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# Molybdenum oxide nanoparticles for the sensitive and selective detection of dopamine

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**Abstract**

Molybdenum oxide nanoparticles ($MoO_x$ NPs) were successfully prepared by the pulsed laser ablation technique in water. Picosecond pulses allowed synthesizing chemically and morphologically stable $MoO_x$ colloidal nanoparticles dispersed in water, which are used to fabricate modified screen printed carbon paste electrode (SPCE). The molybdenum oxide nanoparticles modified electrode ($MoO_x$ NPs/SPCE) shows enhanced electro-catalytic behavior for the detection of dopamine in Phosphate Buffered Saline (pH = 7) solution. Under the optimal conditions, the peak current of dopamine increased linearly with the concentration in the 0.1-600 μM range, with a limit of detection (LOD) of 43 nM. The very easy $MoO_x$ NPs/SPCE fabrication, its high sensitivity, sub-micromolar detection limits and excellent selectivity towards main interferents, made them as a potential candidate for the detection of dopamine in pharmaceutical and clinical preparations.

**Keywords**: Molybdenum oxide nanoparticles, Pulsed Laser Ablation, Electrochemical sensors, Dopamine.

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## *1.* Introduction

Synthesis and engineering of metal oxide nanoparticles is a hot topic today because they find applications in a multitude of fields due to their unique properties as compared with their bulk counterparts. One example in the field of analytical chemistry devoted to biomedical diagnostics is the development of high performance electrochemical sensor for the determination of biologically relevant molecules, such as dopamine (DA) [1].

DA is an important neurotransmitter of the catecholamine class, which controls human physiological functions such as emotion, endocrine regulation, and locomotion. Further, abnormal levels of dopamine result in serious neurological disorders such as Parkinson's disease and