IONIC LIQUID MEDIATED CLAY-SUPPORTED CATALYSTS FOR HYDROGENATIONS

R.T. Tao, Y. Xie, S.D. Miao, Z.M. Liu

Institute of Chemistry, The Chinese Academy of Sciences, Beijing 100080, China

liuzm@iccas.ac.cn

Ionic liquids (ILs) offer new opportunities for the catalyst development due to their unusual properties. The immobilization of ILs onto solid supports and preparation of catalytic materials assisted with ILs have attracted significant attention. In our recent work, an approach to prepare noble metal catalysts supported on clays with the aid of ILs was reported, and the catalytic activity of the catalysts were examined via hydrogenations of alkenes and benzene. In a typical procedure to prepare the catalysts, the clay was first treated with an aqueous solution of IL (e.g., 1,1,3,3-tetramethylguanidine trifluoroacetic acid, TMG^+LA^-), and the clay was then dispersed in a solution of metal precursor to adsorb metal ions; subsequently, the seperated clay from the solution was treated to reduce the metal precursor into the metallic state, resulting in metal/IL/clay composites. In our work, several clays including montmorillonite (MMT), attapulgite (ATT) and sepiolite (SEP) were used as matrice, and ILs with 1,1,3,3-tetramethylguanidine cation (TMG^+) was used to support metal particles on these clays. For example, using MMT as a support and TMG^+LA^- as an IL, Ru nanoparticles were not only decorated on the surface of MMT layers, but also intercalated into the interspace between the layers with the help of IL. The resultant Ru/IL/MMT composites exhibited high activity and stability for benzene hydrogenation, which resulted from the synergistic effect among the metal nanoparticles, IL and MMT. Similarly, Rh and Pd nanoparticles were successfully supported on ATT and SEP using ILs, respectively. The as-prepared Rh/IL/ATT and Pd/IL/SEP composites had high efficiency for hydrogenations of alkenes.

Acknowledgement: This work is financially supported by National Natural Science Foundation of China (No.20773138).