COPPER NANOPARTICLES ON THE MODIFIED SILICA SURFACE

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Recently, an increasing interest has been found in the synthesis of nanoscale particles and clusters. Such interest is generated due to the physical and chemical properties and many important industrial applications. This particles are commonly used in chemical catalysis, electrically conductive paste, solid oxide fuel cells, etc.

The properties of material are strongly dependent from shape and particle size, that's why synthesis of monodispersed, nonagglomerated copper powder is important task. The main challenge in the development of catalytic NPs is to prepare nanomaterials that are highly active, selective, stable, robust, and inexpensive. One economical way of creating advanced Cu-based nanomaterials for catalysis is to anchor CuNPs (e.g., Cu, CuO, or Cu_2O) on supports such as iron oxides, SiO_2, carbon-based materials, or polymers by chemical reduction method. Hydrazine hydrate and sodium borohydride are frequently used as reductants for the synthesis of nanosize copper particles. The synthesis of stable, monodisperse, and uniformly-shaped copper nanoparticles has proven difficult because of the tendency for copper to rapid oxidation. Optimization of synthesis conditions (t, pH, time), using of less strong reducing agents, for example ascorbic acid, and stabilizing agents gives the opportunity to get highly stable, well-dispersed metal nanoparticles.

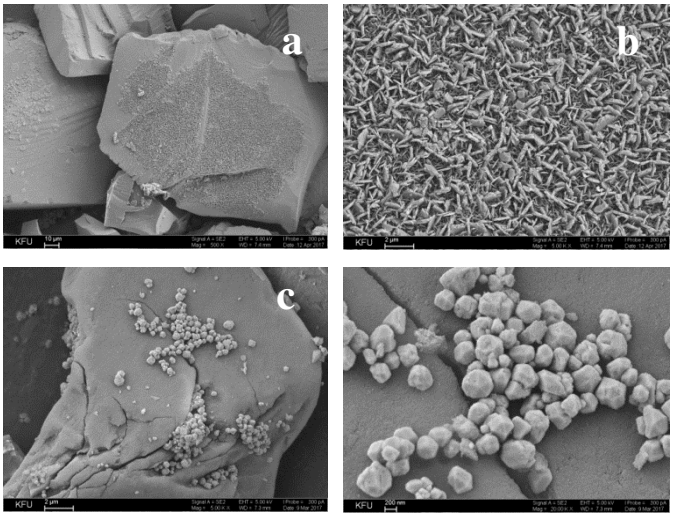

Fig. SEM image a) 10% Cu reduced by $NaBH_4$=1:1 (scale 10µm), b) scale 2µm; c) 10% Cu reduced by asc.acid=1:10 (scale 2µm), d) scale 200nm

Generally speaking we have obtained heterogeneous copper-containing catalysts based on silica gel with nitrogen including precursors on the surface by chemical reduction method. The resulting copper particles were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX). The resulting catalysts showed good activity in the copper-catalyzed cycloaddition reaction of azides to alkynes.

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