

# Nanocomposites and nanomaterials

## Chemical modification of carbon fibre carriers of nano-scale metal catalysts

**T.M. Bezugla, L.M. Grishchenko, A.V. Vakaliuk**

*Taras Shevchenko National University of Kyiv, Volodymyrska Str., 60, Kyiv-01601, Ukraine.*

*E-mail: 2006bezugla@ukr.net*

The creation of nano-scale metal catalyst for heterogeneous process is of warm attention due to the remarkable properties that arise from special structure of such fine formations. Activated carbon fibres (CFs) are promising carriers for metal catalysts due to their high surface area and unique thermal and mechanical properties.

The catalytic activity of precious metals supported on carbon surface is highly dependent on the nature of surface functional groups present on the support. Previously it was shown that introduction of amine groups into carbon surface layer resulted in an increased proportion of Pd<sup>0</sup>, resistant to re-oxidation [1].

The work is focused on developing the methods and techniques for modification of CFs surface layer with N-containing groups.

Commercial Polyacrylonitrile-based carbon fibers ( $S_{\text{BET}}=950 \text{ m}^2/\text{g}$ ,  $V_s=0,19 \text{ cm}^3/\text{g}$ ) was previously brominated using liquid bromine and water solution of Br<sub>2</sub> / KBr. Obtained precursors were treated with alcoholic solutions of diethylamine (Et<sub>2</sub>N), ethanolamine (MEA), sulfolanyl ethylenediamine (SuEn), piperazine (Py) or ethylenediamine (En). The synthesized samples were investigated by chemical (CA) and thermogravimetric (TGA) analysis and temperature-programmed desorption mass spectrometry (TPD-MS).

Analysis of CA, TGA, TPD-MS data confirms obtaining CFs samples with up to 0.5 mmol/g of active bromine atoms in surface layer that are easily substituted by N-containing functional groups. Concentration of these groups weakly depends on the nature of the amine. Aminated CFs revealed to be rather thermally stable. According to temperature of desorption peaks the samples are ordered as follows CFs/Br<sub>2</sub>/MEA>CFs/Br<sub>2</sub>/Et<sub>2</sub>N>CFs/Br<sub>2</sub>/Py, CFs /Br<sub>2</sub>/En>CFs /Br<sub>2</sub>/SuEn.

A scheme of chemical transformations that occur in surface layer when CFs samples are brominated and aminated is proposed.

1. Radkevich V.Z., Senko T.L., Wilson K., Grishenko L.M., Zaderko A.N. Diyuk V.Y. The influence of surface functionalization of activated carbon on palladium dispersion and catalytic activity in hydrogen oxidation // Applied Catalysis A:

General. – 2008. – **335**, Iss.2. – P. 241-251.