Alkylation of 2-Methylquinoline with Alcohols under Additive-Free Conditions by Al2O3-Supported Pt Catalyst

C. CHAUDHARI, S. M. A. H. SIDDIKI, K.-I. SHIMIZU* (HOKKAIDO UNIVERSITY, SAPPORO AND KYOTO UNIVERSITY, JAPAN)


Dehydrative Alkylation of 2-Methylquinoline with Alcohols Using Pt/Al2O3

Significance: The Al2O3-supported platinum nanoclusters (Pt/Al2O3) were prepared by mixing Al2O3 and an aqueous HNO3 solution of Pt(NO3)2(NH3)2 followed by reduction with hydrogen (eq. 1). Pt/Al2O3 catalyzed the dehydrative alkylation of 2-methylquinoline with alcohols in mesitylene. The alkylation took place at the 2-methyl group to afford the corresponding alkylated products in up to 75% yield (7 examples). The catalyst was recovered by centrifugation, reactivated by reduction with hydrogen and reused four times with a slight decrease of its catalytic activity.

Comment: The Pt/Al2O3 nanoclusters were characterized by XANES, EXAFS and CO adsorption analyses. In the reaction of 2-methylquinoline with benzyl alcohol, the catalytic activity of Pt/Al2O3 was superior to that of the other Al2O3-supported metal catalysts (Ir/Al2O3: 53% yield, Rh/Al2O3: 31% yield, Pd/Al2O3: 32% yield, Ag/Al2O3: 5% yield) and Pt nanoclusters supported on the other solid supports (Pt/Nb2O5: 20% yield, Pt/C: 7% yield, Pt/ZrO2: 1% yield). ICP-AES analysis showed no leaching of Pt from the catalyst during the reaction.

Results:

75% yield
65% yield
60% yield
70% yield
42% yield
55% yield (in undecane at 200 °C)
50% yield (in undecane at 200 °C)