

536b Co Methanation on Metal Incorporated MCM-41 Catalysts

Chuan Wang, Sangyun Lim, Guoan Du, Yanhui Yang, and Gary L. Haller

Co-MCM-41 and Ni-MCM-41 derived catalysts have been demonstrated to be good catalysts for the synthesis of SWNT in our group. However, there is another traditional use of Co and Ni catalyst for which these catalysts may be most appropriate, CO methanation. Co-MCM-41 is the first catalysts tested for this reaction, for which the physical and chemical properties were already well characterized by our group. The conversion of CO at different temperatures and with different pretreatments was investigated. Also the comparison of Co incorporated and impregnated MCM-41 showed interesting results. Co incorporated MCM-41 has a higher stability than the impregnated catalyst, which can be explained by the anchoring effect of small metallic Co clusters to the unreduced Co in the MCM-41 framework. Ni catalysts are generally thought to be much more active catalysts for CO methanation than Co catalysts. The catalytic reaction using Ni-MCM-41 also showed much higher reactivity than Co-MCM-41 under the same conditions. In order to understand the different effect of metal incorporated and impregnated catalysts, a kinetic study was performed. The reaction order of CO of incorporated and impregnated Co and Ni-MCM-41 showed totally different results: the incorporated one preparation is positive and the impregnated one is negative order. One of the interpretations is that metal particles formed from Co-MCM-41 and Ni-MCM-41 are decorated with silica or occluded in the silica matrix weakening CO chemisorption.