

## Manganese and iron as promoters of sulfated zirconia isomerization catalysts

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More than two decades ago, two publications by Hino and Arata [1,2] directed attention towards sulfated zirconia as a low-temperature alkane isomerization catalyst. The catalytic performance of this material can be improved through addition of transition metal cations [3]. Initially it was believed that these promoters, e.g. manganese or iron, enhance the acidity of sulfated zirconia [4], but this claim could not be substantiated and the function of the promoters remained unresolved. This presentation will address the effects of manganese and iron on the sulfated zirconia system.

Catalysts with promoter contents of 0.5 to 5 wt% were prepared via incipient wetness impregnation of sulfated zirconium hydroxide (MEL Chemicals). The role of the promoters during calcination will be elucidated [5]. Based on data from ion scattering, electron paramagnetic resonance, and X-ray absorption spectroscopies and from X-ray diffraction it will be shown that manganese and iron are incorporated in the zirconia lattice. The consequences of incorporation are changes to the lattice parameters [6] and a higher stability of the tetragonal phase. Attempts to characterize the surface sites on zirconia catalysts using alkanes as probe molecules and infrared spectroscopy and microcalorimetry as analytical methods will be presented. The talk will end with a discussion of the initiation of the *n*-butane isomerization via oxidative dehydrogenation, which has been investigated by in situ infrared, X-ray absorption, and UV-vis spectroscopies.

[1] M. Hino, K. Arata, *J. Chem. Soc. Chem. Comm.* (1980) 851-852.

[2] M. Hino, S. Kobayashi, K. Arata, *J. Am. Chem. Soc.* 101 (1979) 6439-6441.

[3] C.-Y. Hsu, C.R. Heimbuch, C.T. Armes, B.C. Gates, *J. Chem. Soc. Chem. Comm.* (1992) 1645-1646.

[4] C.-H. Lin, C.-Y. Hsu, *J. Chem. Soc. Chem. Comm.* (1992) 1479-1480.

[5] A. Hahn, T. Ressler, R.E. Jentoft, F.C. Jentoft, *Chem. Commun.* (2001) 537-538.

[6] F.C. Jentoft, A. Hahn, J. Kröhnert, G. Lorenz, R.E. Jentoft, T. Ressler, U. Wild, R. Schlögl, *J. Catal.* 224 (2004) 124-137.