

ADSORPTION MODIFICATION OF NANODIAMONDS WITH TRITIUM-LABELED CATIONIC SURFACTANTS AND POLYSACCHARIDES

Wednesday, 13 July 2022 17:30 (20 minutes)

The radiotracer method is a powerful instrument for studying different physico-chemical processes for example adsorption. Using radiotracer technique allows to quantify tritium-labeled substances up to 10⁻¹⁴ mol. Tritium thermal activation technique allows protium substitution with tritium in almost any organic compound without significant changes in its chemical structure [1]. Nanodiamonds modified with biopolymers and antiseptic drugs are prospective modifiers of biocompatible materials [2].

We developed method of obtaining of tritium-labeled hyaluronic acid by tritium thermal activation with specific radioactivity of 52 GBq/g with preserved molecular mass distribution [3]. Method included unlabeled hyaluronic acid dialysis through membrane, hyaluronic acid lyophilization and tritium incorporation by thermal activation. The labeled hyaluronic acid was purified by dialysis that was being controlled by high-performance liquid chromatography.

With use of radiotracer technique with tritium-labeled compounds (alkyltrimethylammonium bromides, miramistin, chitosan, hyaluronic acid) we studied their adsorption on detonation nanodiamonds. We proposed mechanisms of formation of nanodiamond-sorbate complexes with different electrokinetic potential in water suspensions.

The double and triple complexes of nanodiamond with different sorbates under investigation are prospective for biomedical applications. For this purpose, the sorbates retention on nanodiamond was studied in different media including biological-alike media. Using tritium-labeled compounds allowed confident quantification of substances desorbed from nanodiamonds surface and substances adsorbed on nanodiamond surface even in biological-alike media.

Complexes nanodiamond-miramistin-chitosan and nanodiamond-miramistin-hyaluronic acid were obtained and characterized for the first time.

1. Badun G.A. Chernysheva M.G., Ksenofontov A.L. Radiochim. Acta. 100, 401 (2012).
2. Chernysheva M.G. et al. Fullerenes Nanotubes and Carbon Nanostructures. 28(4), 256 (2020).
3. Chernysheva M.G. et al. Colloids Surfaces A: Physicochem. Eng. Asp. 565, 25 (2019).

The speaker is a student or young scientist

Yes

Section

1. Applications of nuclear methods in science and technology

Primary authors: SINOLITS, Artem (Lomonosov MSU); CHERNYSHEVA, Maria (Lomonosov Moscow State University); Mr BADUN, Gennady (Lomonosov Moscow State University)

Presenter: SINOLITS, Artem (Lomonosov MSU)

Session Classification: Applications of nuclear methods in science and technology