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The structure-property relationship of polyaniline containing core-shell nanocomposites. Input of the core material.

A. Pud[1], N. Ogurtsov[1], Yu. Noskov[1], J-L. Wojkiewicz[2], S. Mikhaylov[1,2], G. Dudarenko[3] , and P. Coddeville[2]

[1] *Institute of Bioorganic Chemistry and Petrochemistry, NAS of Ukraine, 50 Kharkivske shose, Kyiv, 02160, Ukraine.*
E-mail: email of corresponding author: alexander.pud@gmail.com

[2] *Mines Douai, Département Sciences de l'Atmosphère et Génie de l'Environnement (SAGE), 941 rue Charles Bourseul, F-59508 Douai, France.*

[3] *Institute of Macromolecular Chemistry, NAS of Ukraine, 48 Kharkivske shose, Kyiv, 02160, Ukraine*

Looking at development and advances of science and applications of intrinsically conducting polymers (ICP) during last decade, one can say that main interests in this field are shifted to creation of new ICP based multifunctional materials being able to perform a few functions thus saving a lot of resources (human, material, financial). These materials can be used e.g. in various electrochromic, photovoltaic and sensor devices, as components of coatings for EMI shielding, antistatic and corrosion protection etc. As promising candidates in the matter we consider different hybrid core-shell (or host-gest) (nano)composites as they bear multifunctionality of both ICP and other components. Regardless on the preparation method (electrochemical, chemical, physical, solution or melting mixing) of these materials, there is a more or less significant mutual influence of the components. We discuss here on the example of the important ICP representative polyaniline (PANI) that during its synthesis in the dispersion polymerization medium, self-organizing interactions appear between the monomer, growing oligomer / polymer chains and the surface of the template particle/core (polycarbonate, carbon nanotubes, polyvinylidene fluoride, polyvinyl chloride, TiO_2, etc.). This results in formation of (nano)composite particles with a core-shell morphology. We discover that these interactions cause the changed morphology, structure ordering, increased molecular mass and specific properties of the formed PANI shell. In particular, we have found that PANI in the formed shells strongly differs by crystallinity degree, crystallite size, molecular mass and oxidation degree as compared with a pure PANI synthesized in absence of the template particles. We demonstrate some applications of the synthesized multifunctional (nano)materials.