Engineering a Metal-Organic Framework Catalyst by Using Postsynthetic Modification


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Mukaiyama Aldol Reaction Catalyzed by a MOF-Based Fe$^{3+}$ Complex

Significance: A metal-organic framework (MOF) based Fe$^{3+}$ catalyst was developed and applied to the Mukaiyama aldol reaction. Thus, the MOF-based Fe$^{3+}$, UMCM-1-AMFesal, was prepared by condensation of MOF composite UMCM-1-NH$_2$ with acid anhydride 1 followed by metalation with Fe(acac)$_3$. The Mukaiyama aldol reaction of aldehydes 5a,b and a silyl ketene acetal 6 was carried out with UMCM-1-AMFesal (0.1 mol% Fe) to give the corresponding β-hydroxy esters in 70±11% yield (7a) and 53±18% yield (7b). The catalyst was reused twice without loss of catalytic activity.

Comment: The preparation of UMCM-1-NH$_2$ (University of Michigan Crystalline Material-1-NH$_2$), consisting of 4,4',4''-benzene-1,3,5-triyltribenzoate (3), 2-amino-1,4-benzenedicarboxylic acid (4), and Zn(NO$_3$)$_2$, was previously reported (Inorg. Chem. 2009, 48, 296). UMCM-1 was originally prepared by Matzger and co-workers (Angew. Chem. Int. Ed. 2008, 4, 677).