Ni and Co Based Catalysts Supported on Mordenite

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Abstract

Nickel and Cobalt supported zeolites are already known to be suitable catalysts in oil refining and petrochemical processes due to their high selectivity and stability in many processes like for example in selective catalytic reduction of NO_x. In our studies we try to optimize the preparation of Ni and Co exchanged Mordenite (MOR, Si/Al=8) in order to get reproducible, well defined metal loaded catalysts. We try to get the highest number of cations starting from the H-Mordenite without making extra-framework metal oxides. Having homogenous framework sites enables studies without undesired reactions catalyzed by such extra-framework metal oxides. The amount of exchanged metal is linked with the distribution of the aluminium sites in the zeolite. Metal 2+ ions need aluminum pairs to be exchanged. We vary different parameters such as the Metal precursors, the temperature, the pH and the molarity of the precursor solution for the ion-exchange. The highest metal loadings can be find by using nickel(II)acetate and cobalt(II)acetate, rather than the corresponding nitrates which only gets four times lower metal loadings. The temperature has also an impact about the metal loadings. The best results are reachable by using a temperature between 60°C and 70°C. We also study the effect of the pH. and the molarity of the precursor solution. Both show a huge influence. The optimum is represented by a 0.01 mol/L solution at a slightly acidic ph. The best loadings we get are 430 µmol/gram with Nickel(II)acetate and 460 µmol/gram with Cobalt(II)acetate. These results can be studied further including different zeolites such as Ferrierite and characterizing their aluminium distributions.