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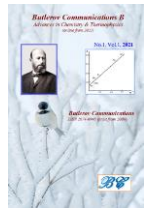

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Investigation of the process of chemical reduction of copper with ascorbic acid in the presence of carbon nanotubes

Natalia S. Amelina,*+ **Evgeny S. Vavilov**, **Alexander I. Biryukov**, **Vladimir E. Zhivulin**, and **Igor N. Kovalev**
Department of Analytical and Physical Chemistry. Faculty of Chemistry. Chelyabinsk State University. Brat'ev Kashirinyh St., 129. Chelyabinsk, 454001. Russia.
Phone: +7 (351) 799-70-69. E-mail: Amelina-natasha@mail.ru

*Supervising author; +Corresponding author

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Abstract

The work investigated the chemical reduction of copper in the presence of various organic additives and carbon nanotubes. The use of ascorbic acid as a reducing agent of copper ions without any additives leads to the formation of suspensions of copper with an average particle size of 1 to 5 μm, which aggregate with each other and precipitate. The use of sodium ascorbate as a reducing agent leads to the formation of copper hydrosols with an average particle size of less than 1 μm. For the direct study of copper sols, the method of optical spectroscopy was used. The formation of metallic copper nanoparticles was judged by the presence of plasmon resonance peaks in the absorption spectrum. In the wavelength range from 500 to 600 nm, the spectrum of the hydrosol without the addition of carbon nanotubes has a plasmon resonance peak characteristic of metal sols. It is noted that the plasmon resonance peak in hydrosols that do not contain additives of carbon nanotubes disappears in a day, which is apparently associated with the aggregation of copper nanoparticles. When copper is reduced in the presence of carbon nanotubes, the plasmon resonance peak is absent in the spectrum of a freshly prepared sol, but appears after 24 hours of exposure. This may be due to the adsorption and desorption of copper ions by carbon nanotubes. When copper is reduced with sodium ascorbate in the presence of carbon nanotubes, copper particles less than 1 μm in size are formed, and their accumulations are distributed among the carbon nanotubes. Particle size and shape were assessed using scanning electron microscopy.

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