Manganese, iron and sulfur
K edge XAFS of promoted sulfated zirconia catalysts

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Abstract:
Promoted sulfated zirconia samples were prepared by the incipient wetness technique to produce isomerization catalysts which were active for the conversion of \(n\)-butane to isobutane at 338K (up to 10% conversion of 1% \(n\)-butane, 1atm., \(0.25\ h^{-1}\) WHSV). The local structure of Fe and Mn in promoted sulfated zirconia was investigated using fluorescence yield XAS. Spectra were taken of calcined samples, activated samples, and samples after reaction with \(n\)-butane (maximum activity and deactivated). Factor analysis reveals that the Mn K edge XANES can be described by a linear combination of the spectra of two separate components, and that the ratio of these components changes with activation of the catalyst, and during use in the \(n\)-butane isomerization reaction. The change in ratio of the Mn species during activation and reaction results in a reduction of the average Mn valence from 2.4 to 2.2. The Fe K edge XANES was not similarly affected by activation and reaction with \(n\)-butane.