Effect of detonation nanodiamond surface chemistry on its catalytic properties

Kulakova I.I.*, Tveritinova E.A., Zitnev Yu.N., Lunin V.V.

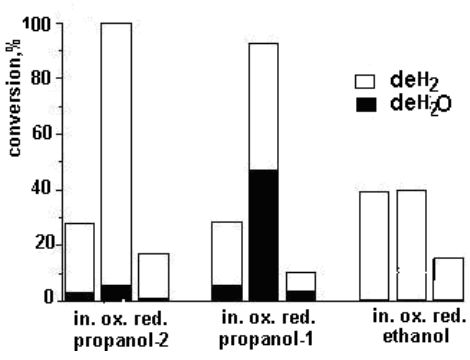
Lomonosov Moscow State University, Chemical Department 119991, Moscow, Russia
**e-mail : kulakova@petrol.chem.msu.ru*

Carbon materials used in catalysis, have usually graphite structure. Most often they are used as the supports of the active phase. Many researchers believe that the structure features formed by sp^2-carbon atoms contributes to the manifestation of their own catalytic activity. Indeed, in recent years the catalytic activity of various forms of nanocarbon (eg carbon nanotubes) has been identified and it has been found that the expression of the catalytic properties of such nanocarbon is due to the presence of certain functional groups on its surface [1].

Diamond materials with different structure, were not practically used in the catalysis before the appearance of detonation nanodiamond (ND). Data of the catalytic activity of the latter is extremely scarce. Chemical state of ND surface, as well as other carbonaceous materials, is determined by the conditions of their pre-treatment (modification) [2].

The aim of this study is to determine whether ND it has the catalytic activity and how the gas-phase pre-processing conditions will affect it. We chose a model reaction – the conversion of alcohols – to test of ND catalytic activity. The study was performed by the set of physicochemical methods: the pulse mikrocatalytic method, electron microscopy, optical (IR) and electron spectroscopy, elemental analysis.

We obtained data of ND catalytic activity in C_2-C_3 alcohols conversion, the products ratio through the dehydrogenation and dehydration as well as the effect on these parameters of pre-treatment conditions of ND and of alcohol nature (see, for example, the Figure at 330°C).



Thus, it was found that ND shows a significant catalytic activity and selectivity in conversion of alcohols. At the same air treatment (400°C, 5 h) increases its activity, whereas the hydrogen treatment (800°C, 5 h) reduces it.

[1] Figueiredo J.L., Pereira M.F.R., *Catalysis Today* **150**, 2 (2010).
[2] KulakovaI.I, Korol'kov V.V., Yakovlev R.Yu., Lisichkin G.V., *Nanotechnologies in Russia* **5**, 474 (2010).