Supported Nickel nanoparticles on halloysite-based supports: synthesis, characterization and applications in catalytic hydrogenations

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INTRODUCTION

Natural clays are a versatile and abundant materials. Among them, halloysites (which have a nanotubular shape) exhibit a big surface area (between 50 and 137 m²/g), an important porosity and acidity (silanol groups at the surface). Here novel halloysite supported Ni-based catalysts are presented (NiNP@HAL), showing an attractive surface reactivity in hydrogenation reactions of a wide variety of substrates.

RESULTS

SYNTHESIS AND CHARACTERIZATION of NiNP@support

- Successful functionalization of the support
- Formation of small and spherical nickel nanoparticles (ca. 3 nm)
- Successful preparation of nickel-supported halloysite catalysts.

Ni-CATALYZED HYDROGENATIONS

- NiNP-quinidine@HAL showed to be the most active system towards hydrogenation
- A wide variety of functional groups was successfully hydrogenated under smooth conditions
- The catalyst was recycled up to 7 consecutive runs

CONCLUSIONS

We prepared nickel nanoparticles supported on both natural nanoclay and functionalized halloysites featuring amino and ammonium groups. Each catalytic material presents different reactivity profiles. In particular NiNP-quinidine@HAL exhibited a remarkable versatility, permitting its recycling.


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