FOXSI
Functional Oxide Surfaces and Interfaces

EINLADUNG

zum Vortrag
von

Prof. Dr. Valerii I. Bukhtiyarov

Boreskov Institute of Catalysis, SB RAS, Novosibirsk, Russia

Size Effects in Combustion of Hydrocarbons over Supported Metal (Pt and Pd) Catalysts for Abatement of Car Exhausts

am

Montag, 29. April 2013, um 11:00

Technische Universität Wien, Institut für Materialchemie
Lehartrakt, Seminarraum Lehar 01, 01. Stock
1060 Wien, Getreidemarkt 9

Abstract:

Understanding why activity, expressed as a turnover frequency, depends upon the particle size of a catalytically active metal has been an area of considerable study in supported metal catalysis. This problem is not only of fundamental, but also of practical interest, since its elucidation allows one to regulate the properties of metal nanoparticles and to synthesize supported metal catalysts with improved performance. Particular importance of this direction of science and technology has for development of competitive catalysts which use expensive Pt-group metals as active component.

Literature and own recent data in this field allows us to conclude that systematic study of the size effects and their practical application is impossible without:

1) development of the methods for reproducible synthesis of the supported metal particles with variation of the mean particle size in nanometer scale (1-10 nm), but with homogeneous size distribution for each specific size;
2) application of the fool-proof methods for characterization of nanosized particles and determination of their size distribution;
3) testing the catalytic properties and comparison of the TOF values depending on the mean particle size;
4) investigation of electronic, structural and adsorption properties of the nanosized metal particles with the aim to understand the reasons of the size effects.

The results of investigations of the size effects in oxidation of alkanes over Pt/Al_2O_3 and Pd/Al_2O_3 catalysts presented in this report illustrate this affirmation.

A series of supported metal catalysts with narrow particle size distributions were prepared by incipient wetness impregnation. The catalysts were used both for catalytic testing and for physical-chemical characterization with XRD, XPS, SAXS, EXAFS, XANES and TEM. It has been shown that the optimal size of the metallic nanoparticles for each specific reactions depends on the nature of the oxidized molecules, peculiarities of metal-support interaction and reaction conditions. Practical result of the study is a possibility to improve essentially the performance of the catalysts and/or to decrease (up to few times) of loading the Pt-group metals via optimization of the mean sizes of active metal nanoparticles.

FWF SFB F45 „Functional Oxide Surfaces and Interfaces (FOXSI)“
Prof. Günther Rupprechter (Speaker), Melanie Schärer (SFB FOXSI Secretary)
Vienna University of Technology, Institute of Materials Chemistry, Getreidemarkt 9, 1060 Vienna, Austria
Tel.:+43-(0)1 58801-165102 - Fax: +43-(0)1 58801-16599
e-mail: grupp@imc.tuwien.ac.at, e-mail: melanie.schaerer@tuwien.ac.at
web: http://foxsi.tuwien.ac.at/