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Abstract

In this work, we present a synthetic protocol for production of sub 10 nm copper nanopowder (CuNPs) using continuous stirred tank (CSTR) and tubular flow reactors (PFR). Substantially higher throughputs of CuNPs have been achieved in this new protocol by reducing a copper salt with hydrazine hydrate/sodium borohydride as reducing agent. Copper nanopowder can be prepared from the sol by high speed centrifugation of the colloid. The nanopowder preserves size and shape upon re-dispersion. It has been shown that the contacting patterns do not have significant effect on particle size and shape but the overall yield is heavily dependent on the contacting pattern and reactor design. Scaling has been identified as a key issue in determining the yield.

Keywords: *Copper nanoparticles, continuous synthesis, nanopowder, nanoparticle yield*

1. Introduction

Nanoparticles are useful in applications like electrochemical sensors [1], energy [2], environment [3] medicine and biomedical applications [4]. While a few applications like biomedical requires small amount of nanoparticles, applications in energy, environment and electronics requires relatively large amount of nanoparticles. For example, large amount of copper nanoparticles are required in ink jet printing [5] of circuits, preparation of advanced thermal fluids (Nanofluids) [6] and catalysis [7,8]. Such requirements can be met only by continuous high throughput production of nanoparticles as powder.