Noble metals nanoparticles are active catalysts in many important catalytic reactions. Very significant problem, which is presently unresolved, is the nanoparticles sintering and catalyst deactivation at catalytic process conditions. This problem is very serious from the economical point of view, thus effective solution of this problem is in demand.

Proposed research tasks pose a try of a new approach to noble metals contained complex catalysts deactivation counteract. The main aim of the study is to obtain highly dispersed, stable and active catalytic systems, which will be able to controllable regeneration of the metallic active phase.

The main idea is to build a hierarchical system, where hydrophobic, spherical particles of mixed oxides (CeO_2 doped with precious metal) will be deposited on the hydrophobic organic layer covered support. Functionalization of the γ-Al_2O_3 will be conducted in order to enhance the interactions between the nanoparticles and the support, to obtain "monoparticle" dispersion of the hydrophobic nanoparticles. These particles will strongly interact with the support surface on the basis: "similar attract similar." These systems will be then activated in controlled reduction process, in order to obtain small metallic nanoparticles on the ceria surface.

To check the effectiveness of the proposed method, synthesized systems will be examined by comprehensive studies, in order to determine its fundamental properties (chemical composition, particles sizes, their distribution on support surface, structure, texture and interactions in such systems). Stability of the systems at raised temperatures, and the regeneration possibility will be also examined. The physicochemical properties of the obtained systems will be linkage to the catalytic activity in oxidation reactions.

Despite its large potential, proposed method for the synthesis of highly dispersed active noble metals contained catalysts, is not well known in literature. Additional stabilizing of the mixed oxides nanoparticles on the modified support should enhance the thermal resistivity of the obtained systems. Possibility of such catalysts to regeneration procure, that they are very interesting from the scientific point of view. This unique property can also enable to its more effective utilization, what currently poses a crucial problem in heterogeneous catalysis.