

Inga ZINICOVSCAIA^{1,2,3*}, Liudmila RUDI⁴, Ana VALUTA⁴, Liliana CEPOI⁴
Konstantin VERGEL¹, Marina V. FRONTASYEVA¹, Alexey SAFONOV⁵
Markus WELLS⁶ and Dmitrii GROZDOV⁷

BIOCHEMICAL CHANGES IN *Nostoc linckia* ASSOCIATED WITH SELENIUM NANOPARTICLES BIOSYNTHESIS

BIOCHEMICZNE ZMIANY W *Nostoc linckia* ZWIĄZANE Z BIOSYNTEZĄ NANOCZĄSTEK SELENU

Abstract: The cyanobacterium *Nostoc linckia* was used to study the biotechnology of selenium nanoparticles synthesis for the first time. The experimental conditions of the nanoparticle production by the studied cyanobacteria in aqueous cobalt selenite solutions were examined. Neutron activation analysis allowed characterization of the dynamics of accumulation of the total selenium quantity by *Nostoc linckia*. Scanning Electron Microscope images demonstrated extracellular formation of amorphous nanoparticles. Released selenium nanoparticles ranged in size from 10 to 80 nm. The changes of essential parameters of biomass (proteins, lipids, carbohydrates, and phycobilin) content during the nanoparticle formation were assessed. During the first 24 h of nanoparticle synthesis, a slight decline of proteins, lipids and carbohydrates content in the biomass was observed. The most extensive was the process of phycobilin degradation. Furthermore, all biochemical component content as well as an antioxidant activity of the biomass extracts significantly decreased. The obtained substance of *Nostoc* biomass with selenium nanoparticles may be used for medical, pharmaceutical and technological purposes.

Keywords: selenium, nanoparticles, *Nostoc linckia*, optical and analytical methods, biochemical analysis

Introduction

The research in the field of nanotechnology has been stimulated by large technological and medical applications of nanoparticles [1]. Selenium possesses excellent photoelectrical and semiconductor properties, which make it extensively used in the production of

¹ Joint Institute for Nuclear Research, 6 Joliot-Curie Str., 1419890, Dubna, Russia

² Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, 30 Reactorului Str. MG-6, Bucharest - Magurele, Romania

³ The Institute of Chemistry of the ASM, 3 Academiei Str., 2028 Chisinau, Moldova

⁴ Institute of Microbiology and Biotechnology of the Academy of Science of Moldova, 1, Academiei Str., 2028 Chisinau, Moldova

⁵ A.N. Frumkin Institute of Physical Chemistry and Electrochemistry RAS, 117342, Obrucheva, 40, Moscow, Russia

⁶ Georgetown University, 3700 O St., D.C. 20057, N.W. Washington, USA

⁷ Vernadsky Institute of Geochemistry and Analytical Chemistry of Russian Academy of Sciences, Moscow, Russia

*Corresponding author: zinikovskaia@mail.ru