

Smart materials: Advances in protein-based molecularly imprinted polymer biosensing

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Hydrogel-based molecularly imprinted polymers (HydroMIPs) were prepared for several proteins using a family of acrylamide-based monomers. We report HydroMIP binding affinities, in terms of equilibrium dissociation constants (K_d) within the micromolar range ($25 \pm 4 \mu\text{M}$, $44 \pm 3 \mu\text{M}$ and $17 \pm 2 \mu\text{M}$ for haemoglobin, myoglobin and catalase respectively within a polyacrylamide-based MIP). We have used atomic force spectroscopy to characterize molecular interactions in the MIP cavities using protein-modified AFM tips. Our force data suggest that we have produced selective cavities for the template protein in the MIPs and we have been able to quantify the extent of non-specific protein binding on, for example, a NIP control surface. For the first time, we have also coded the MIPs with a covalently-bound redox tag in order to elicit a direct electrochemical signal in the event of selective protein binding. GC and SPE probes were used for signal transduction and imprinting determination. Co(II)-complex-based MIPs exhibited $92 \pm 1\%$ specific binding with protein binding capacities of $5.7 \pm 0.45 \text{ mg BSA/g polymer}$ and imprinting factors (IF) of 14.8 ± 1.9 (MIP/ non-imprinted (NIP) control). The selectivity of our Co(II)-coded BSA MIPs were also tested using bovine haemoglobin (BHb), lysozyme (Lyz), and trypsin (Tryp). In summary, MIP technologies could provide an inexpensive, fast, and efficient diagnostic biosensor platform highly sensitive, *in-situ* analysis of biologicals for both environmental and biomedical applications.

Biography

Subrayal M Reddy completed his PhD from University of Manchester and Post-doctoral studies from University of Wales. He was Lecturer and then Senior Lecturer at the University of Surrey (1998-2015) and has recently taken up an academic position at the University of Central Lancashire (2016). He has published more than 50 papers in reputed peer-reviewed journals and has given numerous invited international conference talks.

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