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## Biphasic hydrogenolysis of oxiranes by palladium nanoparticles in water

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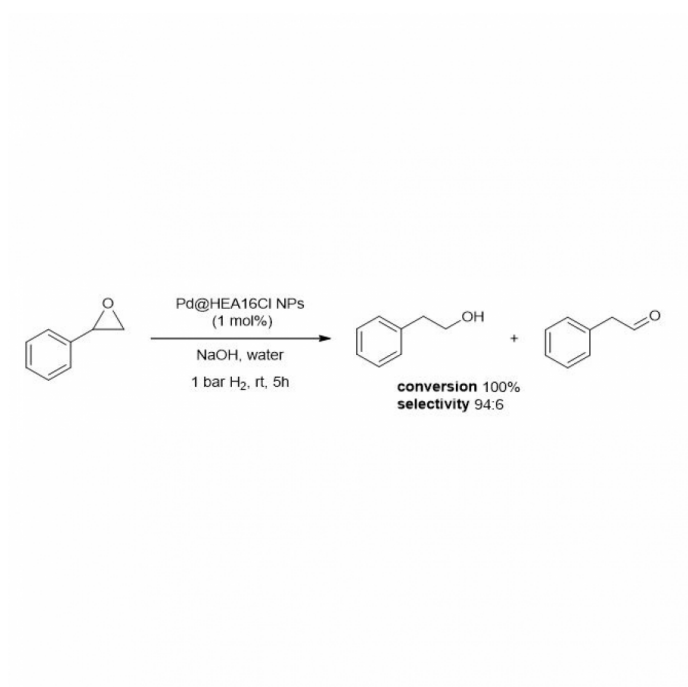
### PURPOSE OF THE ABSTRACT

Catalytic methods for the selective hydrogenolysis of epoxides are highly demanded, since this reaction affords alcohols as relevant intermediates for fine chemistry, perfumery, cosmetics and flavouring industries. [1, 2] Historically, hydrogenolysis of epoxides was performed with metal hydrides, which generated large amounts of toxic and polluting waste. [3] In the drive towards an eco?responsible chemistry, the design of highly active and selective transition metal nanocatalysts for this process remains of great interest, as they combine the advantages of molecular complexes in regards to conversion and selectivity and the ones of heterogeneous systems in terms of convenient recycling. [4]

In this work, well?defined transition metal nanoparticles have been easily prepared by chemical reduction of the corresponding salt, in the presence of various protective agents (surfactants, polymers) in water. They have been investigated as original catalysts for the selective hydrogenolysis of various oxiranes, and have exhibited relevant performances for this transformation.

For example, when using N,N-dimethyl-N-cetyl-N-(2-hydroxyethyl)ammonium chloride salt (HEA16Cl) as surfactant, styrene oxide was converted to primary alcohol with a selectivity of 94% after 5 h, under mild conditions and an adjusted pH of 12 (Scheme 1). A scope of substrates has been carried out, including benzyl or alkyl-substituted epoxides. The influence of various parameters, such as the temperature, the dihydrogen pressure, the protective agent and the pH of the reaction medium has been studied.

## FIGURES



**FIGURE 1**

Scheme 1

Hydrogenolysis of styrene oxide catalyzed by Pd@HEA16Cl nanoparticles

**FIGURE 2**

## KEYWORDS

nanocatalysis | hydrogenolysis | epoxide | water

## BIBLIOGRAPHY

- [1] Florio, S., Comprehensive Organic Synthesis, Oxford, UK, 2014, 8, 1086–1122.
- [2] Cesteros, Y., J. Mol. Catal. A: Chem. 2007, 261, 98–103
- [3] Hirota, K., Chem. Commun. 1999, 11, 1041–1042.
- [4] Roucoux, A., Chem. Rec. 2016, 16 (4), 2127–2141.