Serbian Biochemical Society
Seventh Conference

"Biochemistry of Control in Life and Technology"

Proceedings

Faculty of Chemistry
Belgrade 2017

Serbian Biochemical Society

Proceedings

Editor: Ivan Spasojević
Technical secretary: Jelena Nestorov
Cover design: Zoran Beloševac
Publisher: Faculty of Chemistry, Serbian Biochemical Society
Printed by: Colorgrafx, Belgrade

Serbian Biochemical Society
Seventh Conference

with international participation

Faculty of Chemistry, University of Belgrade
10.11.2017. Belgrade, Serbia

"***Biochemistry of Control in Life and Technology***"

The influence of coated nanoCeO$_2$ on the phenol content in wheat and pea

Ivana Milenković[1*], Manuel Algarra[2], Slađana Spasić[1], Aleksandra Mitrović[1], Vladimir Beškoski[3], Ksenija Radotić[1]

[1]*Department of Life Sciences, Institute for Multidisciplinary Research, University of Belgrade, Belgrade, Serbia*
[2]*Department of Inorganic Chemistry, Faculty of Sciences, University of Málaga, Málaga, Spain*
[3]*Department of Biochemistry, Faculty of Chemistry, University of Belgrade*

[*]*e-mail:ivana.milenkovic@imsi.rs*

The use of nanomaterials in various commercial products and industrial processes has increased. Although the application of nanoparticles has great importance, some of them can be risky to human health and the environment. The unregulated usage of nanoparticles can result in excessive accumulation in sediments, soils, air and aquatic environments, endangering terrestrial plants [1].

Cerium oxide nanoparticles (nanoCeO$_2$) have been extensively investigated due to the excellent oxygen storage capacities on the basis of the redox transition between Ce^{3+} and Ce^{4+} and formation of oxygen vacancies on their surface [2]. The effect of nanoCeO$_2$ on individual organisms and the ecosystem in general are not sufficiently explored and the literature on the toxicity of nanoCeO2 in edible plants is contradictory. NanoCeO$_2$ is very stable in soil and different environmental media and has been found to transfer within plant tissues unaltered. It is very likely that it interacts with plants in nanoparticulate forms [3].

In this research we used CeO$_2$, naked and coated with three different carbohydrates (glucose, pullulan or levan), to study their effect on phenol content, as an important indicator of plant stress [4,5], in aboveground plant organs in wheat and pea. NanoCeO$_2$ was synthetized using self-propagating room temperature method by the procedure of Matović et al [6]. NanoCeO$_2$, synthesized by this method, was subsequently coated to make glucose-, levan- and pullulan-coated nanoCeO$_2$ (G-CeO$_2$, L-CeO$_2$ and P-CeO$_2$). Suspensions of these nanoparticles (200 mg/L) were prepared in water, and characterized by X-ray diffraction (XRD) and transmission electron microscopy (TEM). After the treatment the aboveground parts of plants were cut off and phenols were isolated by the procedure [7].

The physiochemical properties of the synthesized nanoCeO$_2$ were analyzed using XRD and HRTEM methods. The XRD patterns of obtained nanoCeO$_2$ are shown in Figure 1. Samples exhibited typical peaks corresponding to planes which are the typical of face centered. All samples showed broad peaks, explained due their synthesis procedure at low temperature, but no shift was found following synthesis and coating process.