Natalia Semagina is an associate professor in the Department of Chemical and Materials Engineering at University of Alberta. She obtained her Ph.D. in Chemical Kinetics and Catalysis from the Tver State Technical University in Russia. After several years of service as a senior lecturer and researcher at the same university, she worked as a research associate in the Group of Catalytic Reaction Engineering at the Swiss Federal Institute of Technology in Lausanne (EPFL). In 2008, she joined the University of Alberta as associate professor in the Department of Chemical and Materials Engineering. Semagina research is focused on experimental heterogeneous catalysis and aims to get insight into the structure sensitivity of catalytic reactions and to discriminate between observed and intrinsic synergism in bimetallic catalysis using structure-controlled nanoparticle synthesis. The reactions of interest include hydrogenation, hydrodesulfurization, carbonylation, catalytic combustion and ring opening.

Bimetallic Nanoparticle Structure Control: What Matters for Catalytic Methane Combustion

Bimetallic nanoparticles with a controlled morphology are used not only as catalysts with synergetic effects but also as useful tools to study metal interactions, structure evolvement and their consequences for the reaction of interest. In this lecture, Pd-based catalysts for lean methane combustion in a wet feed will be addressed from the viewpoint of Ni or Pt addition. The structure-controlled synthesis of the bimetallic particles is shown to bring significant benefits (Ni) or to be an unnecessary synthetic complication (Pt) for this specific application. A recently discovered mechanism of Pt promotion of Pd-catalyzed wet methane combustion will be addressed as well. The reaction has attracted considerable attention in the past few years due to the increasing demand for efficient converters for natural-gas vehicles.