The project entitled „Study of defected degree and exposed surface of $Ce_{1-x}Eu_xO_{2-y}$ mixed oxide supports on thermal stability and catalytic activity of gold nanoparticles" aims at improving the thermal stability of gold nanoparticles supported by ceria nanoparticles under industrially relevant Red-Ox reactions conditions.

In the modern scientific literature, there are numerous papers devoted to the catalytic activity of nanosized gold supported on a ceria support. Au/CeO_2 composite systems demonstrate excellent catalytic activity in a large number of industrially relevant reactions (e.g., low-temperature CO oxidation, reforming of the ethanol). However, the sintering of gold nanoparticles at elevated temperatures (at working conditions) remains an unsolved problem. In our work we propose two ways for inhibition of thermal induced sintering of gold nanoparticles deposited on $Ce_{1-x}Eu_xO_{2-y}$ nanoparticles. The first way is “geometrical" inhibition of temperature induced sintering of gold nanoparticles via creating obstacles for their migration over the ceria support. The second way is "anchoring" the gold nanoparticles on the surface defect clusters on ceria supports generated by Eu doping.

To investigate the mechanisms of stabilization of gold nanoparticles we intend to carry out the following tasks:

1. The first task will be a synthesis of $Ce_{1-x}Eu_xO_{2-y}$ ($0<x<0.3$) nanocrystals with well-defined shapes (cubes and octahedrons) and textures (smooth and nano facetted) via a microwave assistance hydrothermal method. The shape selected nanocrystals will allow obtaining materials with well-defined surface properties (e.g., structure and energy).

2. In the second step, the shape selected ceria particles will be decorated with gold nanocrystals with a narrow size distribution. The sintering mechanisms of gold nanoparticles on the surface of ceria support at elevated temperatures will be elucidation via modern research methods - transmission and scanning electron microscopy (TEM, SEM). In particular, the role of doping, type and texture of ceria surface and atmosphere (reducing and oxidizing) will be studied.

3. The final step will be devoted to the determination of the influence of shape, texture and europium concentration of the ceria on the catalytic activity (e.g., CO and C_3H_8 oxidation) of composite $Au/Ce_{1-x}Eu_xO_{2-y}$ nanoparticles.