



Oxidation Mechanism of Dopamine and Serotonin Using Cyclic and Square-Wave Voltammetry

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Dopamine and serotonin are main neurotransmitters that maintain excellent mental wellbeing and regulate physiological functions in human tissues. Oxidation of both neurotransmitters is of great importance in understanding their mechanisms of actions in the human body. This scientific study reveals the most probable oxidation mechanisms of these neurotransmitters in simulated physiological conditions (phosphate buffer with $pH = 7.4$) using voltammetric techniques (cyclic and square-wave voltammetry).

Results were obtained using several commercial unmodified electrodes, glassy carbon electrode (GC), platinum electrode (Pt), basal plane pyrolytic graphite electrode (BPPG) and gold electrode (Au) and compared with the literature^{1,2}. Different electrodes gave distinctive voltammetric signals, with slightly better results on both carbon electrodes. Using both techniques and scan rate (frequency in SWV) analysis, both oxidation mechanisms were discussed and explained in terms of the recently proposed ECE mechanism (dopamine)² and ECEC mechanism (serotonin)³. Furthermore, fitting the experiments with theoretical simulations, we were able to find several values for key parameters of the proposed mechanisms.

Keywords: dopamine, serotonin, cyclic voltammetry, square wave voltammetry, electrodes.

References:

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