Organic/inorganic hybrids and functional materials as platforms for host/guest interactions

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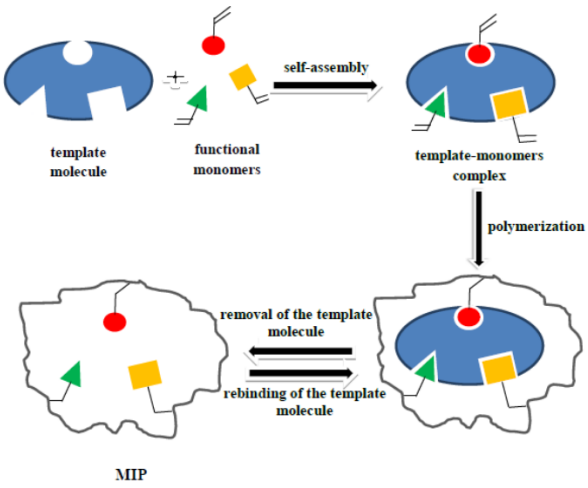
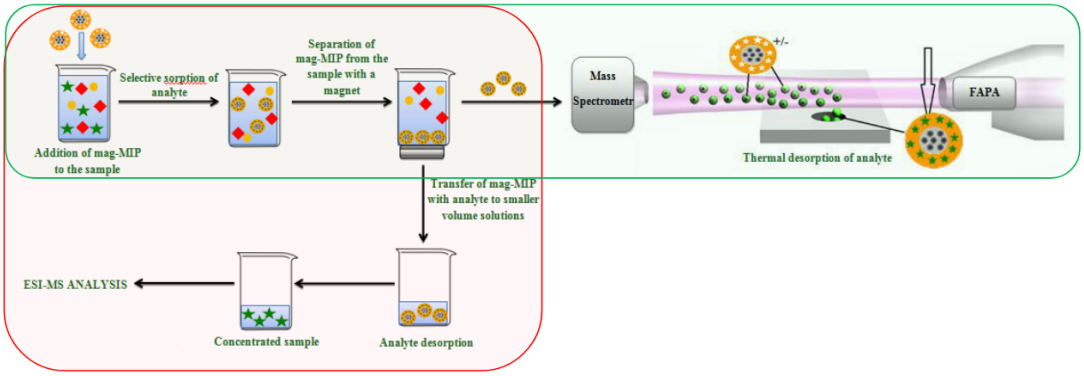
In recent years, after the period during which synthesis of supramolecular receptors and examination of the host-guest interactions has been studied in-depth, the interest in scientific reports describing the combination of supramolecular chemistry, inorganic solids and nanotechnology is growing rapidly. The combination of these three areas of chemistry opens up a completely new areas of application of molecular receptors in analytical chemistry, transport, storage, and drugs delivery.

One of the basic problems of analytical chemistry that scientists have been trying to solve in recent years is the development of fast, cheap, and accurate analytical methods that enable the determination of particular chemical compounds present in very low concentrations (below the detection threshold of instrumental methods) in various matrices, primarily in the aquatic environment.

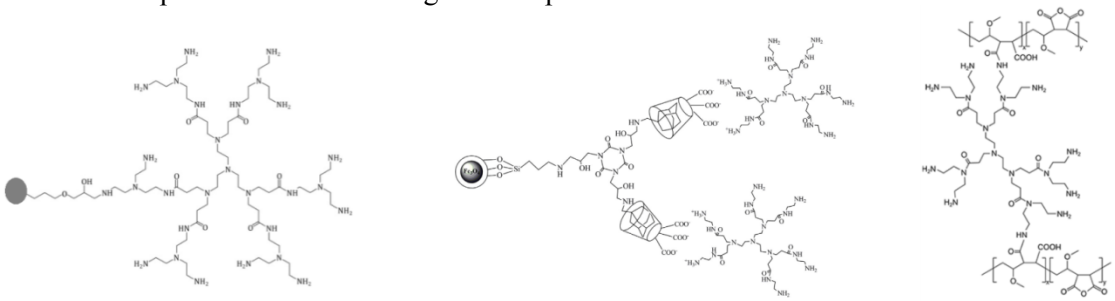
Molecularly Imprinted Polymers (MIPs) are a unique group of functional materials characterized by extremely high selectivity in relation to specific molecules used as a templateduring the material synthesis. These polymers possesing the 3D structure are obtained by co-polymerization of functional monomers, and cross-linking reagents, in the presence of template molecules. After the polymerization is completed, the template molecules are removed, and the resulting molecular cavities present in polymer structure are complementary to them in terms of shape, size, and distribution of functional groups.



An alternative to MIPs are MIPs with magnetic properties . These materials can be used for magnetic separation process that can be carried out with neodymium magnets in just a few seconds. During the lecture the characterization of MIPs and magnetic MIPs will be presented and the application of these materials for the analysis of some biologically active organic compounds (polycyclic aromatic compounds from the group of flavonols, hormones, non-steroidal anti-inflammatory drugs, pesticides, phenols, terpenes, nicotine) will be shown. Moreover, a novel combination of solid-phase extraction using MIPs with a direct analysis using the new plasma ionization (Flowing Atmospheric-Pressure Afterglow) mass spectrometry method (FAPA-MS) will be presented.



Inorganic solids such as silica, magnetite, halloysite, and functional polymers are perfect materials/platforms to deposit supramolecular molecular receptors (e.g. dendrimers) using covalent linking. The synthesis methods and application of these hybrid inorganic-supramolecular systems for the removal of ionic contaminants from water samples as well as the use of these systems for the controlled transport and release of drugs will be presented.



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