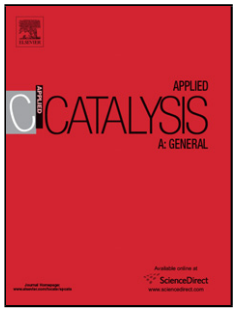

Title: Bifunctional catalysts based on colloidal Cu/Zn nanoparticles for the direct conversion of synthesis gas to dimethyl ether and hydrocarbons

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Bifunctional catalysts based on colloidal Cu/Zn nanoparticles for the direct conversion of synthesis gas to dimethyl ether and hydrocarbons

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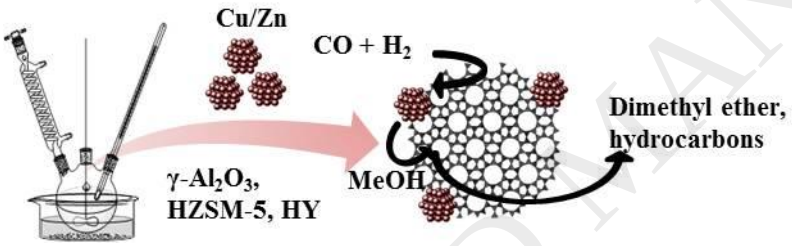
Graphical abstract



Highlights

- Using a model kit principle, well-defined Cu/Zn-based nanoparticle building units are employed for the preparation of specific bifunctional catalysts for syngas conversion to either dimethyl ether or hydrocarbons.
- By this approach, the effects of preparation history are reduced and high comparability of the bifunctional catalysts is enabled.
- Bifunctional catalysts affording the close proximity of two catalytic functions are obtained by subsequently depositing the nanoparticles on different acidic catalysts.
- The formation of the active phase during *in situ* activation is monitored by *in situ* X-ray absorption spectroscopy.
- The present study reveals the importance of Cu loading, Cu to acidic sites ratio and the accessibility of acid sites on the bifunctional catalysts to control activity and selectivity either towards DME or hydrocarbons in the direct conversion of simulated biomass-derived synthesis gas.

Abstract

Hybrid catalysts were prepared using well-defined, colloidal Cu/Zn-based nanoparticles as building units. The nanoparticles were immobilized on acidic supports (*i.e.*, γ-Al_2O_3, HZSM-