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Zeolite–Supported Nickel Phyllosilicate Catalyst for C–O Hydrogenolysis of Cyclic Ethers and Polyols

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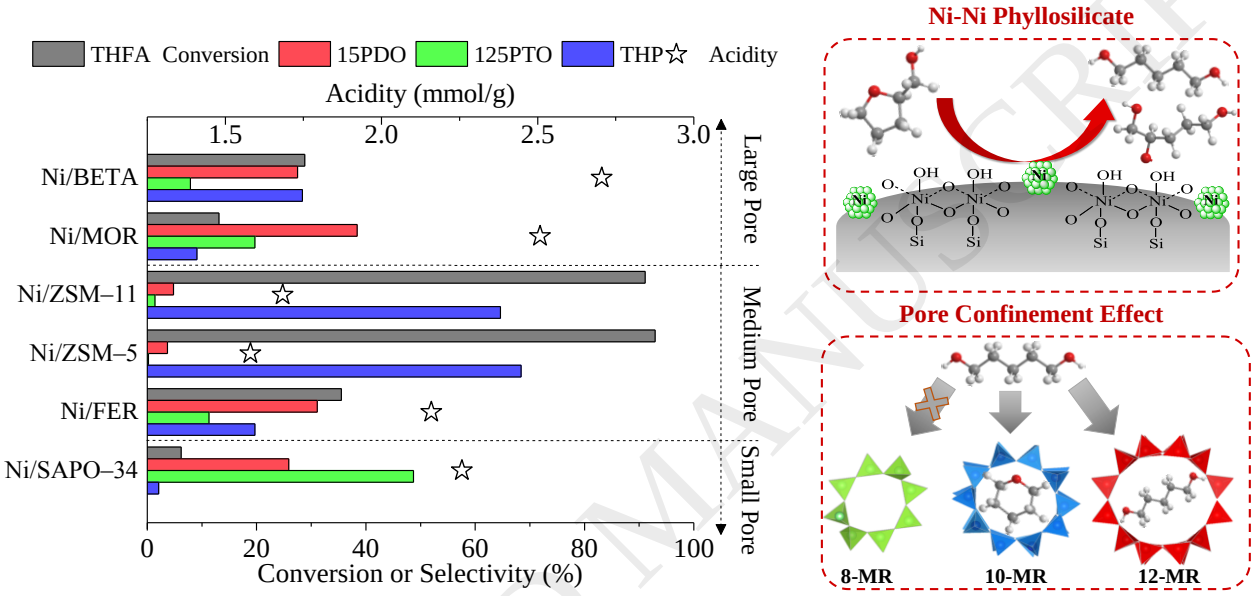
Graphical abstract:



Highlights:

- Zeolite–supported nickel nanoparticles have been prepared by deposition–precipitation method, forming Ni phyllosilicate precursor
- Medium–pore zeolites (ZSM–5 and ZSM–11) with mild acidity exhibited the highest reaction rate in the ring–opening of biomass–derived cyclic ethers and polyols
- Up to 38% 1,5–pentanediol selectivity is obtained at low conversion levels, while tetrahydropyran at a high yield of ca. 64% is the major product at high conversion levels
- ZSM–5 and ZSM–11 frameworks have pore confinement effect on the cyclo–dehydration of pentane polyols, enhancing the catalytic activity for the dehydration pathways
- Up to 51% selectivity towards 1,6–hexanediol is achieved during tetrahydropyran–2–methanol conversion over ZSM–5–supported nickel catalysts

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Abstract:

In this study, a series of zeolite structures, including small pore (SAPO–34), medium pore (Ferrierite, ZSM–5, and ZSM–11), and large pore (MOR and BETA) zeolites were explored as supports for nickel catalysts. The catalysts were prepared by the deposition–precipitation (D–P) method to obtain ca. 10 wt% Ni loading. The structures of prepared catalysts was elucidated using a wide range of