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Fructose conversion into 5-hydroxymethylfurfural catalyzed by POM/graphene oxide

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The fossil fuels have been the dominant sources for energy and chemicals. With the diminishing of petroleum resources, the search for renewable alternative resources is critically important. The conversion of biomass to fuels has attracted significant attention. 5-hydroxymethylfurfural (HMF) has received increasing attention, which can be synthesized from biomass-derived carbohydrates, can be converted to fine chemicals, polymeric materials, pharmaceuticals, and liquid fuels. Hence, efficient and environmentally responsible production of HMF from abundant and cheap fructose has been desired feedstock to compare the efficiency of catalytic systems for biomass conversion. Graphene oxide (GO) prepared from Hummer's method was proven to be a green and efficient carbocatalyst for the dehydration of fructose into 5-hydroxymethylfurfural (HMF). Since the catalytic activities of the POMs (Polyoxometalates) are greatly limited due to their very low surface area, supporting these materials on oxidic carriers, has been examined to enhance the density of acid sites available for reaction. In continuing previous report in the present work, a series of solid acid catalysts, including POM/graphene oxide were prepared, and their catalytic performance in various solvents at temperatures ranging from 120 to 220°C in the conversion of fructose to 5-hydroxymethylfurfural (HMF) was studied. The effects of different reaction parameters and catalyst reuse cycle on the reaction performance were investigated. The physicochemical properties of the representative catalysts were characterized using a variety of techniques.

Recent Publications:

1. Hansen T S, Woodley J M and Riisager A (2009) Efficient microwave-assisted synthesis of 5-hydroxymethylfurfural from concentrated aqueous fructose. Carbohydr. Res. 344(18):2568-2572.
2. Fenfen W et al. (2013) Catalytic dehydration of fructose to 5-hydroxy methyl furfural over Nb_2O_5 catalyst in organic solvent. Carbohydrate Res. 368C:78-83.
3. Huber G W, Iborra S and Corma A (2006) Synthesis of Transportation Fuels from Biomass: chemistry, catalysts and engineering. Chem. Rev. 106(9):4044-4098.
4. Liu R et al. (2013) Conversion of fructose into 5-hydroxymethylfurfural and alkyl levulinates catalyzed by sulfonic acid-functionalized carbon materials. Green Chemistry. 15(10):2895-2903.
5. Wang H et al. (2014) Graphene oxide catalyzed dehydration of fructose into 5-hydroxymethylfurfural with isopropanol as cosolvent. Chem. Cat. Chem. 6(3):728-732.

Biography

Abbas Teimouri is a graduate student at IUT University working under the direction of Professor Dabbagh. He is also working as Professor of Organic Chemistry in Payame Noor University, Iran. He had excellent opportunities in teaching and experience combined with his course work and research background in synthesis, catalyst, biomaterials and theoretical studies.

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