**Nanocomposites and nanomaterials**

# The influence of mechanochemical treatment on the properties of CeO2-MoO3 system

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It is found that CeO2-MoO3 system are widely used as photocatalysts for organic dyes degradation, catalysts supports and also effective catalysts for environment protection, namely oxidation CO. Recently, oxide Ce/Mo mixtures are perspective catalysts in the process of acetaldehyde production from bio-ethanol. It is known that mechanochemical treatment (MChT) permits to obtain the nanocompositions, increase the specific surface area and improve catalytic properties of the systems.

Cerium-molybdenum oxide system with a molar ratio of CeO2/MoO3 = 15:85, 25:75, 50:50 and 75:25 was prepared by mixing of cerium and molybdenum oxides. The MChT of the samples was conducted in the planetary ball mill Pulverisette-6 (Fritsch) during 2, 4 and 8 hours in air. The CeO2-MoO3 compositions before and after modification were studied by methods of BET, XRD, IR, ESR, ТЕМ and catalytic test.

ВЕТ analysis showed that MChT of CeO2/MoO3 = 15:85, 25:75, 50:50 and 75:25 leads to increase of specific surface area of the samples independently on their consist. The X-ray data of initial and modified samples of CeO2-MoO3 presented the simple oxides reflexes without new compounds. It was found that MChT of CeO2/MoO3 leads to change of dominant reflex from α-MoO3 to CeO2 phase with simultaneous decrease of all reflexes intensity and their widening, indicating to crystallites size decrease (calculated by Scherrer equation) from 89 to 50 nm for MoO3 and from 64 to 28 nm for CeO2. According to TEM data of composition Ce/Mo=50:50 shown that MChT during 2 hours of this sample leads to particles size decrease from 200 to 20-40 nm, while the increase of duration treatment to 4 hours accompanied by a formation of nanodispersed structure “core-shell”, and its destruction with agglomerates formation after 8 hours MChT.

The catalytic tests which are conducted on CeO2/MoO3 = 50:50 composition in reaction bio-ethanol oxidation showed its 100%-conversion at T = 300°С into acetaldehyde with yield 90 %. The mechanochemical activation of CeO2/MoO3 composition leads to decrease of 100 %-conversion temperature (T = 195°С) and increase of acetaldehyde yield to 98 %.