

Abstract

Sea Slag-Inspired Modification of Carbon Nanoparticles [†]Ekaterina A. Golovenko ^{1,2,*}  and Regina M. Islamova ^{1,*} ¹ Institute of Chemistry, St Petersburg State University, St Petersburg 199034, Russia² St Petersburg Academic University, St Petersburg 194021, Russia

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[†] Presented at the 1st International Online Conference on Biomimetics (IOCB 2024), 15–17 May 2024; Available online: <https://sciforum.net/event/IOCB2024>.**Keywords:** bioinspiration; carbon nanoparticles; Raman spectroscopy

It is well known that some living organisms use different adaptation mechanisms to survive and thrive [1]. One of the outstanding examples of adaptation are marine gastropod mollusks *Elysia marginata* and *Elysia atroviridis* (sea slugs) [2]. After being decapitated, these living organisms have an ability not only to survive but also to revive and grow again. These invertebrates inspire us to conduct a modification of carbon nanoparticles (CNPs) containing Csp²-hybridized carbons using cyclooligosiloxanes containing redox-active metallocenes. In the CNP modification, the cyclooligosiloxanes containing redox-active metallocenes at first lose some of their parts (cyclopentadienyl ring) in the presence of the catalytic mixture, and coordinate to a wall of CNPs. Then, these cyclooligosiloxanes undergo cationic ring opening polymerization catalysis by one of the components of the catalytic mixture, and a polysiloxane chain grows.

The successful modification of CNPs using (poly)siloxanes containing redox-active metallocenes was confirmed by means of Raman and X-Ray photoelectron spectroscopies and transmission electron microscopy. The modified CNPs have good compatibility with the polysiloxane matrix and an improved distribution in it.

In this mollusk-inspired modification of CNPs, along with the grafting of the polysiloxane chain on the surface of carbon nanotubes, we introduced redox-active centers on the surface of the CNPs. This, in turn, significantly broadened the application of the modified CNPs as promising components of electrochemical sensors, biosensors [3] and energy storage devices [4].



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