Convergence of Molecularly Imprinted Polymers and Electrospinning Technologies to Design Advanced Selective VOCs sensors

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Abstract
Molecular imprinting technology (MIT) has been broadly used to design highly selective sensors [1] by a low-cost synthesis procedure and as a robust alternative to biomolecules, such as antibodies and enzymes, thanks to its ability to bind the target molecules with high affinity and specificity.
The combination of MIT with electrospinning (ES) technology [2], by achieving nanofibrous mats with remarkable specific surface area and high porosity, is expected to provide effective sensing architectures for pollutants detection [3], having the advantages of both the technologies. However, the integration of these two technologies has proven to be quite ambitious, mainly due to the different processing methodologies which characterize the two approaches.
Here, two successfully strategies to design ES-MIP based conductive sensors will be described: i) molecular imprinting during the electrospinning process and ii) dispersion of MIP nanoparticles (MIP NPs) into/onto electrospun nanofibers (MOSSA Project, Italy).
Monoterpenes (biogenic volatile organic compound - BVOCs) have been selected as template, since precursor of ozone and aerosols that influence air quality and climate. UV-crosslinked-PVP (polyvinylpyrrolidone) and polyacrylic acid (PAA)/methacrylic acid (MAA) have been used as carrier polymer and cavity makers, respectively, limonene and linalool as template molecules, and MWCNT as conductive fillers.

References
[1] Kadhem AJ., et al. Molecules 26(20) (2021): 6233.
[2] Patel KD., et al., Advanced Functional Materials 30 (32) (2020): 2001955
[3] A. Macagnano, et al., Electrospinning for high performance Sensors, 2015, Springer

Figure

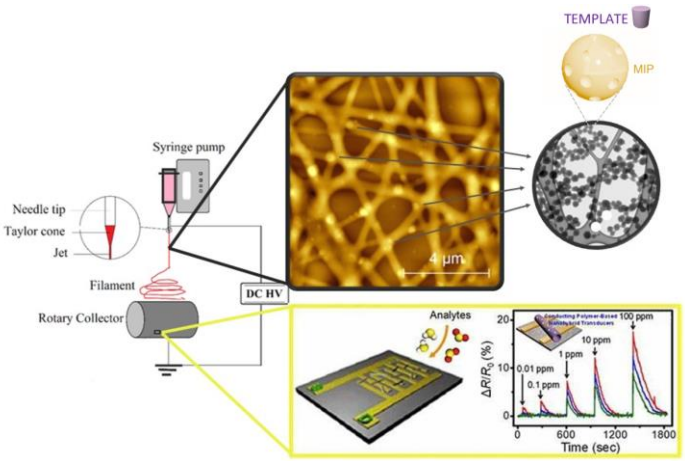

Figure 1: Layout of the strategy II based on dispersion of MIP nanoparticles (MIP NPs) into/onto electrospun nanofibers to design conductive sensors selective to pollutants