

SELENIUM AND SODIUM ALGINATE NANOCOMPOSITES PRODUCING AND PROPERTIES

Panov D. A.

*V. I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russian Federation
E-mail: panovda@crimea.edu*

The selenium as microelement is indispensable for human life since it participates in various biochemical processes and is a strong antioxidant, increases immunity, reduces the risk of cardiovascular disease, and is part of some enzymes. The products of Russians in most regions are poor in selenium, so the resulting highly dispersed nanoselenium with a particle size of less than 40 nm, which has a low toxicity, is recommended to be eaten as a biologically active additive. One of the promising methods of obtaining aggregate-resistant nanoparticles is the reduction of selenium from the ionic forms in presence of polymer solutions, and natural biopolymers – polysaccharides of marine algae with a wide range of biological activity, which used for colloid stabilization.

The purpose of this work was to study the physico-chemical properties of sodium alginate from various manufacturers (Germany, Norway and the USA) and its influence on the formation and stability of selenium nanoparticles, determination of the selenium nanoparticles sizes in the alginate matrix using scanning electron and atomic force microscopy.

Based on measurements of the optical density, pH and viscosity of nanoselenium colloidal solutions, it has been found that the best stabilizer among the alginates of various manufacturers is the biopolymer produced in Norway (BioPolymer). The obtained nanobiocomposites are sufficiently stable for 20–25 days.

Scanning electron and atomic force microscopy revealed that the obtained nanoparticles of the selenium in the sodium alginate matrix had an average diameter of 34 nm (52%).

To determine the toxic properties, biotest on luminous bacteria (*Photobacterium leiognathi* Sh1) was used. The obtained data testify to the absence of toxic properties at obtained selenium nanoparticles in the matrix of sodium alginate.

The synthesized water-soluble nanobiocomposite was used for presowing treatment of wheat seeds. It was found that this preparation stimulated the accumulation of the biomass of the roots and the aerial part of the plant as compared to the control samples.

Keywords: nanoselenium, sodium alginate, L-cysteine, atomic force and scanning microscopy.

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