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Alkylation of 2-Methylquinoline with Alcohols under Additive-Free Conditions by Al_2O_3 -Supported Pt Catalyst
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Dehydrative Alkylation of 2-Methylquinoline with Alcohols Using $\text{Pt}/\text{Al}_2\text{O}_3$

Results:

Significance: The Al_2O_3 -supported platinum nanoclusters ($\text{Pt}/\text{Al}_2\text{O}_3$) were prepared by mixing Al_2O_3 and an aqueous HNO_3 solution of $\text{Pt}(\text{NO}_3)_2(\text{NH}_3)_2$ followed by reduction with hydrogen (eq. 1). $\text{Pt}/\text{Al}_2\text{O}_3$ 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 $\text{Pt}/\text{Al}_2\text{O}_3$ nanoclusters were characterized by XANES, EXAFS and CO adsorption analyses. In the reaction of 2-methylquinoline with benzyl alcohol, the catalytic activity of $\text{Pt}/\text{Al}_2\text{O}_3$ was superior to that of the other Al_2O_3 -supported metal catalysts ($\text{Ir}/\text{Al}_2\text{O}_3$: 53% yield, $\text{Rh}/\text{Al}_2\text{O}_3$: 31% yield, $\text{Pd}/\text{Al}_2\text{O}_3$: 32% yield, $\text{Ag}/\text{Al}_2\text{O}_3$: 5% yield) and Pt nanoclusters supported on the other solid supports ($\text{Pt}/\text{Nb}_2\text{O}_5$: 20% yield, Pt/C : 7% yield, Pt/ZrO_2 : 1% yield). ICP-AES analysis showed no leaching of Pt from the catalyst during the reaction.

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