

MIP nanoparticles for diagnostics and imaging applications

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Our team has made a major breakthrough in MIP technology developing solid-phase approach for preparation of soluble molecularly imprinted nanoparticles (nanoMIPs) - “plastic antibodies” with exquisite affinity and selectivity for their templates. The success came from combining controlled radical polymerisation with an affinity separation step performed on surface-immobilised template. This approach represents the state-of-the-art in nanoMIP synthesis: not only are soluble particles with defined size (20-200 nm) and a narrow size distribution produced in one hour, they possess subnanomolar dissociation constants for their respective targets, they can be easily functionalised with fluorescent, electrochemical or magnetic labels, and the immobilised template can be re-used. High affinity nanoMIPs were made for small molecules, proteins, whole cells, bacteria and virus particles.

The main practical niches for application of synthesised nanoMIPs are diagnostics, imaging and drug delivery. Members of our team have used nanoMIPs successfully as a replacement for antibodies in ELISA-type assays, electrochemical and optical sensors. The exciting examples of our work with in vitro and in vivo imaging by targeting membrane proteins and sugar derivatives. Very encouraging facts that enables practical applications of MIPs in vivo are lack of polymer toxicity, ability of nanoMIPs to penetrate into cells and to pass blood barrier. The possibility to integrate sensing and drug delivery functions in our MIPs make them suitable for theranostics applications. Current paper discusses this work and opportunities that it brings for our collaboration.

