Synthesis of Nitriles from Primary Alcohols and NH₃ with Ru(OH)ₓ/Al₂O₃

Significance: An Al₂O₃-supported ruthenium hydroxide catalyst (Ru(OH)ₓ/Al₂O₃) promoted the reaction of primary alcohols (1) or aldehydes (2) with ammonia to give the corresponding nitriles (3) in 65–96% yield (from 1, 13 examples; from 2, 7 examples). No leaching of ruthenium was observed by ICP-AES analysis after the reaction.

Comment: The authors have previously reported the preparation and characterization of Ru(OH)ₓ/Al₂O₃ and its application to the aerobic oxidative dehydrogenation of alcohols (Angew. Chem. Int. Ed. 2002, 41, 4538; Chem. Eur. J. 2003, 9, 4353). The catalytic activity of Ru(OH)ₓ/Al₂O₃ was superior to that of the other supported catalysts for the formation of 3a from 1a [Au(OH)ₓ/Al₂O₃: 10%, Pd(OH)ₓ/Al₂O₃: <1%, Pt(OH)ₓ/Al₂O₃: <1%, Rh(OH)ₓ/Al₂O₃: <1%, Ru/C: 22%, RuHAP: 4%].