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In the last 20 years scientific publications, the number of researchers and research & development activities in the field of senzors increased exponentially worldwide. This trend went hand in hand with the amount of investement in the area.

Molecularly imprinted polymers (MIP) function similarly to several natural detection systems, such as the nasal mucosa or the oral cavity, that follow the key-lock principle. In this respect, the sensitive layer of the optic sensor can be adapted by using a molecularly imprinting technique, in order to „sniff" selectively the target drugs. MIPs will be synthesized directly on the gold thin layer of the SPR sensor by 2 procedures: direct deposition of the synthetic layer on the convex gold surface, and grafting MIP on the previously functionalized gold surface.

Biomimetic sensors will be used on site by the authorities in order to provide enough information for routine testing and transportation screening. The main advantages of using drug sensors refer to their versatility and the cost to efficiency ratio, and more importantly to the short response time that allows for rapid legal actions on site, meant to prevent the traffic and consumption of illicit substances. Apart from its reduced cost, the new sensor will have an extended lifetime due to the synthetic polymer, it will offer the continuous monitoring and will be reusable.

The preparation method by phase-inversion for ephedrine thin films did not encounter difficulties regarding the tunability of reological parameters. However, the qualitative and quantitative analyses deemed this method unfit for the template (ephedrine) due to its water solubility. Implicitly, the template leaks out of the polymeric thin film before the phase-inversion takes place, thus preventing the imprentation from happening.

Structural analysis of molecularly imprinted polymeric films deposed by means of a sol-gel technique, emphasize a significant difference against the width of the deposed film, aspect confirmed by the morphological analysis by SEM. Optic studies reveal the high transparency of the films, together with refractive properties similar to those of normal glass (n is close to 1.5), which indicates their potential use in the surface plasmon resonance method. For this reason, the deposition on optic fiber was tried out (to be further used as a sensor in the SPR module) with a modified composition. The dilution lead to smaller widths of the film, as the optic measurements show (widths are <500 nm compared to 2-3 μm, as SEM analysis shows);

however the SEM analysis also revealed the presence of several bubbles on the surface, posing questions on the homogenity of the said films. This aspect would be studied in detail in the following stages of the project. Preliminary adsorption measurements for ephedrine solutions showed that the 2-3 μm films specifically adsorb the target ephedrine chlorhidrate molecule out of solution.

In the sol-gel method the predominant factor is the monomer concentration, that leads to significant structural modifications, as well as width and morphological ones. However, one could say that this method presents with a high potential for generating imprinted films with high adhesion and tunable width. The final synthesis method would be decided upon in the future stages of the project, as more tests of the obtained materials are realized.

The value of the imprinting factors over 1 indicated the specificity for Epi Cl of the MIP (MIP Cl measured after 2.5 h, 5 h and MIP Na measured after 5h) with respect to the non-imprinted polymer (NIP), that gives a non-specific adsoption. The maximum value of 2.1 is of notable interest, proving the efficiency of this imprinting method for the recognition and adsorption of ephedrine from ephedrine salts.