Copper encapsulated alkaloids composite: An effective heterogeneous catalyst for electrocatalytic asymmetric hydrogenation

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Copper encapsulated alkaloids composite: an effective heterogeneous catalyst for electrocatalytic asymmetric hydrogenation

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Abstract: A novel heterogeneous catalyst, alkaloid@Cu was prepared by the entrapment of commercially purchased alkaloids within non-noble metallic copper nanoparticles. This composite was compacted into a coin and directly used as cathode for electrocatalytic asymmetric hydrogenation of aromatic ketones. Using water as hydrogen source, optically active alcohols with 71% ee value and 93% yield were obtained under very mild conditions.

Keywords: Copper nanoparticles; Encapsulated alkaloids; Electrocatalytic hydrogenation; Asymmetric hydrogenation

1. Introduction

The catalytic asymmetric reduction of pro-chiral ketones, especially asymmetric hydrogenation and asymmetric transfer hydrogenation, has been recognized as one of the most important methods for the synthesis of chiral alcohols, which are widely-applied intermediates in the pharmaceutical, natural products, agrochemical, fragrance, and other fine chemical industries [1-2].

In both academic laboratories and industrial operations, homogeneous catalysts based on rare and expensive transition metals such as ruthenium, iridium and rhodium have typically been used in this context [3]. As for heterogeneous catalyst, the Pt/cinchona alkaloids catalyzed asymmetric hydrogenation of α-ketoester is one of the few successful examples with both high enantiomeric excess (ee value) and yield

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