Reductive amination of 2-propanol to monoisopropylamine over Ni/γ-Al_2O_3 catalysts

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Monoisopropylamine (MIPA) is generally synthesized by the amination of 2-propanol with ammonia in the presence of hydrogen over dehydrogenation-hydrogenation catalyst at high pressures (~20 bar). The Ni/γ-Al_2O_3 catalysts with different nickel contents (4-27 wt%) were prepared by incipient-wetness impregnation method. The reductive amination of 2-propanol was studied in a continuous fixed-bed reactor at atmospheric pressure. The catalyst with 17 wt% Ni/γ-Al_2O_3 exhibited the highest catalytic activity. The catalytic activity for 2-propanol conversion was shown to be directly proportional to the exposed metal surface area. Excess ammonia was effective for the enhancement of the conversion and MIPA selectivity. Feed of excess hydrogen could efficiently hinder the phase transition of catalyst to metal nitride formation during reaction and prevent catalyst deactivation. In the absence of hydrogen the catalyst deactivated but its initial activity and selectivity was regenerated by re-exposing to feed containing hydrogen. The Ni/γ-Al_2O_3 catalysts were characterized by XRD, N_2-sorption, H_2-TPR, TEM, XPS and H_2-chemisorption.