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Synthesis of Hybrid Fe_3O_4–Silica–NiO Superstructures and Their Application as Magnetically Separable High-Performance Biocatalysts

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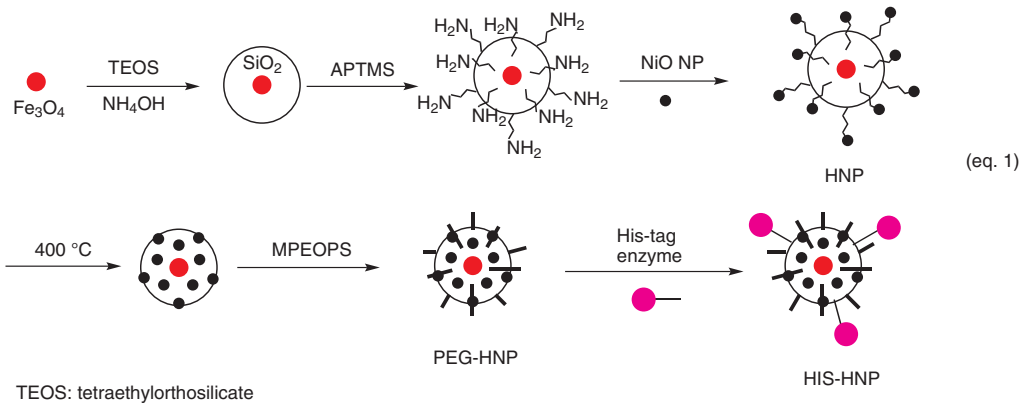
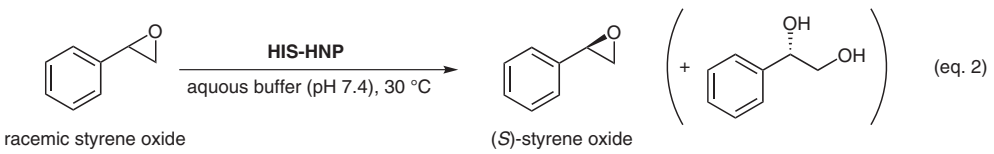
Optical Resolution with Immobilized Enzymes on Nanoparticles





1st run: 40.2%, >98% ee (reaction time 25 min)
2nd run: 37.5%, >98% ee (reaction time 35 min)
3rd run: 35.3%, >98% ee (reaction time 50 min)
4th run: 39.5%, >98% ee (reaction time 60 min)
5th run: 40.0%, >98% ee (reaction time 90 min)
6th run: 40.7%, >98% ee (reaction time 105 min)

Significance: Enzyme-anchored hybrid nanoparticles (HIS-HNP) were prepared by reaction of His-tagged enzymes (epoxide hydrases) with the PEG-HNP-bearing NiO particles (eq. 1). The kinetic resolution of racemic styrene oxide was performed with HIS-HNP to give enantioenriched (*S*)-styrene oxide (>98% ee). The catalyst was magnetically separated from the reaction mixture and reused five times (eq. 2).

Comment: HNP and PEG-HNP were characterized by ICP-AES, TEM, and SEM analyses. Though the amount of detached enzyme from HIS-HNP was less than 5% during the reaction, the enzymatic activity decreased as the recycling process was repeated.

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Category

Polymer-Supported Synthesis

Key words

immobilized enzymes

hybrid nanoparticles

kinetic resolution