Nanocomposites and nanomaterials

Enhancing stability and electrocatalytic reactivity of aniline-derived active matrix polymeric nanocomposites

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Active matrix nanocomposites attract significant attention due to their promising physico-chemical and optical properties. Of particular interest are hybrid polymeric materials based on aniline derivatives owing to superior conductivity and redox reactivity of such polymers. Being functionalized with embedded metallic nanoparticles or bimetallic core-shell objects such materials show improved performance toward target reaction, being suitable for low-temperature fuel cells, electrochemical sensors and organic semiconductor devices.

Numerous approaches has been proposed for obtaining such materials, including mixing preliminary obtained polymers and NPs, growing polymers around preformed NPs, forming NPs on organic templates, or single-step synthesis [1].

In our previous work, the polydiphenylamine-Ag nanocomposite was obtained as a result of *in situ* oxidizing polymerization of DPA in presence of silver NPs [2]. Computational studies show that the functional properties of the material are extremely dependent on dopant composition so even minor admixtures from the NPs preparation step may impact performance and stability. In present study, we reporting that the best results may be achieved with *in situ* synthesized NPs during matrix polymerization within a single step process, where geometrical parameters of the NPs may be adjusted via ultrasonic and thermal treatment.

1. *Jiaxing Huang* Syntheses and applications of conducting polymer polyaniline nanofibers // Pure Appl. Chem.-2006.- **78**, №1.-P. 15-27.

2. *Brazhnyk I.V., Vyshnevska Yu.P., Kudrya S.A., Rumiantsev D.V.* Synthesis, computational studies and characterization of polydiphenylamine nanocomposite with embedded silver nanoparticles // Int. Conference on Chem. and Chem. Education. “Sviridov Readings”-2015.- P. 60.