Physico-Chemical nanomaterials science

The ultrasonic treatment influence on the structure and properties of CeO_2-MoO_3 system

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Nowadays CeO_2 as wells as MoO_3 containing materials are one of the important catalysts, photocatalysts, catalytic supports, sorbents [1, 2]. Traditional methods of preparing oxide cerium-molybdenum compounds such as co-precipitation, sol-gel, impregnation have some disadvantages and the creation of new methods synthesis of these compounds is actual. One of the alternative methods which permits to synthesize complex nanocompositions based on the cerium and molybdenum oxides is ultrasonic treatment (UST).

CeO_2-MoO_3 compositions with atomic ratio Ce/Mo=15:85, 25:75, 50:50 and 75:25 were modified by ultrasound during 1 hour in aqueous medium.

XRD data show that the UST leads to an increase of all reflexes intensity exception the sample Ce/Mo=75:25. In turn after sonochemical activation the change of basic reflex α-MoO_3 from the plane (020) for initial composition to (040) for activated samples independently on atomic ratio Ce/Mo is observed.

TEM study demonstrates that the ultrasound treated samples have habitus of MoO_3 nanorods with length 40 nm and ring-like nanoparticles about 20 nm which are belong to CeO_2.

According to the results obtained by the BET method the UST of all samples accompanies by an increase of their specific surface area ($S_{BET.}$) from 1.7 m^2/g up to 6.6 m^2/g and pore volume ($V_{s.}$) from 2.8×10^{-2} cm^3/g up to 5.5×10^{-2} cm^3/g.The thermogramm of modified samples show that UST accompanied by the presence of endothermal peak at 52°C (without weight loss) which corresponds to removal of adsorbed water and appearance of two exothermal effects in temperature range 450-570°C which associate with the process of CeO_2 crystallization.

1. *Peng Y., Qu R., Zhang X., Li J.*, The relationship between structure and activity of MoO_3–CeO_2 catalysts for NO removal: influences of acidity and reducibility // Chem. Commun.-2013.-**49**.-P. 6215-6217.
2. *Jin Y., Li N., Liu H., Hua X., Zhang Q., Chen M., Teng F.* Highly efficient degradation of dye pollutants by Ce-doped MoO_3 catalyst at room temperature // Dalton Trans.-2014.- **43**.-P.12860-12870.