ADVANTAGES OF BIOMORPHIC $Ce_{0.5}Zr_{0.5}O_2$ IN CATALYTIC OXIDATION OF SOOT

N.V. Zaletova, A.O. Turakulova, V.V. Lunin

Lomonosov MSU, Chemistry Department, Moscow, Russia

n_zaletova@mail.ru

In the past decades, special attention has been paid to the oxidation of soot particulate emitted from diesel engines due to its harm to the environment and human health [1,2]. Systems on the basis of cerium-zirconium mixed oxides recently gained attention on the utilization for soot oxidation because of their high oxygen storage capacity [1]. In the present work two types of CeO_2-ZrO_2 mixed oxide were prepared and examined in the oxidation of model soot (carbon black (CB): N330n Degussa). The first one is coprecipitated oxide, the second – biomorphic one, prepared with the use of pine sawdust as structural template.

Soot-catalyst mixtures (10% of soot) were milled in an agate mortar and heated from room temperature to 650^0C (5^0/min) in air flow (75 ml/min).

The combustion of pure carbon black occurs at 632^0C [2]. Coprecipitated cerium-zirconium oxide decreases the temperature of soot oxidation to 489^0C. Biomorphic CeO_2-ZrO_2 displays better results: 415^0C. We suppose the following factors to be responsible for catalytic activity of the samples: external surface and presence of modifying ions (K^+ and Ca^{2+}) in biomorphic sample, which promote catalytic oxidation of soot [1, new]. By external surface we understand the real surface of contact between soot and catalyst, which depends not only on the surface area, but also on the structure of the sample, its density and capability to destruct in order to provide better contact while been mixed in the mortar with soot. Comparing these properties we can conclude that biomorphic $Ce_{0.5}Zr_{0.5}O_2$ has 1.33 times higher value of surface area (72 m^2/g and 54 m^2/g for biomorphic and coprecipitated samples correspondingly), it is 34 times lighter, and thanks to its ash-resembling structure turns into dust been milled in the mortar, whereas particles of coprecipitated sample are solid and firm.

1. Xiaodong Wu, Dongxu Liu // Catalysis Communications. 2007. V. 8. P. 1274-1278.
2. Saab E., Abi-Aad E., Zhilinslaya E.A., Aboukais A. // Carbon. 2007. V. 45. P. 561-567.
3. Yuan An, Meiquing Shen // J. of Alloys and Compounds. 2007. V. 441. P.305-310