microscope (AEM) micrographs of the neutral composite suspensions showed that platinum nanoparticle size decreased with increased the concentration of NaOH and the molar ratio of chitosan repeat unit number, In addition, all the mean diameter of platinum nanoparticle in the neutral composes were smaller than 5 nm. At 600 °C and during 30 min, pyrolysis was used to decompose chiotsan and to gain platinum nanoparticles. The emission scanning microscope (FESEM) micrographs of platinum nanoparticles obtained by pyrolysis showed that the mean sizes were smaller than 20 nm.

Keywords : chitosan ; sodium hydroxide ; nanoplatinum

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