

# ARTIFICIAL NEURORECEPTORS BASED ON ELECTROPOLYMERIZED MOLECULARLY IMPRINTED CONDUCTIVE POLYMERS

Elena Nedzinskaitė<sup>1</sup>, Šarūnas Žukauskas<sup>1,2</sup>

<sup>1</sup>Centre for Physical Sciences and Technology

<sup>2</sup>State Research Institute Centre for Innovative Medicine

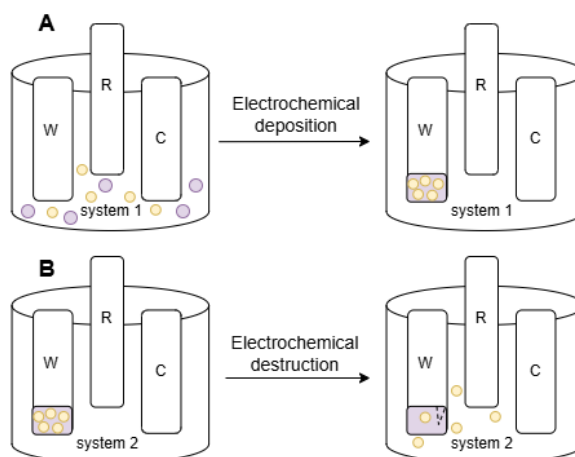
[elena.nedzinskaite@ftmc.lt](mailto:elena.nedzinskaite@ftmc.lt)

Selective detection of neurotransmitters remains a significant challenge in electrochemical sensing. Dopamine and serotonin are key neurotransmitters involved in motor control, mood regulation and neurological disorders such as Parkinson's disease and depression. Although both molecules are electrochemically active, their selective detection is complicated by interference from other electroactive species and by electrode fouling in complex biological environments.

In this work, an artificial neuroreceptor concept based on molecularly imprinted polymers combined with conductive polymers is investigated for the recognition of dopamine and serotonin. Molecular imprinting enables the formation of selective binding sites for target neurotransmitters, while the conductive polymer matrix allows the conversion of molecular recognition events into measurable electrical signals. This approach aims to mimic key features of biological neuroreceptors using stable and reproducible synthetic materials.

Molecularly imprinted polymer layers were electrochemically synthesized on electrodes using monomers as the conductive matrix, with dopamine or serotonin acting as template molecules. Non imprinted polymer layers were prepared under identical conditions and used as reference systems. The imprinting effect and selectivity were evaluated using voltammetric methods by comparing the responses of imprinted and non imprinted electrodes.

The developed system serves as a simple and low cost model for selective dopamine and serotonin recognition. Such artificial neuroreceptors may be useful for neurotransmitter related studies, including disease models and sensor development, and could be further adapted for electrochemical sensing and bioelectronic applications.



**Fig. 1.** Schematic illustration of electrochemical polymerization and neurotransmitter release. A) Potential deposition of the conductive polymer in the presence of neurotransmitter results in neurotransmitter-loaded films. B) Application of amperometric destruction causes polymer oxidation, triggering neurotransmitter release into the surrounding electrolyte. Yellow – neurotransmitters, purple – monomers.