

Sensorial Activity Determination of the Human Catechol-*O*-Methyl Transferase at Fluorine Doped Tin Oxide †

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Morbus Parkinson belongs to the most frequent disorders of the central nervous system. The loss of dopamine-producing cells causes a lack of the neurotransmitter dopamine in the brain. This deficiency results in progressive movement disorders - typical symptoms of Parkinson's disease (PD). Due to the central role of dopamine in the catecholamine metabolism numerous enzymes are regulating its concentration, for example the catechol-*O*-methyl transferase (COMT). The treatment of PD is based on the regulation of the COMT activity by administration of COMT inhibitors (entacapone, tolcapone). For a personalized medication the observed change of the PD symptoms should be complemented by direct measurements of enzyme activity.

Here, the determination of the enzyme substrate dopamine was performed by differential pulse voltammetry (DPV). By the applied electrode material fluorine doped tin oxide (FTO) a clear discrimination between the substrate dopamine and the conversion product methoxytyramine is possible [1]. A linear dependency of the dopamine oxidation signal on the concentration in the range of the maximum reaction rate of the COMT and a high signal stability during consecutive measurements allow a reliable sensor construction. Even though none of the individual essential assay components induces a current signal at the FTO electrode, in the complete activity assay the dopamine oxidation signal was influenced by each added ingredient. After adjustments of the DPV potential range and changes of the assay composition a reproducible determination of dopamine concentrations in the assay can be achieved. Investigations with COMT captured on agarose beads demonstrate clearly the dependency of the voltammetric dopamine signal on the substrate incubation time with the enzyme. Furthermore, the signal change correlates clearly to the activity of bound enzyme, indicating that enzyme action can be followed by electrochemical means and demonstrating the suitability of FTO as electrode material for activity detection of the COMT via DPV.

References

1. Göbel, G.; Talke, A.; Lisdat, F. FTO—an Electrode Material for the Stable Electrochemical Determination of Dopamine. *Electroanalysis* **2018**, *30*, 225–229.



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