

Catalytic conversion of sugars to commodity chemicals

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ABSTRACT:

Nanocatalysts have played an important role in biorefinery and advanced biofuel applications. The conversion of cellulosic biomass feedstocks to platform or commodity biochemicals, such as sugars, organic acids and furans, is one of the key steps in biorefining. In our research group, metal phosphate catalysts have been developed for production of 5-hydroxymethylfurfural from C6 sugar. Incorporating metal species in phosphate networks provides suitable active sites and phases for the reaction. In addition, non-crystalline mesoporous aluminosilicate catalysts with combination of strong and weak acid sites have been developed for conversion of C5 sugar to levulinic acid in one-step without any solvent and H₂ addition. The proposed processes proceed efficiently in hot water media, making it highly effective and friendly to the environment. Moreover, the catalytic conversion of levulinic acid to its derivatives such as levulinate ester and gamma-valerolactone can be effectively achieved on bimetal nanocatalysts. The integration of all processes with a variety of products and broad value-chain would lead to new technologies and markets for biorefinery and biofuel industries.