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Development of magnetic nano molecular imprinted polymer (MIP) electrochemical sensors based on polymers prepared by the "Core Shell grafting-from" approach and their application in bioanalysis

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Background and Aims: The application of Molecular Imprinting to the development of novel electrochemical sensors is of great interest for both academic and industrial worlds for different reasons, Due to their high stability (even in harsh environments), low cost and selectivity, on the other hand electrochemical transduction may ensure great sensitivity, robustness and reduced costs. The aim of this project was the study of Incorporation of Core Shell MIPs into Magnetic Nanoparticles as a way to improve integration between transducer and sensing element which would result in better analytical performances of sensors in bioanalytical applications (e.g. detection of serotonin) with use of robust, reproducible devices in fast screening methods.
Methods: Magnetic Nanoparticles (NPs) were prepared, and were functionalised with RAFT (Reversible Addition Fragmentation Chain Transfer) agent. Bulk and Core Shell Graft form approch were utilized for Serotonin MIP synthesis, and optimized template, monomer and solvents were found. Characterization methods such as TGA, BET, FTIR, XPS, TEM, SEM, HPLC and rebinding test were done on Nano Magnetic MIPs. Furtheremore, NPs were deposited on the surface of different substrates and electrochemical sensore and their application in Bioanalysis were optimized.
Results: Magnetic NPs were successfully prepared. Desirable characters of NPs and MIP NPs were confirmed by characterization methods. According to rebinding test, Magnetic Nano MIPs showed better results comparing to Bulk polymers. Gold substrate applied as electrode deposited by Magnetic nanopaticles had better electrochemical behavior and could be applied in bioanalytical applications

Keywords: Molecular imprinting; Magnetic Nanoparticles; Electrochemical sensor; Bioanalysis