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Track: AM

Surface-Imprinted Nanoparticles for Small Molecule Detection

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Material-based alternative technologies mimicking those existing biosensors are emerging rapidly. Molecular imprinting technology is one of such recognized methods, yet to be industrialized because of some limitations. This technique is a well-known alternative to create chemically stable and ready-to-use antibody mimics and can be employed to make material-based biosensors at a much lower cost. The main advantages of this technique include stability, reusability, scalability etc. Herein, major focus will be the development of biosensors comprising molecularly imprinted polymers (MIPs) in small molecules such as chiral drug, bacterial biomarker, environmental pollutants identification as well as separation using the materials.

Molecular imprinting is a technology for creating lock and key type synthetic and inexpensive analogues such that they can selectively mimic the biological antibody-antigen interactions. An imprint of any molecule/biomolecules (template) can be made using suitable monomers by inducing polymerization around the template. Following this, the template is dissolved so that a specific cavity containing polymer host is created. The general process is illustrated in the following Figure 1.

Separation of chiral drug from the enantiomer mixture is often expensive and time consuming, but is an inevitable step now-a-day. An inexpensive, east and fast method incorporating imprinted magnetic nanoparticles for S-naproxen was developed using acrylamide as a monomer. The imprinted nanoparticles showed a promising imprinting factor of ~13 and the material could selectively recognize and separated S-naproxen from its enantiomers.

Detection of whole bacteria is sometimes difficult and may require trained-personal to do all the tedious experiments. Herein, bacteria were identified by surface-imprinted magnetic nanoparticles by recognizing pyocyanin, a secreted small molecule biomarker from *Pseudomonas aeruginosa*. The cost-effective, reusable materials showed a binding capacity of ~2.5 mg/g with an imprinting factor of around 5. These types of materials can be thus will be extremely helpful for culture-free detection of bacteria from a complex biological media.

Molecularly-imprinted polymers also possess huge potential in detection and separation of pollutants such as endocrine disruptors, heavy metals in water etc. Besides, these materials when combined with a fluorophore can be used for disease diagnostics such as malaria. Details discussion about the potential of these materials will be presented further.

References.

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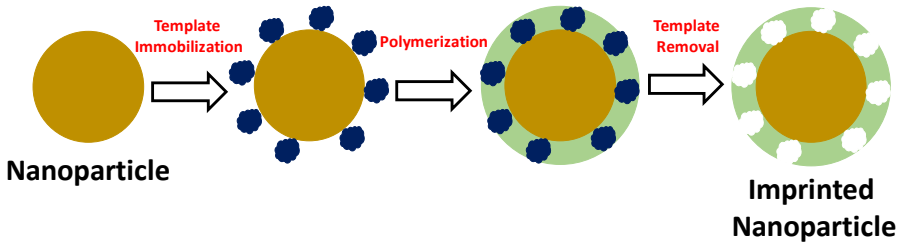

Figure 1. Overview of surface molecular imprinting process