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Molecularly imprinted micro- and nano-materials for direct protein MALDI-TOF MS analysis

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Molecularly imprinted polymers (MIPs) are a class of tailor-made biomimetic materials, made by a template assisted synthesis and suitable for the recognition of target analytes, including peptides and proteins, with reported affinities and selectivity of the par of natural antibodies. With the aim to develop flexible analytical platforms performing high sensitivity and selectivity measurements, suitable for multi-biomarker determinations, the integration between the biomimetic MIPs and MALDI-TOF mass spectrometry (MS) was studied. Libraries of micro and nano-MIPs, including responsive MIP-materials, addressed at both peptide- and protein-biomarker were synthesized, characterized and coupled to MALDI-MS. The analytical performance and the extent of the applicability of the MIP/MALDI-MS was studied by challenging the system with selected biomarkers, present in serum at concentrations spanning from the nano- to the pico-molar, but bearing different characteristics in size, folding and complexity. Results indicate the coupling of micro and nano-MIP materials to MALDI-MS indeed generates rapid and highly sensitive detection methods. As MIPs are suitable “baits” for the general development of flexible platforms for the analysis of molecular biomarkers of clinical interest, MIP/MALDI-MS foreseen applications span from the global evaluation of the health status of patients, to functional proteomic research, letting envisage multiple domains of interest.

Biography

Alessandra Maria Bossi completed her PhD in Polymer Chemistry in 2002 at Cranfield University, UK. She is an Analytical Biochemist. She holds the Associate Professor Chair in Analytical Chemistry at University of Verona, Italy, where she is Leader of the research team on Biomimesis and Molecular Recognition. Main focus of her research is on “The development of bio-analytical methods for protein and proteome analysis by: fundamental studies on hydrogels, preparation of biomimetic and responsive nanomaterials, molecular imprinting of polymers, integration of these materials to mass spectrometry and sensing”. She is author of 78 papers in peer reviewed journals and six book chapters of bio-analytical methods.

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