Molecularly imprinted polymer on glassy carbon and graphene surface for electrochemical detection of Isoproturon

Imer Sadriu[1,2]
Jimmy Nicolle[1]
Christine Vautrin-Ul[1]
Fetah Podvorica[2,3,4]

[1]*ICMN Interfaces, Confinement, Matériaux et Nanostructures, UMR7374 – Université d'Orléans, France*
[2]*Chemistry Department of FMNS, University of Prishtina, rr. "Nëna Tereze" nr. 5, 10000 Prishtina, Republic of Kosovo*
[3]*Academy of Sciences and Arts of Kosova, Rr. "Agim Ramadani" nr 305, 10000 Prishtina, Republic of Kosovo*
[4]*NanoAlb-Unit of Albanian Nanoscience and Nanotechnology, 1000 Tirana, Albania*
imersadriu01@gmail.com; imer.sadriu@cnrs-orleans.fr;

Molecularly imprinted polypyrrole (MIP) film containing isoproturon (ISO) were made first onto glassy carbon (GC) and then on pure electrochemical graphene deposited on polystyrene. The electrochemical preparation procedure included two steps: electropolymerization of pyrrole performed by cyclic voltammetry and chronoamperometry where ISO template molecules were successfully trapped in the PPy film. After the electrochemical extraction of the template, the PPy film acted as a MIP for the selective recognition of ISO whereas the non-imprinted polymer (NIP) film, made in the same conditions except for the presence of targeted molecule, did not exhibit any interaction. ISO-MIPPy films made on GC electrodes were found to selectively detect ISO. Its limit of detection (LOD) in milli Q water, achieved via square wave voltammetry was as low as 0.5 µg L^{-1}, whereas in real water samples it was found to be 2.2 µg L^{-1}. In a second part, an original method for elaboration of 100% graphene electrodes has been developed. It is based in electrochemical exfoliation of graphene at negative potentials in a single step and then the electrodes were prepared by temperature compression of graphene on a polystyrene substrate. Electrochemical properties of these electrodes were evaluated using redox probes. XPS, Raman, IR methods and four-point probe conductivity measurements are used to finely characterize the surface chemistry and nanostructure of graphene electrodes. Finally, the electropolymerization of ISO-MIPPy films has been successfully carried out onto graphene and their potential for the determination of ISO in water has been demonstrated.

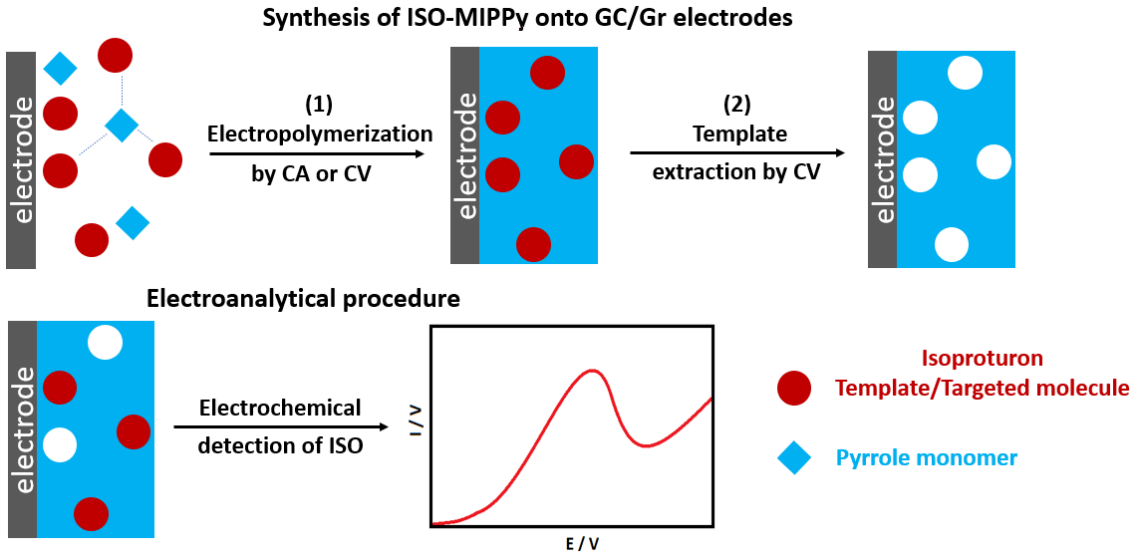

Figure 1: Schematic representation of the procedure used for the preparation of ISO-MIPPy films onto GC and Gr electrodes, including two steps: 1) electropolymerization of MIPs by CA and/or CV, and 2) the CV extraction of ISO molecules. Both electrodes were tested for electrochemical detection of ISO.

References

[1] I. Sadriu, S. Bouden, J. Nicole, F. Podvorica, V. Bertagna, C. Berho, L. Amalric, C. Vautrin-Ul, *Talanta.* 207 (2020) 120222.