EX-SITU XPS STUDY OF THE ROLE AND BEHAVIOUR OF COBALT-OXIDE SUPPORT SURFACES IN CO_2 HYDROGENATION

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Abstract

While noble metals' excellent catalytic properties are undeniable, they are scarce and expensive materials, hence the research for new options is of great interest. One fairly appropiate solution is to use as litte noblemetals as possible while maintaining or improving catalytic performance. This approach emphasises the role of support materials greatly. In this study the role and mechanism of mesoporous support materials were examined by conducting ex situ x-ray photoelectron spectorscopy on the pretreated and the spent catalysts.

In this study our catalysts' were cobalt-oxide samples with different structures. The catalytic reactions were carried out in the modified pre-chamber of our XPS instrument. The standard pre-chamber was expanded with a quartz tube, a thermocouple, a heating element which provided uniform heating and a programmable control unit. During the pretreatment of the sample and during the reaction continous gas flow was provided.

The reaction of CO_2 hydrogenation may take many reaction paths and these paths may yield different products and by-products, depending on what type of catalyst was used. And depending on reaction conditions the surface of the catalyst undergoes changes. The main purpose of my research was to track these changes by aquiring the spectra for the Co 2p and O 1s regions and evaluate the results.

The gathered and processed data helps to evaluate the role of different surfaces in the given catalytic process. Furthermore, studying their behaviour enables the design of new catalytic systems, reducing the trial-and-error nature of these experiments.

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