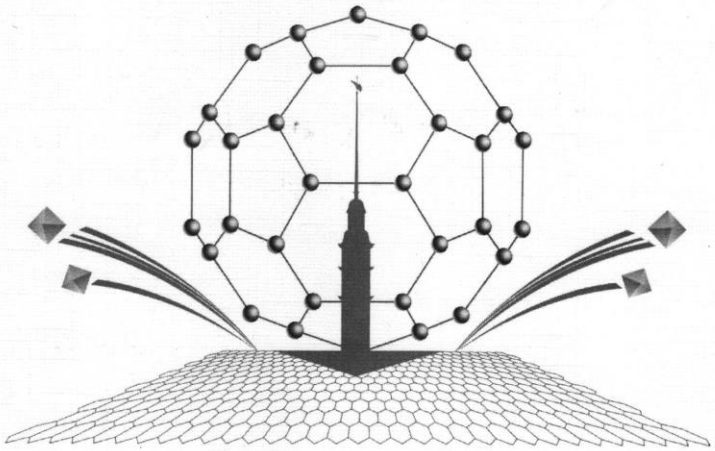
Book of Abstracts

14th International Conference

Advanced Carbon Nanostructures



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Effect of structure and oxidation state of carbon nanomaterials on the conversion of propanol-2

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It is known that catalytic dehydration of aliphatic alcohols is carried out on acid Lewis, and dehydrogenation - on basic Lewis centers. It is the catalytic conversion of alcohols that is usually used as a test reaction to the content of acidic and basic Lewis catalyst centers. Oxygen atoms in the composition of carbon nanomaterials (CNM) surface are mainly included in the carbonyl, carboxyl, anhydride, ethereal functional groups, which in catalysis play the role of Lewis acid and basic centers. The aim of this study was to identify the effect of oxidative treatment and the structure of carbon matrix on the formation of acid-base properties of CNM.

We used the following carbon nanomaterials: carbon nanotubes (CNT): cylindrical (CNTcyl) different degrees of oxidation and conical (CNTcon), nanodiamonds of detonation synthesis (ND). The study of the influence of the structure and degree of oxidation of CNM on their catalytic activity was performed by pulsed microcatalytic method. The formation of oxygen-containing surface functional groups occurred during the treatment of CNM with nitric acid for different times (table.) The test reaction was the conversion of propanol-2. The figure shows the obtained data on the selectivity of conversion depending on the nature of the carbon matrix and the oxygen content in the samples of UNM.

It was found that the catalytic activity of CNM (Fig.) is affected by their matrix structure and the content of oxygen surface groups. The conversion of propanol-2 on the way of dehydration goes on ND, whereas the dehydration goes mainly on CNTs. Comparison of the catalytic activity of CNM with approximately the same oxygen content, but with different carbon structure, showed that the activity of cylindrical CNTs (9.35% O2) exceeds the activity of conical CNTs (9.4% O2) and is significantly higher than the activity of ND (7.40% O2). The specific surfaces of cylindrical and conical CNTs are of the same order and equal to 249 and 204 m2/g, respectively. This fact indicates that, unlike ND, not only the surface functional groups of CNTS participate in the catalytic process, but also the sp2-carbon structure itself in the form of defects due to its curvature.

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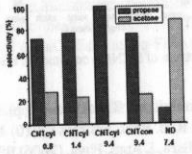

Conversion of propanol-2 on samples of CNM (oxygen content, % by weight. indicated on x-axis)