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**ABSTRACTS**

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### Effect of CeO<sub>2</sub> Reductive Pretreatment on the Formation of Bimetallic Particles in Ag-Doped Pt/CeO<sub>2</sub> Catalysts for 4-Nitrophenol Reduction

Bugrova T.A., Kharlamova T.S., Svetlichnyi V.A., Salaev M.A., Mamontov G.V.

*Tomsk State University, Tomsk, Russia*

*bugrova.tatiana@gmail.com*

It is known that bimetallic nanoparticles feature unique properties different from those of the corresponding single-metal materials. These properties are assumed to result from the interaction of the metals and also depends on the preparation conditions and support used. The Pt-based catalysts are used in a wide range of oxidative and reductive reactions such as hydrogenation of aromatic compounds, NO<sub>x</sub> conversion, VOCs abatement, etc. [1-3]. The addition of the second metal (in particular, Ag) to the supported Pt catalysts results in an increase of the selectivity towards the target products in the hydrogenation reactions and a decrease of the loading of expensive platinum [4,5]. High catalytic activity of these catalysts can be achieved due to the synergistic effect of the metals.

One of the approaches towards the formation of the bimetallic particles is the preparation of catalyst based on the prereduced CeO<sub>2</sub>. The use of the support reductive pretreatment leads to the formation of a large number of surface Ce (III) sites in the CeO<sub>2</sub> structure that react with the precursor of the active components during the impregnation step. The metal–support interaction in the catalyst obtained is high due to the formation of the metal/CeO<sub>2</sub> interface, while the formation of the PtCe<sub>x</sub>O<sub>y</sub> solid solution does not practically occur.

Thus, the present work is focused on the metal–support interaction and interaction of Pt and Ag in the ceria-supported Pt–Ag bimetallic catalysts and their catalytic activity in p-nitrophenol reduction with NaBH<sub>4</sub>.

Ceria was prepared by thermal decomposition of cerium nitrate at 500 °C. The catalysts were prepared by incipient wetness impregnation of the prereduced CeO<sub>2</sub> support. In monometallic nM(M=Pt or Ag)/CeO<sub>2</sub> samples, the metal content was  $n = 0.5-2$  wt. %. Bimetallic samples were prepared by sequential impregnation. The prereduced CeO<sub>2</sub> was impregnated with the H<sub>2</sub>PtCl<sub>6</sub> solution. Prior to the addition of the second component, the catalyst was dried at 120 °C and reduced again. Then the catalysts were impregnated with the AgNO<sub>3</sub> solution. The total content of the metals in the (n-x)Pt<sub>x</sub>Ag/CeO<sub>2</sub>, (n), was 2 wt%, and x was 0.5, 1.0 or 1.5 wt%. Then all samples were dried in air at 120 °C and reduced in 10%H<sub>2</sub>/Ar flow at 300 °C. The catalysts were characterized by the low-temperature N<sub>2</sub> sorption, XRD, Raman and UV-vis DR spectroscopies, pulse CO adsorption, temperature-programmed reduction and oxidation. The catalytic activity was tested in the 4-nitrophenol hydrogenation with NaBH<sub>4</sub> to aminophenol.

According to the H<sub>2</sub>-TPR results, in the temperature range from 25 to 300 °C the increase of the metal content in the monometallic samples leads to the shift of the reduction peak maximum towards higher temperatures. However, the TPR profiles of the bimetallic catalysts contain single peak in the temperature range from 50 to 180 °C. The effect of the Pt-Ag interaction on the

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formation of the active sites and activity of the Pt-Ag/CeO<sub>2</sub> catalysts in 4-nitrophenol hydrogenation to aminophenol will be discussed.

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