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An extremely stable and highly active periodic mesoporous lewis acid silica for mukaiyama-aldol reaction in water

Fang Zhang
Shanghai Normal University, China

Homogeneous acid catalysts are mostly common used in the production of industrial chemicals and fine chemicals. However, their inherent drawbacks such as the corrosivity, the environmental hazards as well as the high cost of separating the acids from the reaction system, are very difficult to meet the requirements of environmentally friendly chemical processes. Moreover, some of them must be used under anhydrous conditions, which necessitates massive toxic, flammable organic solvents and specialized reaction vessels. Therefore, the development of solid acid catalyst for chemical synthesis in water attracted a lot of attention in recent years since it could simultaneously reduce the pollution and cost resulting from liquid acids and organic solvents, coupled with the ease of recovery and recycling of homogeneous acid catalysts. Herein the first synthesis of a series of PMO supported rare earth Lewis acid catalysts ($(OTf)_2Ln\text{-}SO_3\text{-}Ph\text{-}PMO$) was reported by coordinating $Ln(OTf)_3$ with benzenesulfonate-ligand ($\text{-}PhSO_3\text{-}$) resulted from sulfonation of phenyl (Ph) groups embedded in PMO silica walls. The $(OTf)_2Sc\text{-}SO_3\text{-}Ph\text{-}PMO$ showed the highest catalytic reactivity and selectivity in water-medium Mukaiyama-aldol reaction. Meanwhile, it exhibited significantly enhanced catalytic reactivity against that of $Sc(OTf)_3$ homogeneous catalyst and higher catalytic efficiencies than the $(OTf)_2Sc\text{-}SO_3\text{-}Ph\text{-}SBA\text{-}15$ with Sc complex terminally bonded to the pore surface. Moreover, it could be easily recycled and reused at least 10 times without significant loss of its catalytic activity.

Biography

Fang Zhang received his PhD degree in 2009 from East China Normal University. He worked as joint PhD student at University of California, Los Angeles and Post-doc fellow at University of New Mexico. He was promoted to an Associate Professor in Shanghai Normal University (2011). His research works mainly focus on the design and development of more selective and active catalysts for water-medium organic synthesis. He has published more than 50 peer-reviewed papers and obtained 10 Chinese patents.

zhangfang@shnu.edu.cn