DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Project entitled „Study of defected degree of $Ce_{1-x}Ln_xO_{2-y}$ mixed oxide surface on shape and size supported on it nanoparticles of noble metal and its orientation on the support.” aims to improve the knowledge about interaction between the metal nanoparticles and the support in various conditions.

First task, what will be realized in this project, will be elaborate selectivity synthesis method of mixed oxides $Ce_{1-x}Ln_xO_{2-y}$ (where Ln = trivalent lanthanide ion) with various chemical composition given morphology (e.g. cubes, octahedrons, rods). Syntheses will be performed using hydro(solwo)thermal methods, which are successfully used, by researchers, to shape-selectivity synthesis of pure ceria. Our previous experience indicate that, formation of single phase $Ce_{1-x}Ln_xO_{2-y}$ mixed oxides, shapely crystals (with mean size e.g. 100-200 nm) (cube-like or octahedron-like), is possible for materials where $x <= 0.3$. Next step, will be decorate support by nanocrystals of noble metal. The use of modern research methods as transmission and scanning electron microscopy (TEM, SEM), electron diffraction (ED)and X-ray diffraction (XRD) enable to depth description of influence of support morphology on orientation and shape supported on it metal nanoparticles. In the next part of planned research, detailed physic-chemical characteristic, description of red-ox properties (TPR, TPO, TG) and catalytic tests (e.g. CO oxidation) of obtained $M\backslash Ce_{1-x}Ln_xO_{2-y}$ systems will be performed. Sensitivity of this process on exposed by oxide (CeO_2) and noble metal (Au) crystal planes will enable to choice the system with the best catalytic properties.

In the modern scientific literature, many articles about marvellous catalytic activity of nanosized gold supported on oxide support are easy to find. In contrast to inactive (catalytically) gold crystals, the nanocrystalline gold, with mean size under 5 nm, exhibit have very high activity in the reactions of catalytic oxidation of various compounds (eg. CO). Additionally, activity of nanosized gold as a catalysts increasing with decreasing of mean size of crystals. That unexpected property (size effect) leads us to undertake research into the $M\backslash Ce_{1-x}Ln_xO_{2-y}$ systems. Research on strong dispersed particles (e.g. gold) supported on doped ceria based mixed oxides with given morphology could have very significant influence on present knowledge about heterogenic catalysis. Skilful selection of the system parameters like exposed planes of support crystals, defecting degree of support, temperature and atmosphere of heat treatment or type of noble metal allow to design the efficient and active catalytic systems, adjusted to the needs of a given process.