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.

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