# An efficient and easily retrievable dip catalyst based on silver nanoparticles/chitosan-coated cellulose filter paper

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## Abstract

Re-use of a catalyst is an important task, which is usually achieved by loading it on easily separable supports such as magnetic substrates. However, we demonstrate here the process of easy and fast catalyst separation from a reaction medium by loading it onto an economically feasible and microscopically high surface substrate of filter paper (FP) made up of cellulose microfibers as catalyst support. To achieve the goal, we coated chitosan (CH) on filter paper (CH-FP) to impart a high affinity of the substrate for metal ion absorption. AgNO3 dissolved in water with a 0.1 M concentration was used as the Ag ion carrier solution, and CH-FP strips with known rectangular dimensions were submerged into it for the metal ion absorption. The metal ion-laden CH-FP strips were dip treated with sodium borohydride (NaBH4) aqueous solution to prepare Ag-nanoparticle loaded CH-FP (Ag/CH-FP). X-ray diffraction and energy dispersive X-ray spectroscopy confirmed the formation of the Ag/CH-FP hybrid. Ag/CH-FP morphology was examined through scanning electron microscopy analysis, which showed the presence of Ag nanoparticles attached to the cellulose microfibers. The prepared Ag/CH-FP was employed as a dip catalyst for the degradation of nitroarene compounds of 2-nitophenol (2-NP) and 4-nitrophenol (4-NP) by NaBH4. Remarkably, the rate constants for 4-NP and 2-NP were 3.9 x 10(-3) and 1.7 x 10(-3) s(-1), respectively. In addition, we discussed the ease of the catalyst retrievability from the reaction mixture and its re-usability.

## Keywords

**Author Keywords:** Silver nanoparticles; Chitosan coating; Cellulose filter paper; Catalyst; Pollutants degradation

**KeyWords Plus:** SUPPORTED GOLD NANOPARTICLES; COMPOSITE FILMS; GREEN SYNTHESIS; IN-SITU; NANOFIBERS; REDUCTION; WATER; REMOVAL; HECK; DEGRADATION

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