BALL-MILLING SYNTHESIS OF IRON-BASED REDOX CATALYST WITH BIOREFINERY WASTE TEMPLATE

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The technological advancement of biomass conversion into valuable compounds (e.g. HMF, levulinic acid, furfural) is limited by the production of the so-denoted humin byproducts[1], i.e. dark insoluble polymeric compounds of yet undefined structure. The strikingly high yields of humins (up to 50wt%[2]) in the acidic conversion of biomass results in an invitation to treat these compounds as valuable base materials rather than traditional waste, nonetheless only a few valorization studies have yet been published in the matter.

In this communication, humins have successfully been used as a template material for the solvent-free synthesis of highly crystalline hematite (Fe_2O_3) *via* the inexpensive ball-milling technique. The obtained material has been characterised by X-Ray Diffraction (XRD), N_2 physisorption (BET), and Transmission Electronic Microscopy (TEM).

Moreover, the catalytic activity of the material has been tested in the microwave-assisted oxidation of isoeugenol to the high added value product vanillin, displaying the noteworthy redox properties of said material.

The present research therefore proves the incredible potential that humin byproducts possess in their use as template material in the synthesis of highly crystalline and catalytically active metal oxides.

References

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[2]T.M.C. Hoang, L. Lefferts, K. Seshan, *ChemSusChem.* **2013** 6 1651–1658.