# COMPARISON OF WHEAT AND CORN-DERIVED BIOCHAR AS MODIFIERS OF CARBON PASTE ELECTRODE FOR VOLTAMMETRIC DETERMINATION OF CARBENDAZIM

Sanja Mutić[1*], Jasmina Anojčić[1], Nina Đukanović[1], Tamara Apostolović[1], Tijana Marjanović Srebro[1], Jelena Beljin[1]

[1] *University of Novi Sad, Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Trg Dositeja Obradovića 3, Novi Sad, Serbia, sanja.mutic@dh.uns.ac.rs**

## Abstract

*Revealing the different types of biomass as low-cost resources with high availability is a way of exploring biochar (BC) potential for environmental waste management. BC, as a versatile and sustainable solution, can deal with various environmental pollutants, such as pesticides, in different environmental samples. The corn (CBC) and wheat (WBC)-derived biochars were synthesized at two pyrolysis temperatures, 400 °C (BC400) and 700 °C (BC700), and characterized using scanning electron microscopy (SEM). The effect of pyrolysis temperature on BC surface structure was recognized by the distinct difference in the morphology of CBC and WBC. Observed properties of the synthesized BCs led to a possibility for good electrocatalytic properties, which consequently are considered as possible material for modification of carbon paste electrode (CPE) comprised of graphite powder and paraffin oil. The electrochemical performance of the prepared BC-CPEs was evaluated by electrochemical impedance spectroscopic (EIS) and cyclic voltammetric (CV) measurements of the redox couple $[Fe(CN)_6]^{3-/4-}$. BC positively affects the electrochemical performance of the electrodes, which is attributed to an increase in the current intensity of the redox peaks, and to better reversibility due to the higher electron transfer rate. The electrochemical response is influenced by used modifiers in depending of conductivity of the electrode surfaces, and the WBC700-CPE produced the lowest peak separation value and the highest peak currents of redox probe compared to the unmodified CPE, CBC400-CPE, CBC700-CPE and WBC400-CPE. The observed electrochemical behavior of designed BC-modified CPEs suggests the ability to detect electroactive analytes such as broad-spectrum fungicide carbendazim (methyl-1H-benzimidazol-2-yl-carbamate, CBZ) deemed as a persistent organic pollutant. CV experiments showed that CBZ exhibits an irreversible behavior with a well-defined oxidation peak around 0.9 V at pH 5.0. Among the tested working electrodes for CBZ sensing, WBC700-CPE showed the most favorable interactions with the target analyte. The obtained results emphasize the enormous potential and bright future of WBC700-CPE with good catalytic activity and electron transfer ability for sensitive electroanalytical determination of CBZ in food and various environmental samples.*

**Keywords:** *persistent organic pollutant, carbendazim, electrochemical sensor, carbon paste electrode, biochar, voltammetry.*

***Acknowledgment:*** *This research was supported by the Science Fund of the Republic of Serbia, #10810, Sustainable solutions in environmental chemistry: exploring biochar potential–EnviroChar.*