

## **SPECIAL REPORT:** NANOTECHNOLOGY

- 49** Although not a cure for all the world's ills, nanotechnology has the potential to address some of the pressing issues of our time, reports Mark Morrison
- 55** International standards are vital if we are to fully explore the potential of nanotechnology, argues Dr Mihail Roco
- 59** New products based on nanotechnology are already making life easier and safer for thousands of people, claims Degussa's Markus Pridoehl

# Nanoimprinting Technologies for Selective Recognition and Separation (NANOIMPRINT)

Composite filter for separation of biological molecules  
(Fraunhofer Institute for Interfacial Engineering & Biotechnology)



Molecular imprinting of polymers is a technique often employed in the fabrication of biomimetic polymeric recognition matrices that is rapidly attracting increasing industrial interest. By this technology, recognition matrices, possessing high substrate site selectivity and specificity, can be prepared. The physical and chemical characteristics of molecularly imprinted materials are highly appealing. These materials exhibit high physical and chemical resistance against external degrading factors. Thus, molecularly imprinted polymers (MIPs) are remarkably stable against mechanical stresses, high temperatures and pressures, resistant against treatment with acid, base or metal ions, and stable in a wide range of solvents. The storage endurance of the polymers is also very high. Furthermore, the polymers can be used repeatedly without loss of their "memory effect".

It is widely accepted that MIPs will be one of the most important technological and scientific challenges in the fields of biotechnology, separation, purification, analytical science, catalysis, biomedical and environmental applications. Particular advantages to be realized by MIPs are the low preparation cost and the potential utility in situations where no recognizing biomolecule is available. Driven by the numerous potential applications, the NANOIMPRINT project aimed to bring MIPs one step closer to true antibody-mimics enabling the direct use of MIPs in aqueous systems and to shed light on the nature and function of the MIPs at a molecular level.

## Scientific & Technical Results

- Development of novel synthesis routes (e.g., suspension, inverse suspension, miniemulsion, inverse miniemulsion and precipitation polymerization) for

the economically feasible production of MIPs, in the form of nano-, micro-particles and membranes, taking into account limitations of the current synthetic approaches, and the rational design of improved imprinting materials.

- Development of MIPs towards hydrophobic or hydrophilic biomolecules, such as amino acid derivatives (e.g., *z-His-oMe*, *L-Methionine*), oligo-homo-peptides (e.g., *boc-Trp*<sub>3</sub>, *z-(His)*<sub>2</sub>-*oMe*, *Pal-(His)*<sub>6</sub>), and oligo-hetero-peptides (e.g., *enkephalines*, *AISY*, *CCK-5*) as well as towards mannan oligosaccharides.
- Encapsulation of MIPs in bead shaped support materials based on hydrogels (e.g., PVA) and inorganic oxides (e.g., Al<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub>).

## Exploitation – Potential Market

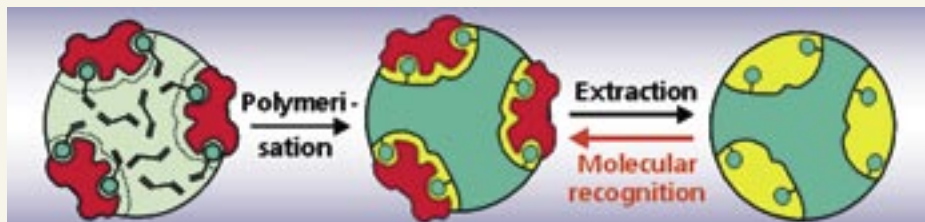
- The new synthetic strategies developed in this project will allow large-scale production of MIPs in the form of beads and composite structures with well-controlled particle size distribution and morphology.
- Application of biomolecules-imprinted polymers as **artificial receptors with high substrate selectivity and specificity in analytical techniques** such as HPLC, capillary electrophoresis and solid phase extraction.
- Development of purification tools for native proteins (alternative to immunoaffinity chromatographic techniques) and recombinant tagged proteins.
- Application of carbohydrate-imprinted polymers in medical, bioanalytical and biotechnology fields.

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## Website

<http://lpre.cperi.certh.gr/nanoimprint>



Model scheme for the molecular imprinting process



**INSIDE:**

**Europabio's  
Stephanie Pingitzer**

**The Big Donor show:  
Frédérique Ries on  
organ donation**

**Making life healthier:  
The Joint Research  
Centre in action**

# Medical Research

## ADVANCED THERAPIES – ETHICS VS POLITICS

### NANOTECHNOLOGY UNDER THE MICROSCOPE

*Expert comment  
and analysis from:*

**Mark Morrison  
Mihail Roco  
Markus Pridoehl**



### PLUS:

**Profile: Helmuth Markov  
Wolfgang Heusel, Diana  
Wallis & Klaus-Heiner  
Lehne on ERA's birthday  
Bulgarian MEPs, Romanian  
PM visit, Ukraine**

