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BIOMIMICRY AT THE MOLECULAR LEVEL: MOLECULARLY IMPRINTED POLYMERS AS SYNTHETIC ANTIBODIES FOR ENZYME RECOGNITION

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Biomimicry is the general term covering any approach aimed at reproducing artificially essential properties of one or more biological systems. At the molecular level, molecularly imprinted polymers (MIPs) are an example mimicking molecular recognition phenomena. MIPs are synthetic antibody mimics that specifically recognize molecular targets. They are highly cross-linked polymers that are synthesized through the polymerization of monomers bearing suitable functional groups, in the presence of the target molecule acting as a molecular template. This templating induces three-dimensional binding sites in the cross-linked polymer network that are complementary to the template in terms of size, shape and chemical functionality. Thus, these so-called 'plastic antibodies' can recognize and bind their targets with an affinity and selectivity similar to biological antibodies. We present different approaches using controlled and localized photopolymerization allowing for the synthesis of MIPs specific for biomolecules. This allows for example to obtain protein-size, soluble MIP nanogels showing specific binding of their targets, small organic molecules or proteins (enzymes), with a good affinity and selectivity. The use of these functional nanomaterials for enzyme detection, inhibition and stabilization, and for bio imaging will be discussed.

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