전자장치 응용을 위한 금속(은, 구리) 나노입자의 합성

Synthesis of Metal Nanoparticles for the Application of Electronic Device

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Abstract : The development of synthetic pathway to produce a highly yield nanoparticles is an important aspect of industrial technology. Herein, we report a simple, rapid approach to synthesize organic-soluble Cu and Ag nanoparticles in colloidal method for the application in a conductive pattern using inkjet printing. The silver nanoparticles have been synthesized in highly concentrated organic phase. The Cu nanoparticles have been synthesized by the reducing of the copper oxide materials using acid molecules in high concentrated organic phase. Their sintering and electric conductivity properties were investigated by melting process between 200°C and 250°C for application to printed electronics.

Key Word : Cu, Ag, Nanoparticle, Synthesis

1. Introduction

In this paper, we present a new synthetic method of narrowly dispersed silver and copper nanoparticles in the size range 5~10 nm in diameter for the mass production of kilo gram or sub kilo gram scale. We refer to a synthesis that offer narrowly dispersed nanoparticles without use of size-selection process as the new method. The new method for the synthesis of metal nanoparticles, described here, yield highly concentrated and stable dispersions of monodispersed silver and copper nanoparticles in a simple and cost-effective methods.

2. Results

Mass production of silver nanoparticles has been carried out by the redox of silver ion and cuprous oxide. In a typical synthesis, silver nitrate and copper acetylacetonate were added to the mixture of butyl amine and toluene. The color of the solution changed from gray color to purple and to deep purple when the reaction mixture reacted at 105-110 ℃ for 60-90 min. Kg scale Cu nanoparticles have been synthesized by the reducing of the copper oxide particles using acid molecules in high concentrated organic phase. The Ag nanoparticles also have been synthesized by redox method in colloidal system using Cu(acac)2 as a reductant. Furthermore, we have made high concentrated metal NPs ink which contain the metal nanoparticles above ~55 wt% due to their highly stable dispersibility. As a result, we achieved not only high yielded (>90%) but also high concentrated synthetic condition using the reduction controlled process. Also, synthesized metal nanoparticles were applied to the metal nanoink for inkjet printing with high metal contents.

3. Reference

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