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APPLICATION OF $CoFe_2O_4$/PEG NANOCOMPOSITE AS A PEROXIDASE MIMETIC IN THE COLORIMETRIC DETECTION OF GLYPHOSATE

Tatiana Gutsul, Andrei Sirbu, Maria Lupu, Anatolie Sidorenko
Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies,
Academiei str., 3/3, Chisinau, Moldova

The technological revolution in agriculture, along with the achievements of obtaining high yields, has led to the use of huge amounts of herbicides. One of the widely used herbicides is glyphosate, the so-called "chemical weeding". Glyphosate is a broad-spectrum organophosphorus herbicide, which causes plant death by inhibiting the activity of 5-enolpyruvylshikimate-3-phosphatase in an important plant metabolic pathway. Currently, the abuse of glyphosate has led to contamination of soil, water and agricultural products. Recent studies have shown that glyphosate can affect the internal regulation of cells, cause chronic kidney disease and even cause cancer. The US Environmental Protection Agency (EPA) has issued relevant standards providing for a maximum limit of glyphosate residues in agricultural products and it is 500 μg/kg [1]. Thus, the search for new herbicide detection systems is an urgent task.

Recently, a new class of artificial enzymes, the so-called nanosimes, has been proposed – these are nanomaterials with their own enzyme-like activity, they are able to combine both the catalytic properties of enzymes and the properties of nanoscale materials. Due to these advantages, methods based on the catalytic activity of nanoparticles with mimetic properties of enzymes, in particular of peroxidase, such as palladium nanoparticles, porous nanostructures of cobalt oxide and others, are being developed, they are successfully used to detect pollutants in the environment [2, 3]. In the presented work, cobalt ferrite nanoparticles stabilized with polyethylene glycol were synthesized by the solvathermal method, the $CoFe_2O_4$/PEG nanocomposite was created on their basis, and identification by various SEM, EDX, XRD, and FI-IR methods was carried out. The peroxidase-like activity of the resulting $CoFe_2O_4$/PEG nanocomposite was studied, which makes it possible to use this catalytic process for the detection of glyphosate. A method for the determination of glyphosate was developed on model aqueous solutions and it was shown that the minimum detectable concentration is 0,13 μM. It was shown that the nanocomposite $CoFe_2O_4$/PEG has the property of mimetic enzyme peroxidase and can be used to detect glyphosate.

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Corresponding author: JRS Tatiana Gutsul
UTM, Institute of Electronic Engineering and Nanotechnologies “D. GHITU”
Academiei 3/3, Chisinau MD-2028 Moldova
e-mail: tatiana.gutsul@iien.utm.md
ORCID: 0000-00012-6528-285X