



OPPORTUNITÀ TECNOLOGICHE NEL SETTORE DEI DISPOSITIVI MEDICI

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Sistema microarray a proteine per diagnostica umana

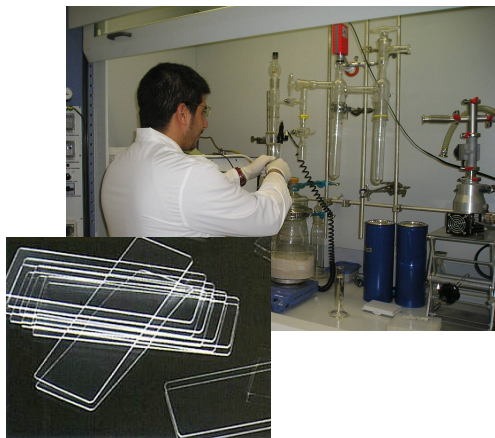




Analytical Microsystems Group



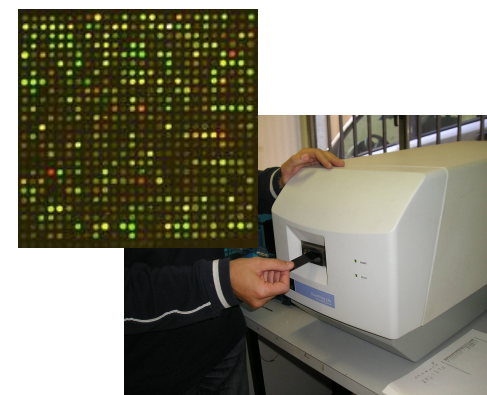
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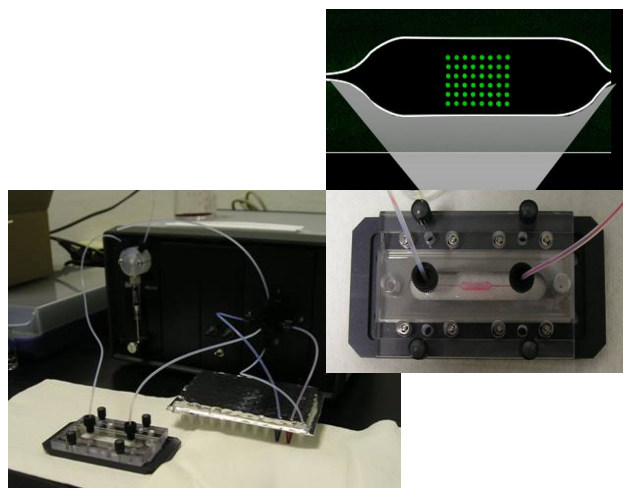
**Polymer synthesis and
surface modification**



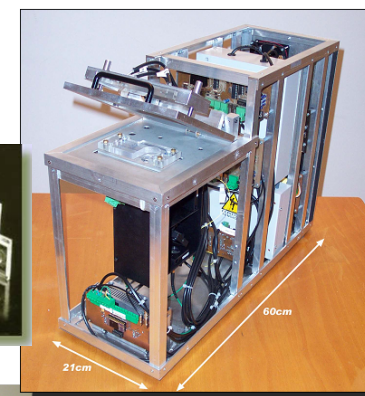
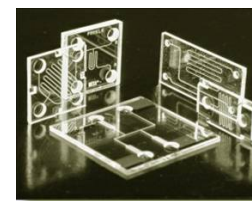
**Microarray design and
realization**



Microarray analysis

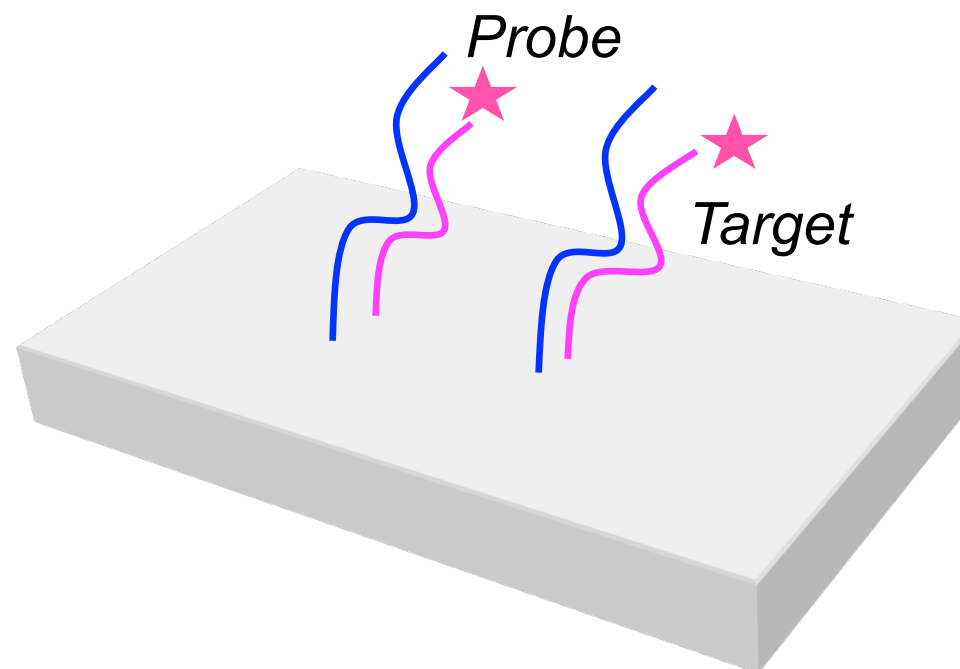
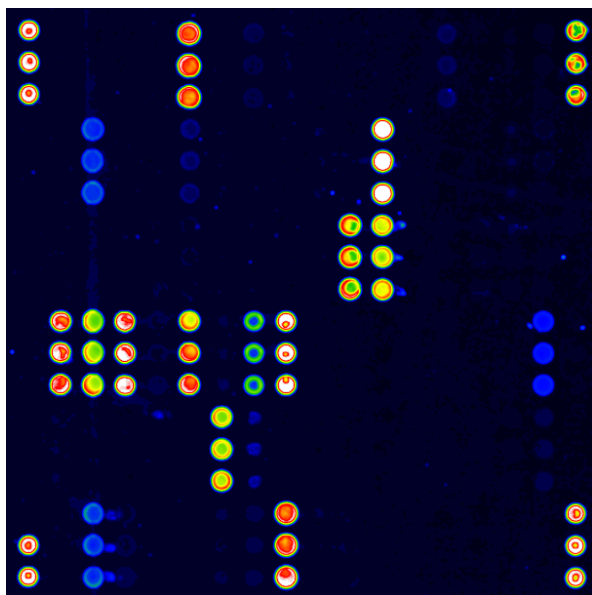


**Microfluidics
coupled to
microarrays and
microchip
electrophoresis**





Microarray Technology

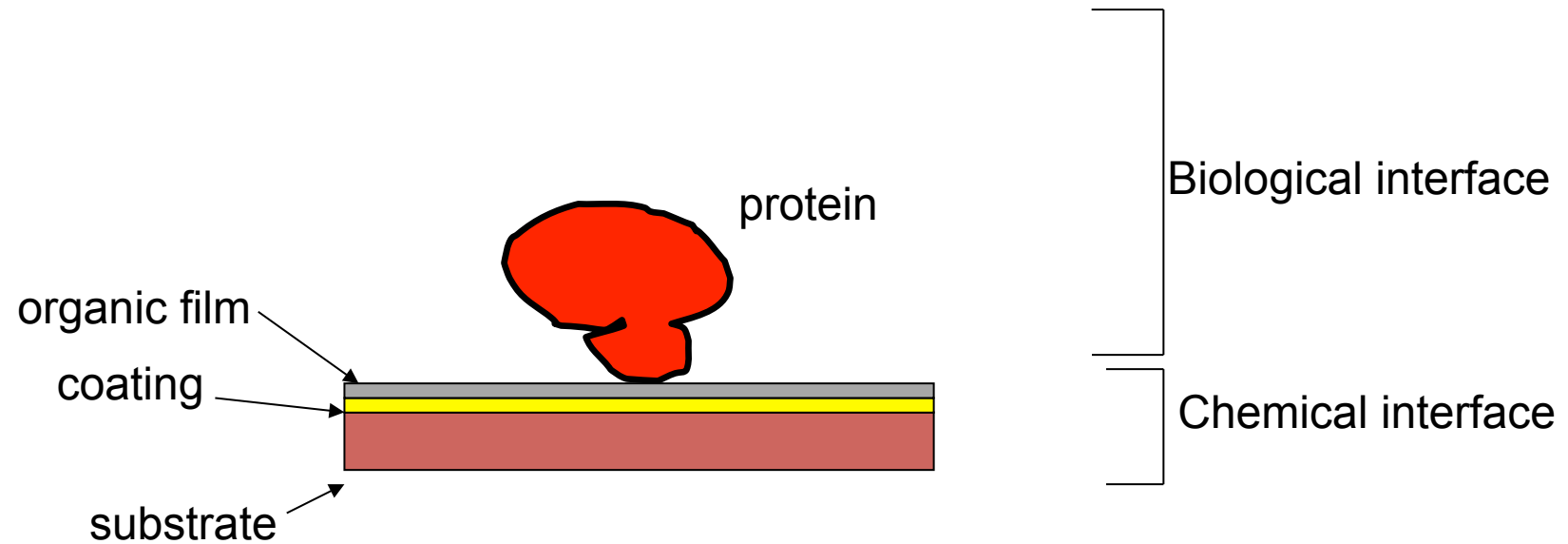


Support

Glass or silicon slide,
Nitrocellulose membrane

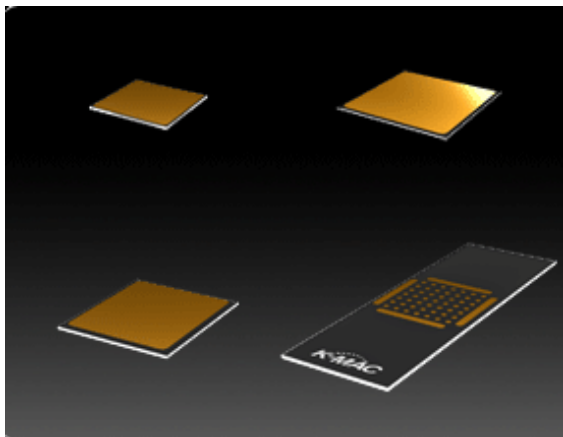


Biosensor architecture

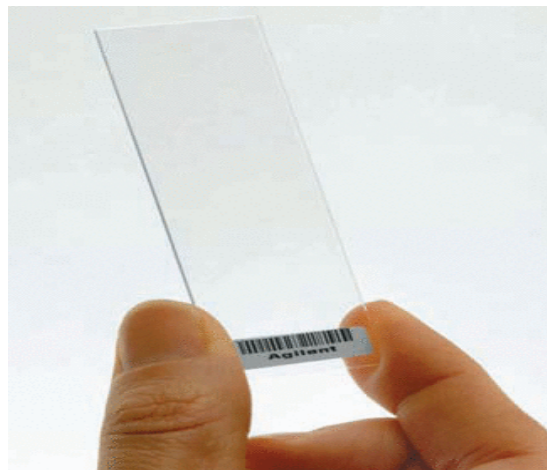




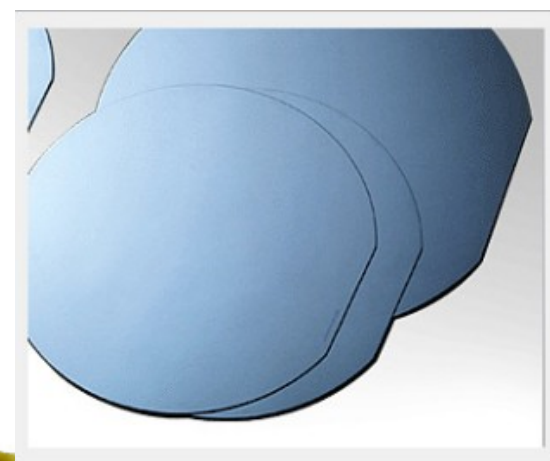
Microarray surface



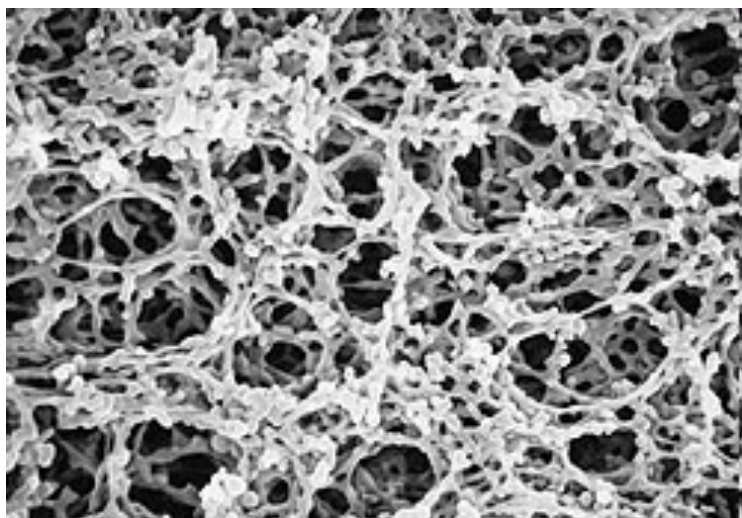
gold



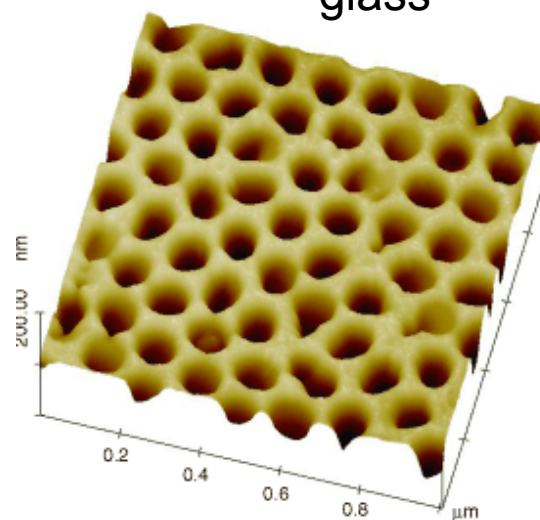
glass



Silicon/silicon oxide



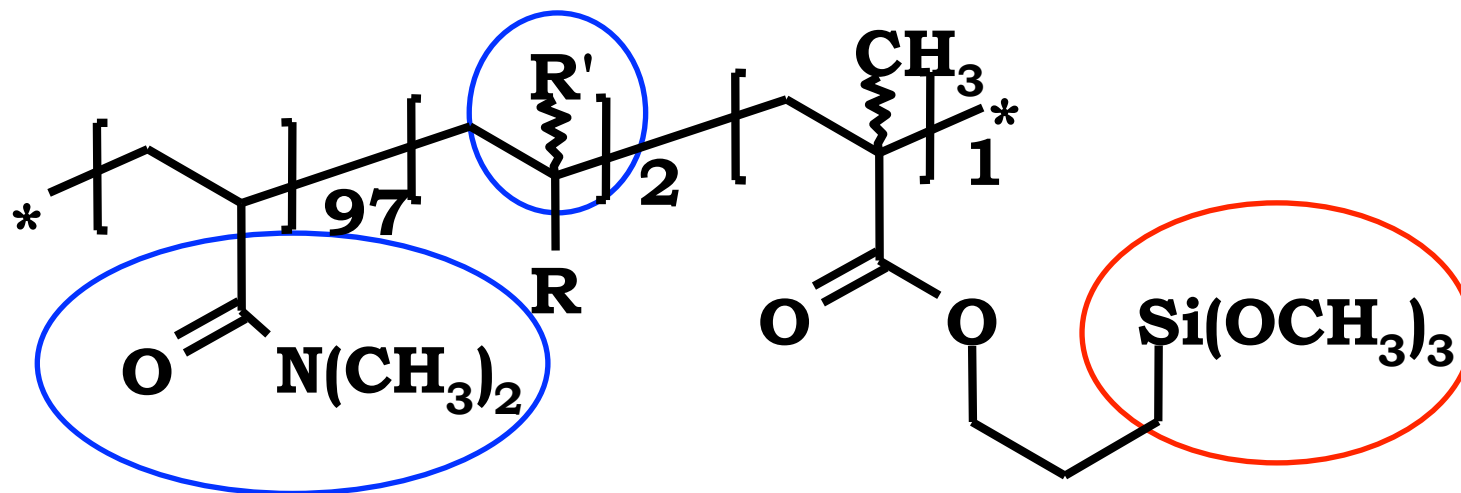
nitrocellulose



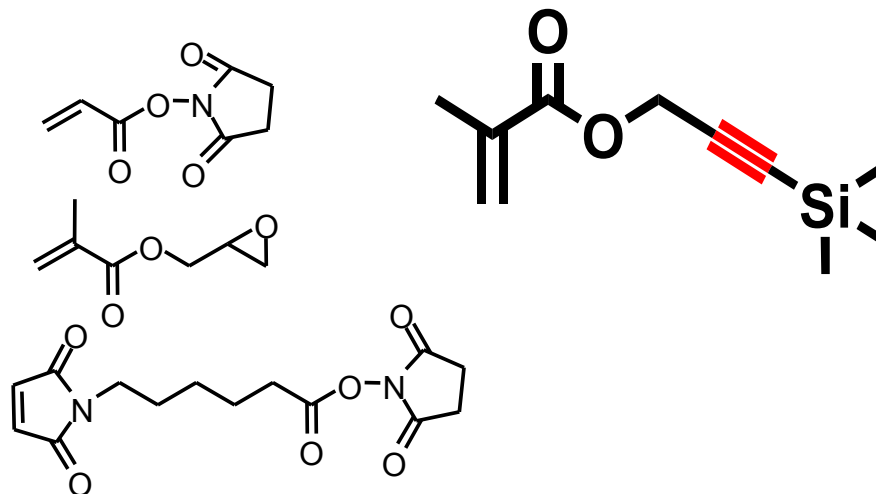
alumina

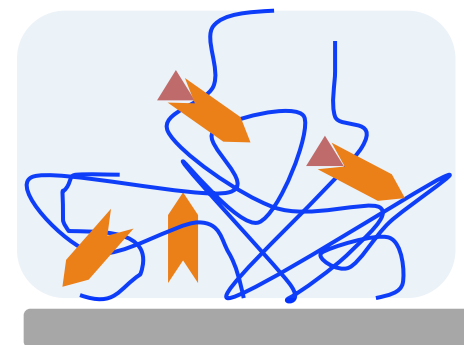
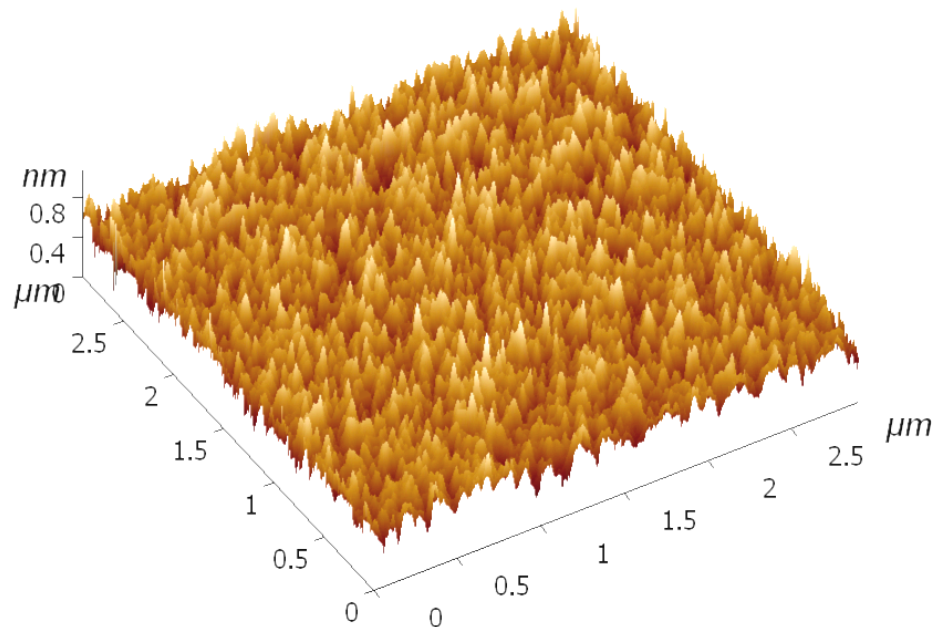


Physisorption/grafting of random linear copolymers



R' Chemically reactive monomers





3D polymeric random films (by grafting to)

	RI	Thickness (nm)	Mass (ng/mm ²)	Density (g/cm ³)
Copoly(DMA-NAS-MAPS)	1.36±0.05	15.73±1.4	2.15±0.04	0.15±0.02

Determined by Dual polarization Interferometry

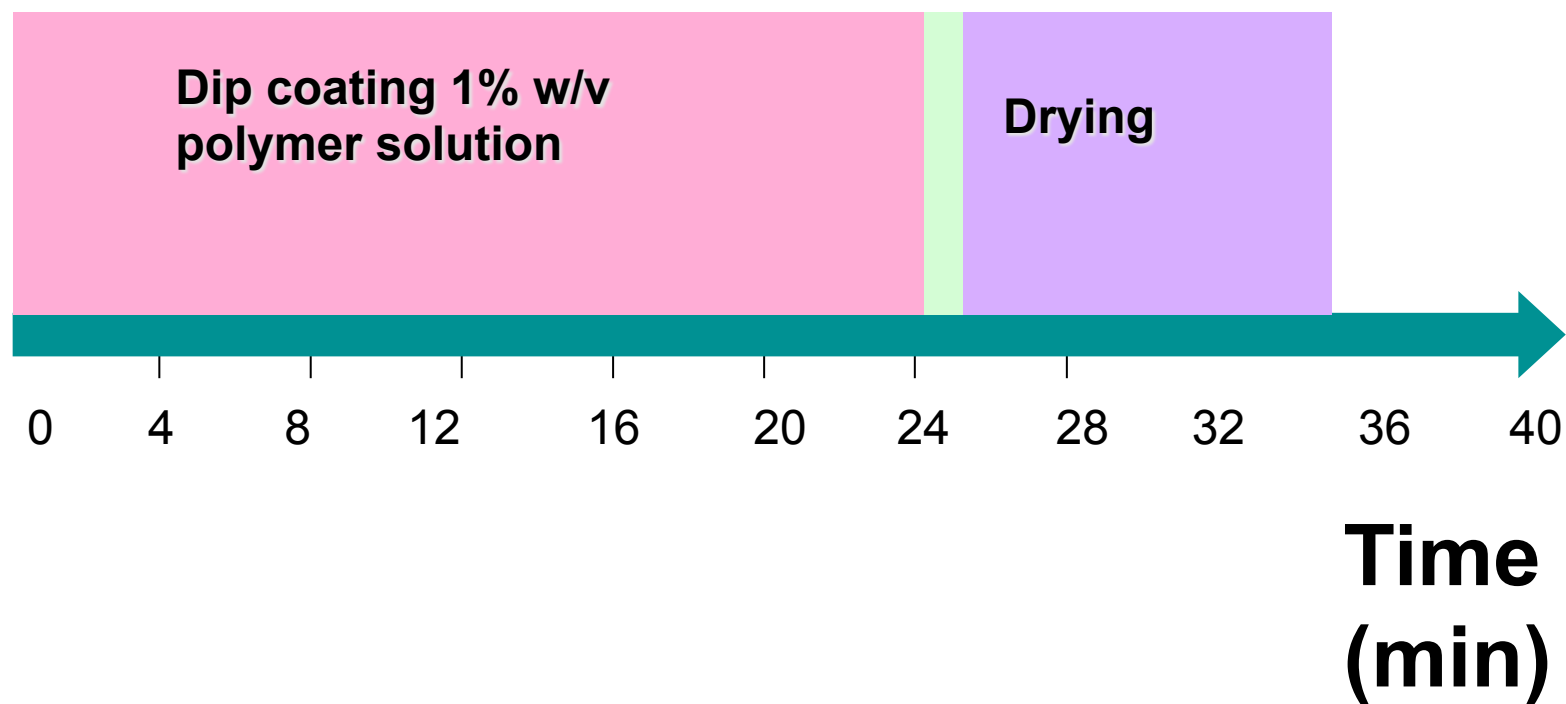


Quality of the surface





Coating procedure

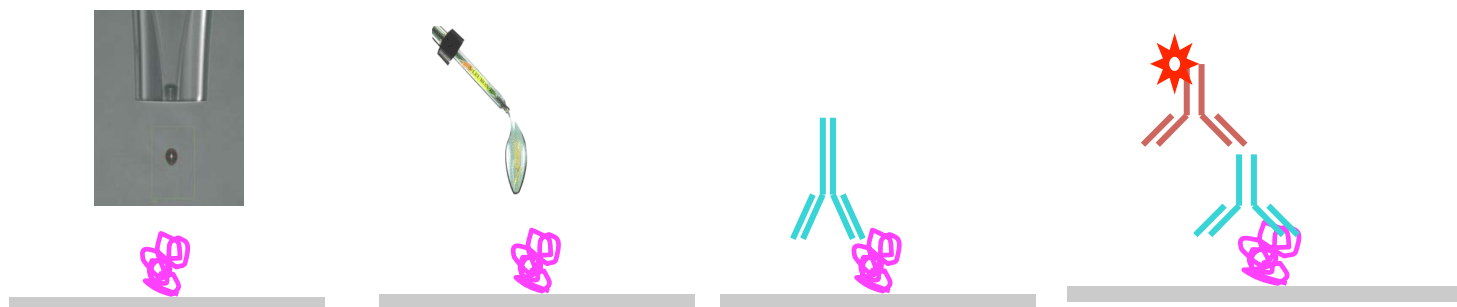


Allergen microarrays on high-sensitivity silicon slides

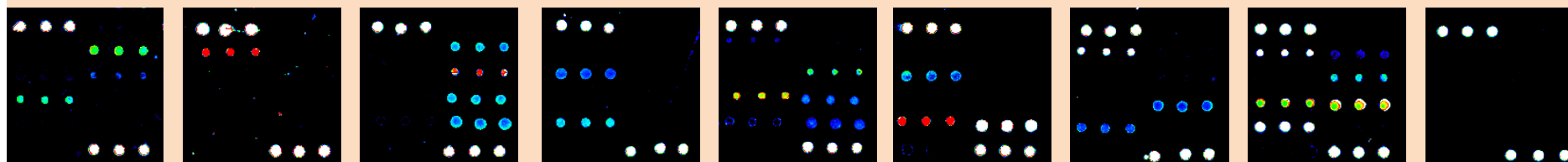
Cretich et al. Anal Bioanal Chem. 2010 Aug 22



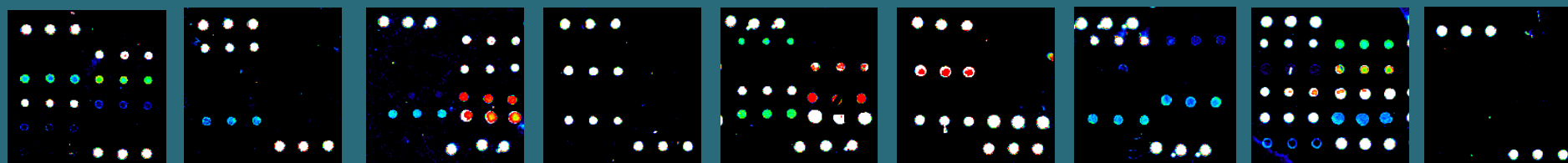
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Glass



Silicon



Serum 3

Serum 31

Serum 35

Serum 59

Serum 68

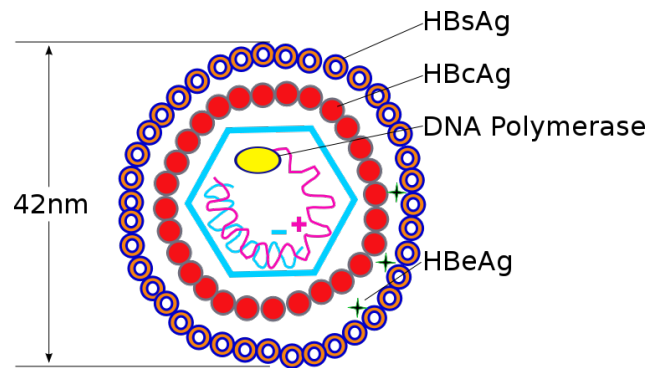
Serum 71

Serum 97

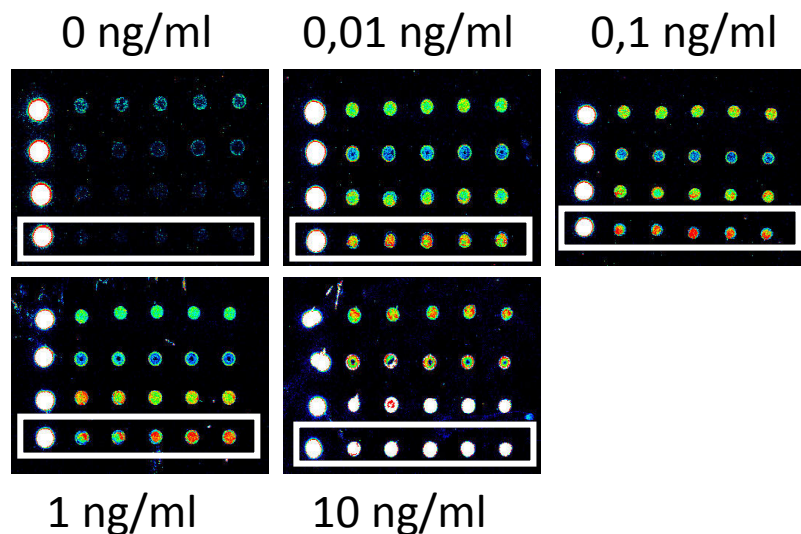
Pool

Negative
serum

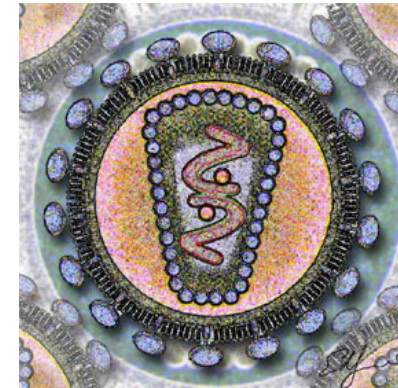
HBsAg is used to establish a diagnosis of hepatitis B infection (6-16 weeks after infection), to monitor antiviral treatment and for control of blood donors.



LOD: 50pg/mL

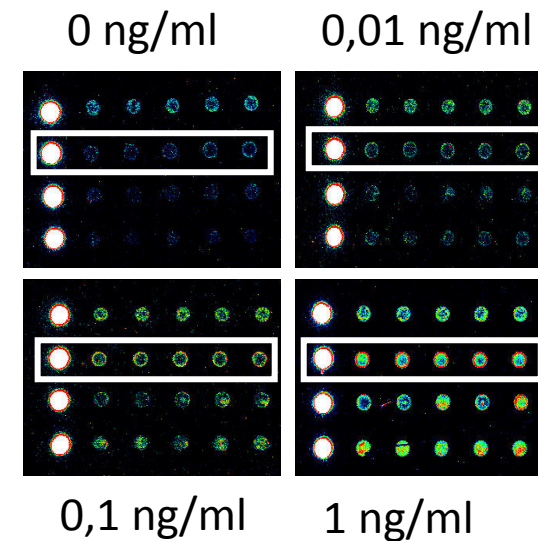


HIV p24 antigen (early diagnosis marker, 1-3 weeks after infection)

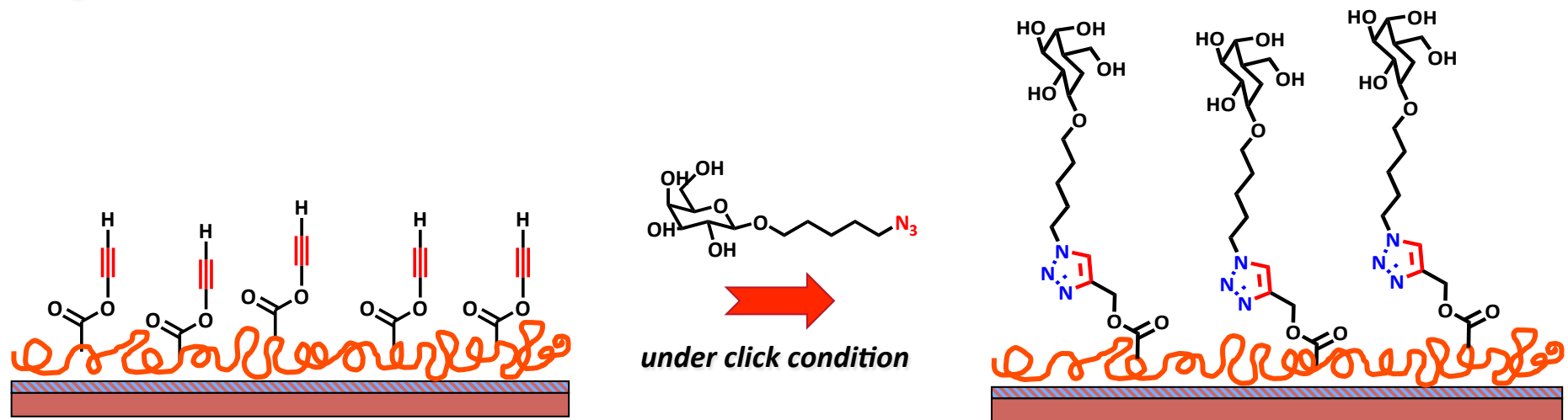


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LOD: 24pg/mL

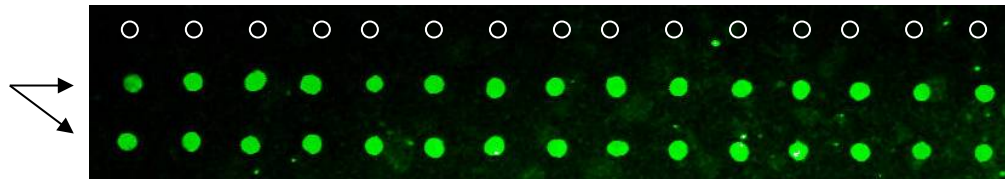


Glycan immobilization



After incubation with the specific α -mannose lectin (Concanavalin A)

Negative control
 α -Mannose

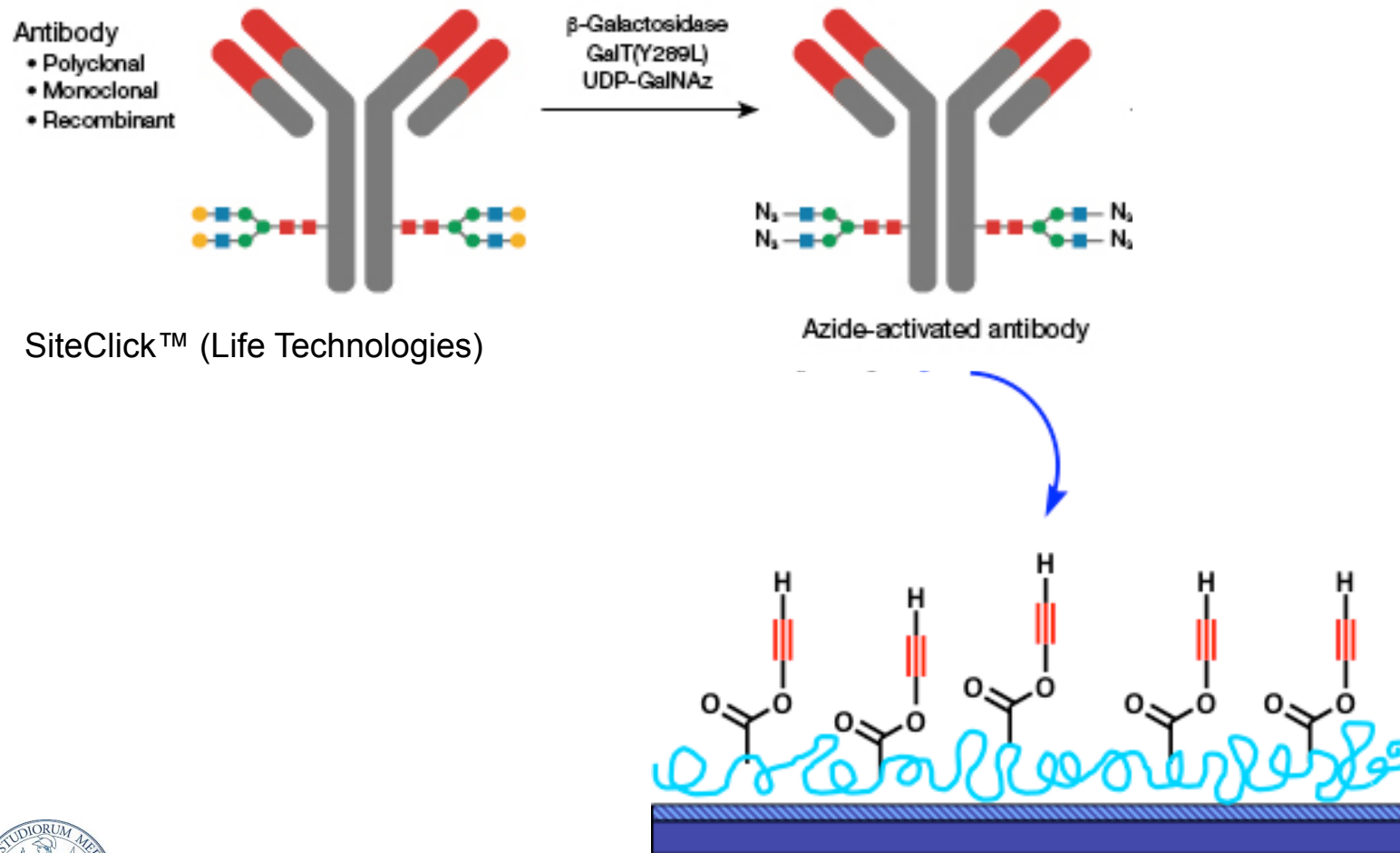


Microarray of the Cy3 fluorescence signals

Negative control: α -mannose without click reagents



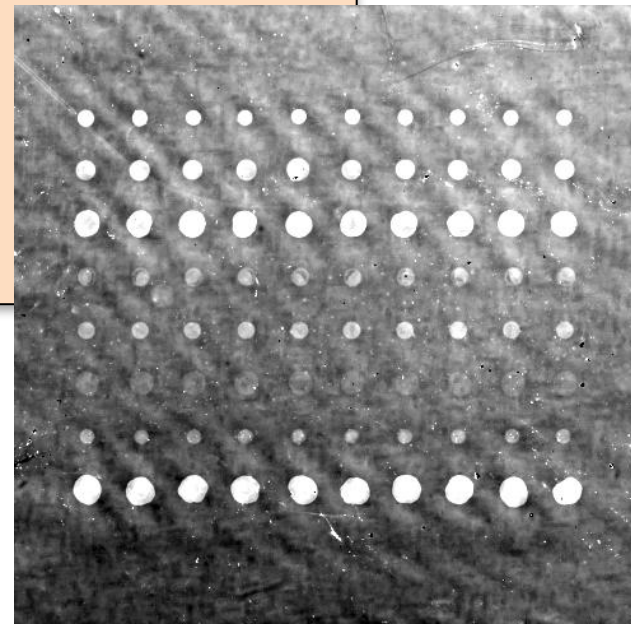
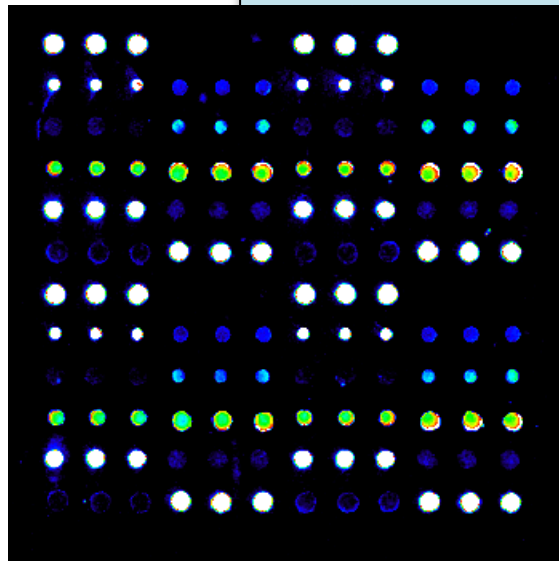
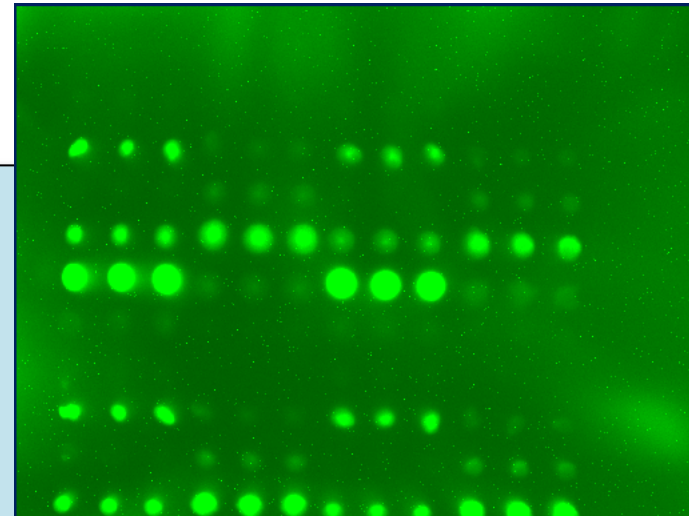
Oriented immobilization of antibody on thiol-ene surface coated with the clickable copolymer



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The chips allow to detect simultaneously

- Total protein amount (label free)
- Fluorescence
- Chemiluminescence



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Materials coated by the copolymers



- ✓ glass
- ✓ silicon oxide, nitride
- ✓ COC, polycarbonate, PDMS, Teflon
- ✓ nitrocellulose
- ✓ gold

Applications in microarray technology

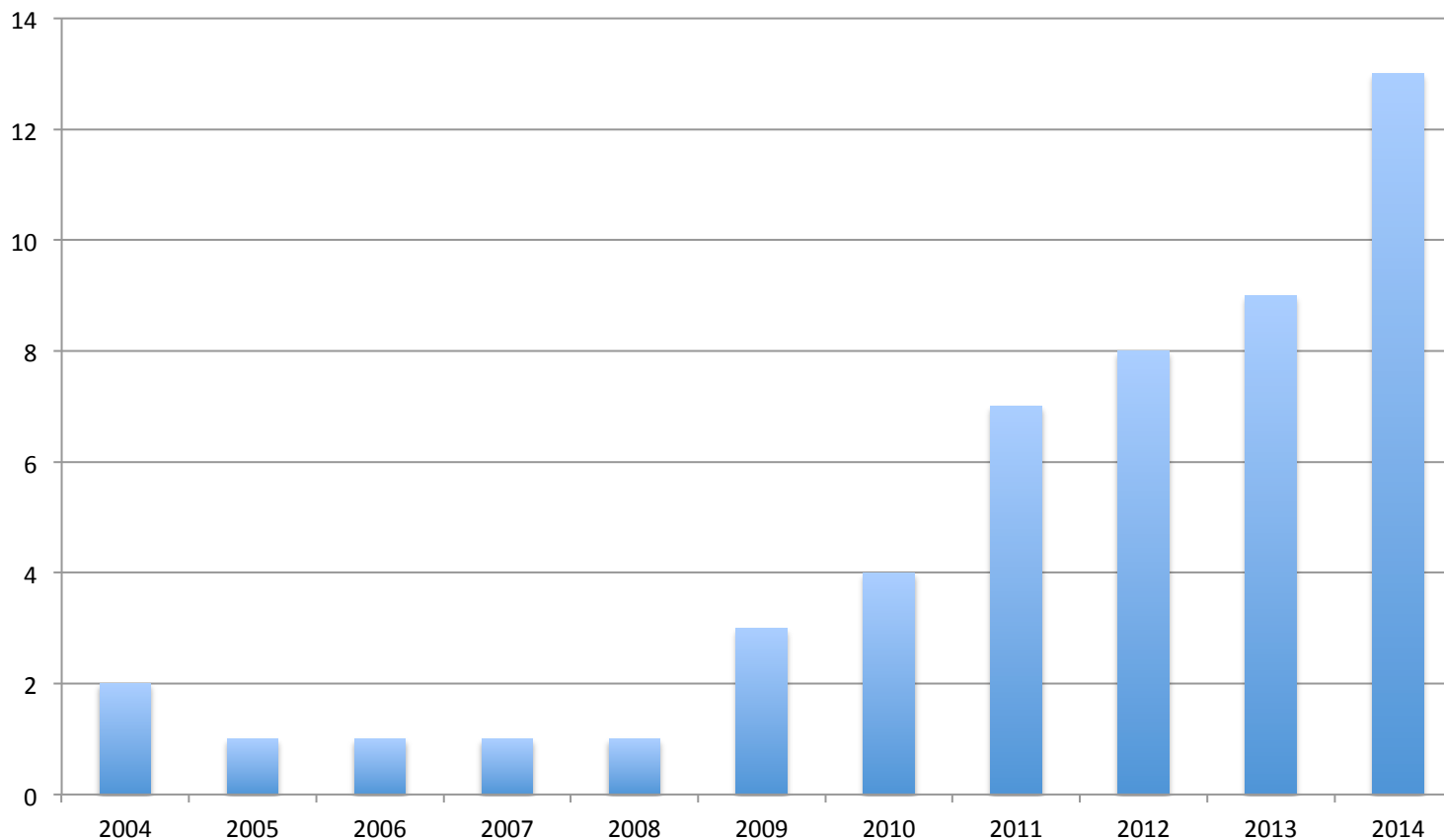
- Protein biomarker detection: hepatitis, HIV, Rheumatoid arthritis, Alzheimer's disease, allergy, inflammation
- DNA biomarker detection: prenatal diagnosis of cystic fibrosis and cancer related genes
- Pathogen detection in food

Applications in capillary electrophoresis and microfluidics

- Suppression of EOF in protein analysis
- Modulation of hydrophilicity in microfluidic devices



Number of publications on international journals on the use of copoly(DMA-NAS-MAPS)





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