

Highly selective catalytic two-step sequential reaction of 5-hydroxymethyl-2-furaldehyde to 2,5-bis(alkoxymethyl)furans for potential biodiesel production

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5-Hydroxymethyl-2-furaldehyde (HMF) was hydrogenated to 2,5-bis(hydroxymethyl) furan (BHMF) in various n-alcohol solvents with more than 98 % yield using Ru(OH)_x/ZrO₂ catalyst. The BHMF in the n-alcohol solvents was subsequently transformed into 2,5-bis(alkoxymethyl)furans (BAMFs, 4 samples) with reasonable yield and the highest ones using Amberlyst-15. A two-step sequential reaction (hydrogenation followed by etherification) process from HMF to produce BAMF was developed. Ru(OH)_x/ZrO₂ catalyst revealed excellent performance for the hydrogenation reaction of HMF to BHMF in various n-alcohol solvents in more than 98 % yields. Due to the active sites of Ru-OH and the metal-support interaction between Ru and ZrO₂, Ru(OH)_x/ZrO₂ gave these outstanding results. The resulting solution of BHMF in various n-alcohols (methanol, ethanol, 1-propanol and 1-butanol) was then etherified by using Amberlyst-15. From simple two-step sequential reactions, HMF was transformed to BAMF in more than 70 % yields, except for BMMF, which was obtained in 50 % yield.