Aromatization of methane and other hydrocarbons over Mo_2C catalysts

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The upgrading of lower alkanes is an important subject of heterogeneous catalysis. Early studies focussed mainly on Pt catalysts, which exhibited an outstanding catalytic performance among the metals. All these studies were exclusively restricted to the reactions of C_2-C_7 hydrocarbons. The discovery of Wang et al.[1] that methane can be converted into benzene on MoO_3/ZSM-5 opened a new route for the utilization of methane. It turned out, however, that not the MoO_3 but Mo_2C is the key component for the activation and aromatization of methane, which is formed from MoO_3 during the induction period of the reaction. Methane can be converted into benzene on Mo_2C/ZSM-5 with ~80% selectivity at a conversion of ~15% at 973 K. In our laboratory, we have worked in two directions: (i) elaborating the effect of Mo_2C on the aromatization of C_1-C_7 hydrocarbons, and (ii) studying the chemistry of hydrocarbon species (CH_2, CH_3, C_2H_5, C_3H_5, C_4H_9 and C_5H_{11}), the primary products of the activation of the above compounds, on Mo_2C/Mo(100) in UHV by several spectroscopic methods.

[1] L.Wang, L. Tao, M.Xie, G.Xu, J.Huang, Y.Xu, Catal. Lett. 21 (1993) 35.