The effect of the alumina phase for the reductive amination of 2-propanol to monoisopropylamine over Ni/Al_2O_3 catalysts

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Various single-phase aluminum oxides were prepared through the thermal decomposition of bayerite, boehmite and gibbsite. Ni/Al2O3 catalysts were prepared by the incipient-wetness impregnation method for the synthesis of monoisopropylamine (MIPA) by the reductive amination of 2-propanol in the presence of hydrogen and ammonia. The Ni/η-Al2O3 and Ni/γ-Al2O3 catalysts exhibited the higher catalytic activity. The observed variation in the conversion can be attributed to differences in the reduced nickel surface area of the catalysts, due to the interaction of nickel particles with different alumina phases. The Ni/γ-Al2O3 and Ni/δ-Al2O3 catalysts exhibited higher MIPA selectivity than the η-, Θ- and κ-Al2O3 supported Ni catalysts. The FT-IR spectra after pyridine adsorption showed that the high Lewis acid sites could be correlated with the enhancement of MIPA selectivity. Both the activity and the selectivity of the catalysts were strongly affected on the reductive amination by the nature of the support. The Ni/Al2O3 catalysts were characterized by XRD, N2-sorption, H2-TPR, H2-chemisorption and FT-IR after pyridine adsorption.