
Naturally-Occurring Silicates as Carriers for Copper Catalysts Used in Methanol Conversion

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Abstract: Bentonite- and sepiolite-supported copper catalysts have been prepared either by adsorption of Cu(II) from aqueous solutions of copper nitrate at pH \sim 4.5 or by adsorption of a $[\text{Cu}(\text{NH}_3)_4]^{2+}$ complex from an ammonia solution of CuSO_4 at pH \sim 9.5. The structure and composition of the calcined preparations have been studied by X-ray diffraction, chemical analysis, and energy dispersive X-rays. Textural characteristics have derived from the analysis of the adsorption-desorption isotherms of N_2 . All catalysts have been tested for the dehydrogenation of methanol to methyl formate. For this reaction, bentonite-based catalysts were found to have very little activity, which indicates that copper located in the interlamellar spaces is inaccessible to methanol molecules. On the contrary, copper-sepiolite catalysts showed a very high specific activity even for those catalysts with a very low copper content. The chemical state of copper in the catalysts on-stream has been revealed by X-ray photoelectron spectroscopy and X-ray-induced Auger techniques. In most of the catalysts Cu^+ is the dominant copper species.

Key Words: Bentonite • Copper catalysts • Methanol dehydrogenation • Sepiolite

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