Flexible strategy to design selective sensors for gaseous markers (MOSSA Project)

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Sensing technologies have improved the daily life of humans in many applications in almost all fields. Sensors can be distinguished into two categories, depending on the target: highly specific sensors (for physical parameters or chemical substances) and sensor arrays based on nonspecific but selective sensors (when groups of molecules associated with a single target need to be detected simultaneously to get information on it, like in e-noses). Electrospinning (ES) has been demonstrated to be one of the best nanotechnologies for designing and developing smart and ultra-sensitive sensing systems, both for the properties of the resulting nanostructures and for the production rate and cost. Hence, ES has also been exploited to design sensors of both categories for various applications in biomedicine, environment, food, agriculture, cultural heritage, security and safety, and control of industrial and production processes. The further combination of ES with other nanotechnologies, although challenging for mixing different processing methodologies, may result in additional improvements in “on-demand” sensor development and increased tunable selectivity and sensitivity. Recently, the molecular imprinting technology (MIT) has been combined with ES to design very selective sensors (MIT/ES-sensors) for volatile biomarkers (BVOCs) released by plants (e.g., terpenes) under abiotic (drought, UV, and pH) and biotic (phytopathogens and parasites) stress conditions. Briefly, the combination of the excellent selectivity of MIPs, due to their recognition mechanisms similar to those of biological receptors, and the ability of ES technology to produce diverse forms of fibrous assemblies with excellent specific surface area and high porosity, have contributed to developing high-performance sensors capable of discriminating stereoselective compounds, which are typical biomarkers of plant stress conditions (POR-FESR 2014-2020-MOSSA Project). These results open the perspective for creating BVOC MIT/ES sensors for a multitude of applications, including plant and ecosystem health monitoring systems.