PE1

무전해 도금법에 의한 은도금된 구리분말의 활성화 복합처리

Improving activation and complexion process for coating copper particle with silver by electroless process

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Abstract

Silver- copper composite powders with silver layer on the surface of synthetic copper (~325 mesh) were coated by electroless plating method. A very dense, uniform silver coating layer, and especially without free silver particles was obtained by controlling strictly such reaction parameters: NH_4OH concentration along with $NH_4OH/(NH_4)_2SO_4$ molar ratio, activation time, potassium tartrate concentration and complexing time. It was found that the density and uniformity of coated-silver layers increase with the increase of potassium tartrate concentration and with the decrease of NH_4OH concentration and activation time. the decrease of NH_4OH concentration and activation time also contribute to the decrease of free silver particle. Scanning electron microscopy (SEM), atomic absorption spectra (AAs), X-ray diffraction (XRD) and BET methods were employed to characterize the composite powders.

I. Introduction

In order to overcome the problems associated with copper, namely oxidation, or the high cost of using silver, the substitution by silver coated copper particles for solid silver particles has been contemplated and electroless plating methods has been employed due to uniform distribution of obtained coating layers.

II. Experimental procedure

The synthetic copper powder (~325 mesh) with chemical purity of greater than 99% was first dispersed in an ammonium sulphate (assay > 99.0%) and ammonium hydroxide (28%) solution. The slurry was stirred at 500RPM to remove surface oxide film and activate the surface. A changeable amount of potassium tartrate was added to the slurry to act as both a complexing agent for the Cu^{+2} ions and subsequently as a mild reducing agent of the silver ions. An aqueous solution containing silver nitrate (purity > 99.8%) and ammonium hydroxide was then added dropwise. After the silvering process was complete, the solids were separated, washed, filtered and dried.

III. Results and discussions

Fig.1 shows the characteristics of silver-coated copper-based composite powders at various periods of activation time. It is evident that the uniformity and density of coated-silver layer decrease if the activation time is too long or too short; these results related to the incomplete removing of oxidized copper surfaces and the hydrolysis of copper particle surfaces.

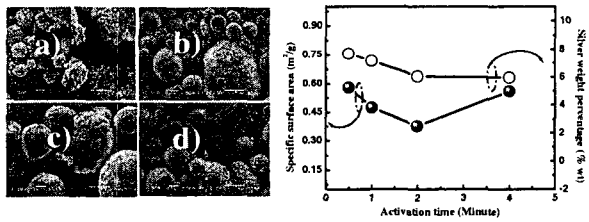

Fig.7 Characteristics of silver-coated layers at various activation times. a) 0.5minute, b) 1minute, c) 2minutes, d) 4minutes.

IV. Conclusions

The silver-coated copper-based composite powder with dense and uniform coating layer, especially without free silver particles have been systematically prepared by the electroless plating. The important things to get uniform silver coating layer are to remove complete oxides and hydroxides surface layers and to protect the cleansed copper particle surface from hydrolysis.