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Surface and Bulk structural Properties of Copper Catalysts in static and dynamic Systems of partial Methanol Oxidation

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Abstract:

The copper-oxygen-system has been studied due to its capabilities for catalyzing partial oxidation of organic compounds. We choose methanol as sample for investigation of the active state of the copper catalyst because of its known partial oxidation reaction paths, high turnovers per time and its technological importance as basic material for formaldehyde production. The objective of our present research was to study with in situ and ex situ methods the chemical composition, electronic state and morphology of the surface and the bulk structure of the copper catalyst. For this purpose we perform a photoemission study and made in situ coupled time resolved EXAFS-mass spectrometry experiments under real catalytic conditions. Furthermore we have discovered self sustained oxide state-oscillations of copper catalysts in methanol-oxygen-helium mixtures under special conditions of methanol turnover. We present results yielded of several in situ experiments to achieve a qualitative comprehension of the oscillating mechanisms.