**Nanocomposites and nanomaterials**

**Synthesis and structure of carbon nanospheres in liquid phase**

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For the first time, methods for the synthesis of carbon nanospheres from liquid aromatic and halogenated saturated hydrocarbons by high-frequency plasma-chemical method have been developed. To modify and change the properties of carbon nanospheres, the functionalization of these nanomaterials by adding organometallic and metal-complex compounds to the initial liquid raw material has been proposed and practically implemented. Using liquid hydrocarbons (hexane, heptane, isooctane, toluene, bromethane) laboratory samples of carbon nanospheres, as well as nanospheres with implanted metals were developed [1].

The structure and nature of chemical bonds in the obtained carbon nanospheres were studied by IR, NMR and Raman spectroscopy, SEM and HRTEM microscopy. It is confirmed that individual particles of onion-like carbon consist of a nucleus of ~ 5 nm, surrounded by a graphite shell of 5-6 layers [2].

Experimental batches of additives for automotive fuels were made on the basis of synthesized carbon nanospheres. Road-operational tests of influence of the created additives on energy efficiency of motor fuels at work of engines of cars in various modes are carried out, reduction of fuel consumption under the influence of additives by 10 -15% is established.

1. *Haidai О., Pilyavski V*., *Shelud’ko Y., Polunkin Y*. Improvement of Performance Characteristics of Ethanol Motor Fuels Through Use of Additives Based on Nanoscale Carbon Clusters. EUREKA. *Physical Sciences and Engineering*. 2016. 6. 3-10.
2. *Rud A.D., Kuskova N.I., Ivaschuk L.I., Zelinskaya G.M. and Biliy N.M.* Structure state of carbon nanomaterials producedby high-energy electric discharge techniques. *//* Fullerenes, Nanotubes and Carbon Nanostructures. - 2011. -**19**, Is. 1-2. -P. 120-126.