

TASNANO

Tools and Technologies for the Analysis
and Synthesis of Nanostructures

STREP-NMP 2005-7

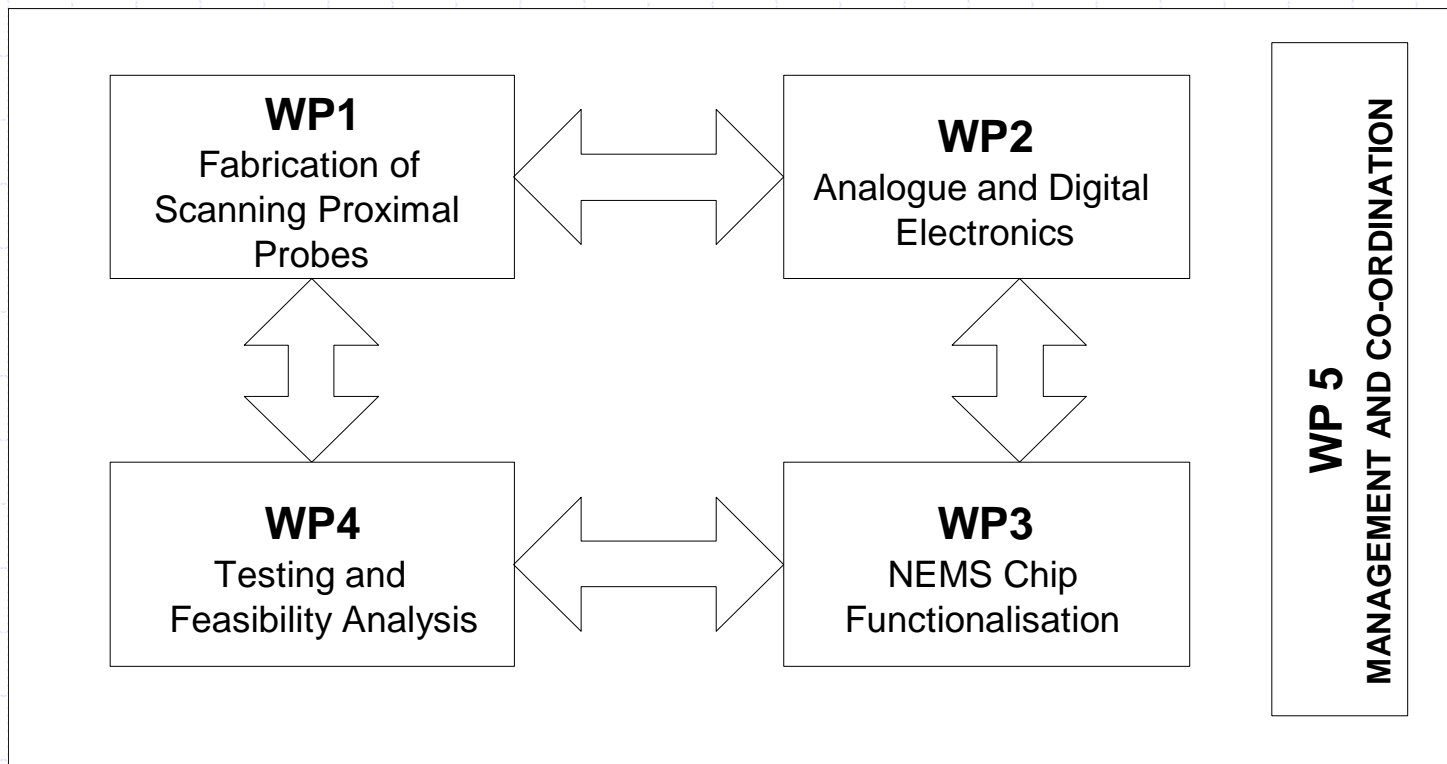
Objectives

- ◆ A generic Nanotool platform provided by a Parallel Modules of Nano-Electro Mechanical System (PM-NEMS) chip incorporating array of intelligent proximal probes with integrated actuator and piezoresistive readout, fully addressable, for high-speed data analysis or bottom-up product synthesis,
- ◆ The modular generic NEMS-chip will be Nanofunctionalised to generate a family of Application Specific NEMS-chip packages (AS NEMS) for integration into a range of new intelligent, cantilever based Nanotools,
- ◆ Prototypes of experimental Nanotools based on the functionalised AS NEMS chips developed in TASNANO will be produced and demonstrated in selected applications and the results used to support of the development of new Nanotechnology processes and products.

Participants

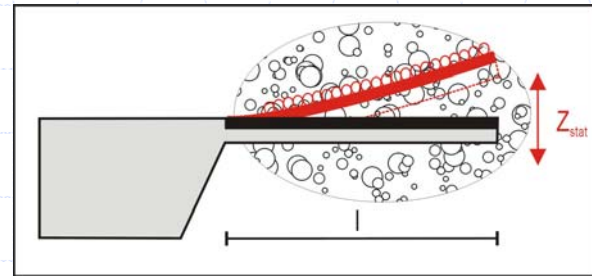
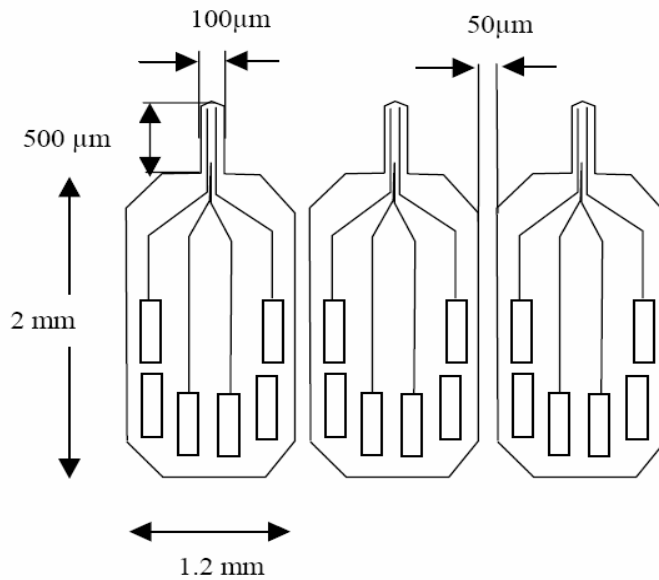
Partic. Role	Partic. no.	Participant name	Participant short name	Country	Date enter project	Date exit project
CO	1	Institute National Polytechnique. de Lorraine/ CNRS	INPL/CNRS	F	1	36
CR	2	Rutherford Appleton Laboratory CCLRC	CCLRC	UK	1	36
CR	3	NCSR Demokritos	NCSR	GR	1	36
CR	4	University of Kassel IMA	UK	D	1	36
CR	5	Microsystems Ltd	Microsystems	BU	1	36
CR	6	Nanoworld Services GmbH	Nanoworld	D	1	36
CR	7	Fraunhofer IISB	Fraunhofer	D	1	36
CR	8	Seibersdorf Research GmbH ARC	ARC	A	1	36
CR	9	AlphaContec GmbH	ALFA	D	1	36
CR	10	University of Genova DIST	DIST	IT	1	36
CR	11	Surface imaging Systems SIS	SIS	D	1	36
CR	12	University of Wroclaw	WRUT	PL	1	36

Workplan



Cantilevers

Single Module



Applications

Material synthesis, surface and tip functionalisation

Tasks 1,2,5

Molecular Manipulation

Nano-electrochemistry, nanopatterning, molecular characterisation

Tasks 3,4,8

Bio - Applications

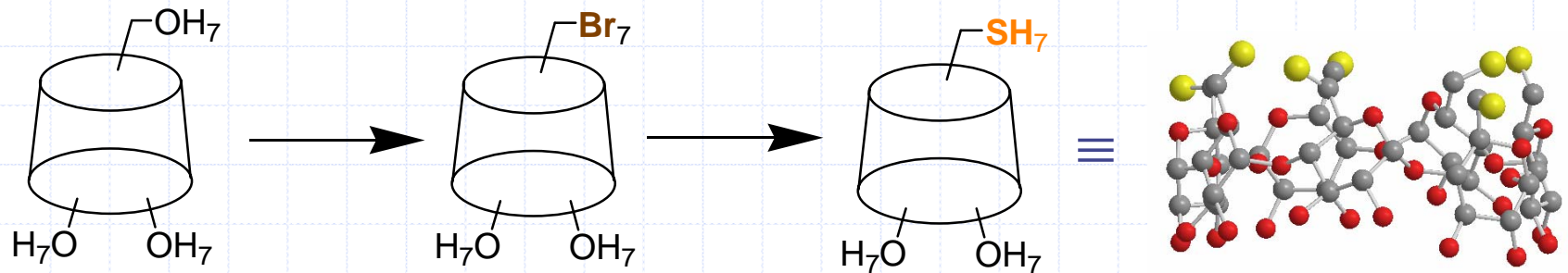
Biomolecular and cell surface characterisation,

Single protein functionalisation, Modelling

Tasks 6, 7, 9,10

Involvement of NCSR "D"

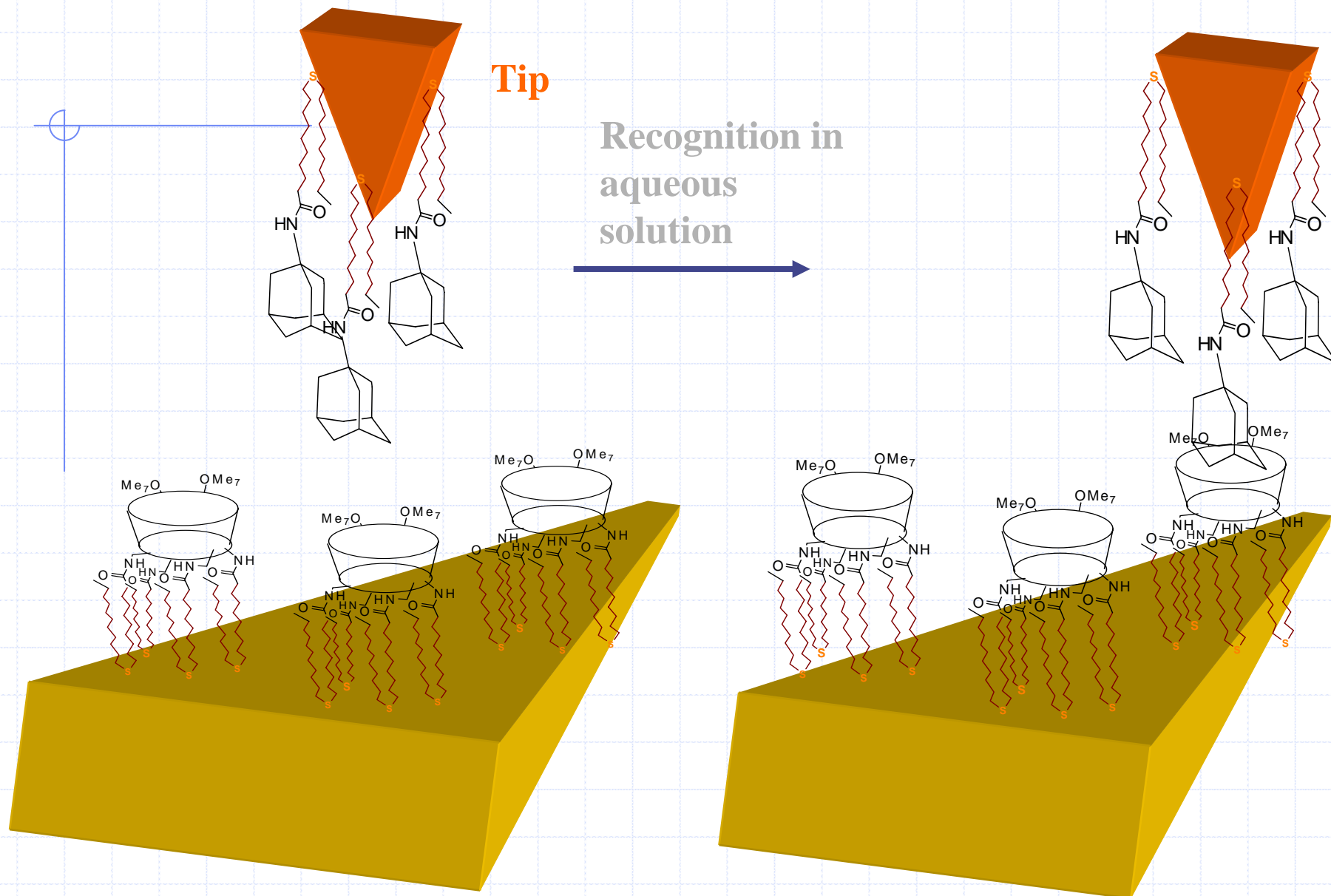
(a) Synthesis of simple thio- β -Cyclodextrin for attachment on Au



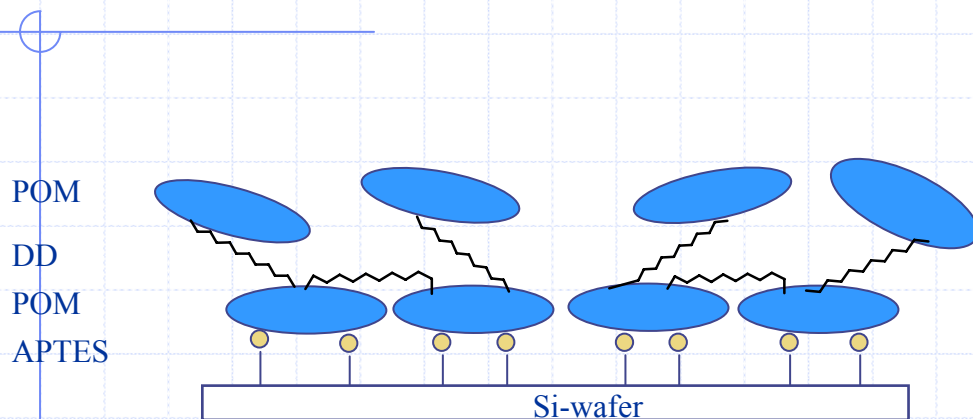
Prepared in our lab according to *J. Am. Chem. Soc.* **1995**, 117, 336-343

(b)

Use tailored guests on **Au** tip, to bind to cyclodextrins

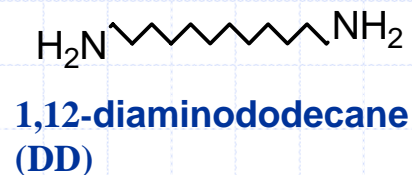


Surface functionalisation based on POMs

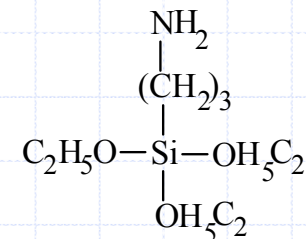


APTES-(POM-DD)-POM multilayer film prepared with LbL method

APTES: 2% v/v aq. 20 min/ 120 °C, 20 min
POM: 0.01M aq. 20 min (pH~0.5)
DD: 0.009M, H₂SO₄ 0.01N aq. (pH~2) 20 min



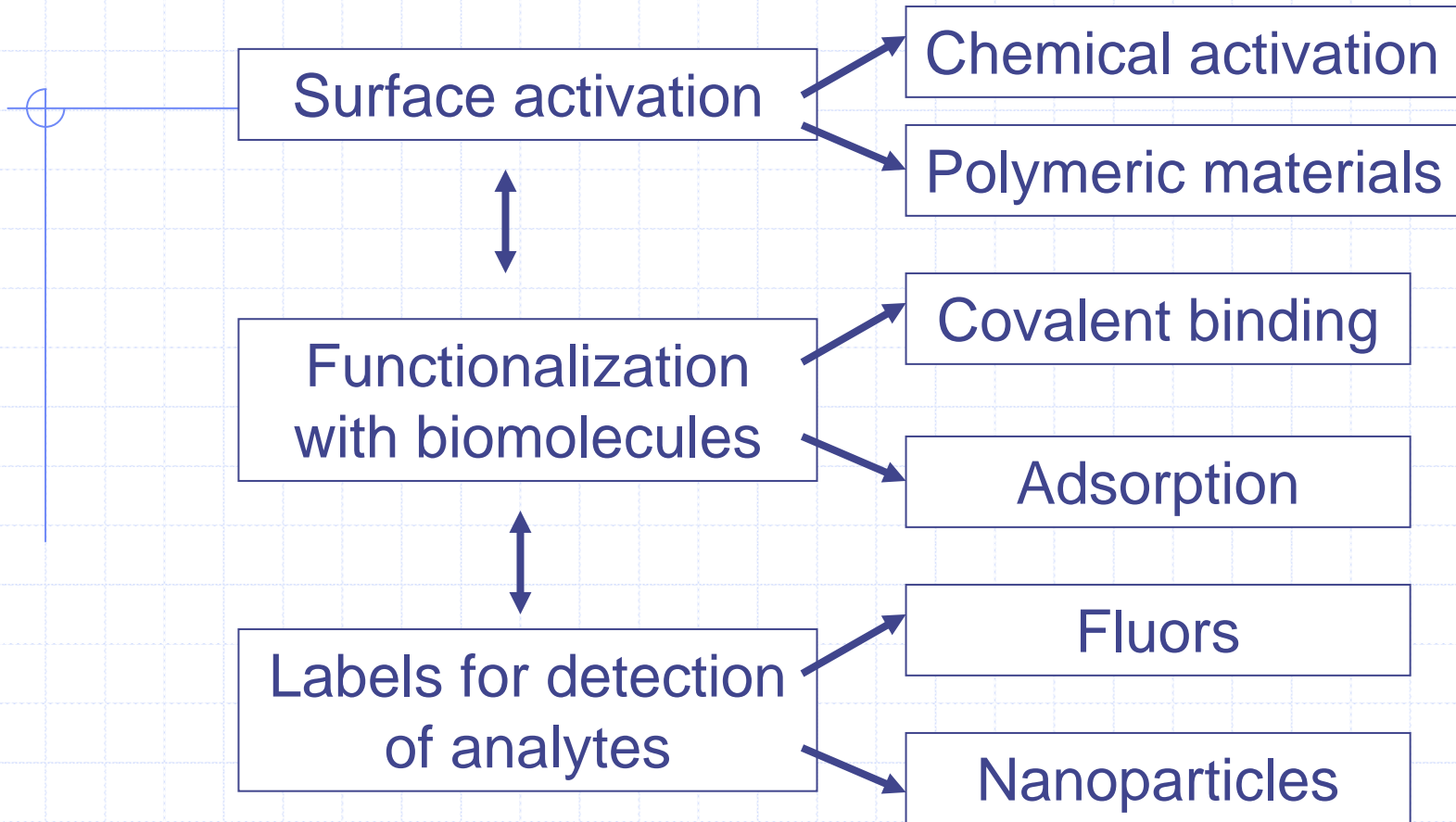
phosphotungstic acid (polyoxometalate, POM)



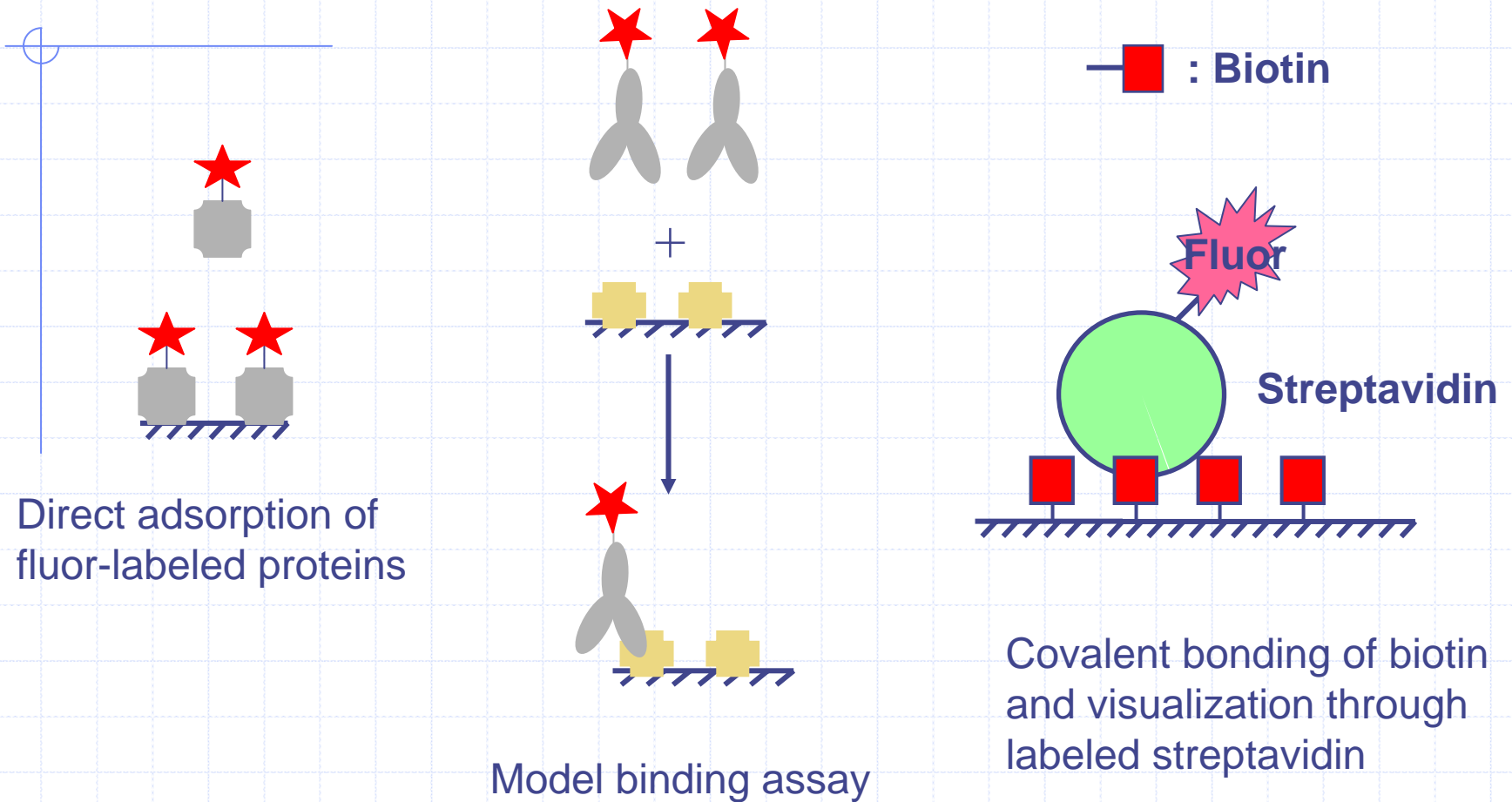
3-aminopropyltriethoxy silane (APTES)

Biomolecular characterization

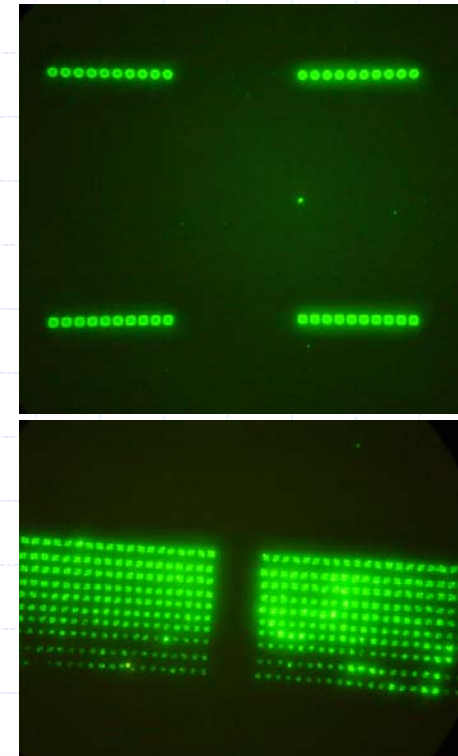
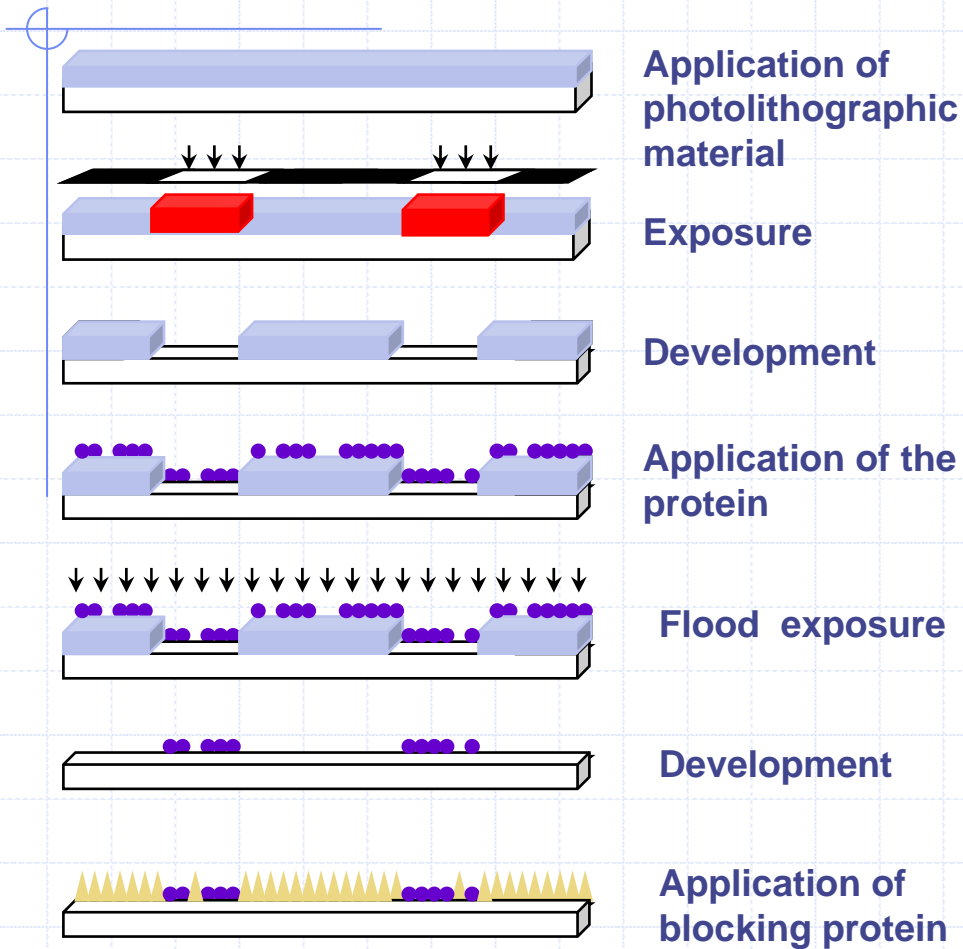
Single protein functionalization of MP SPP tips



Evaluation of methods for surface activation

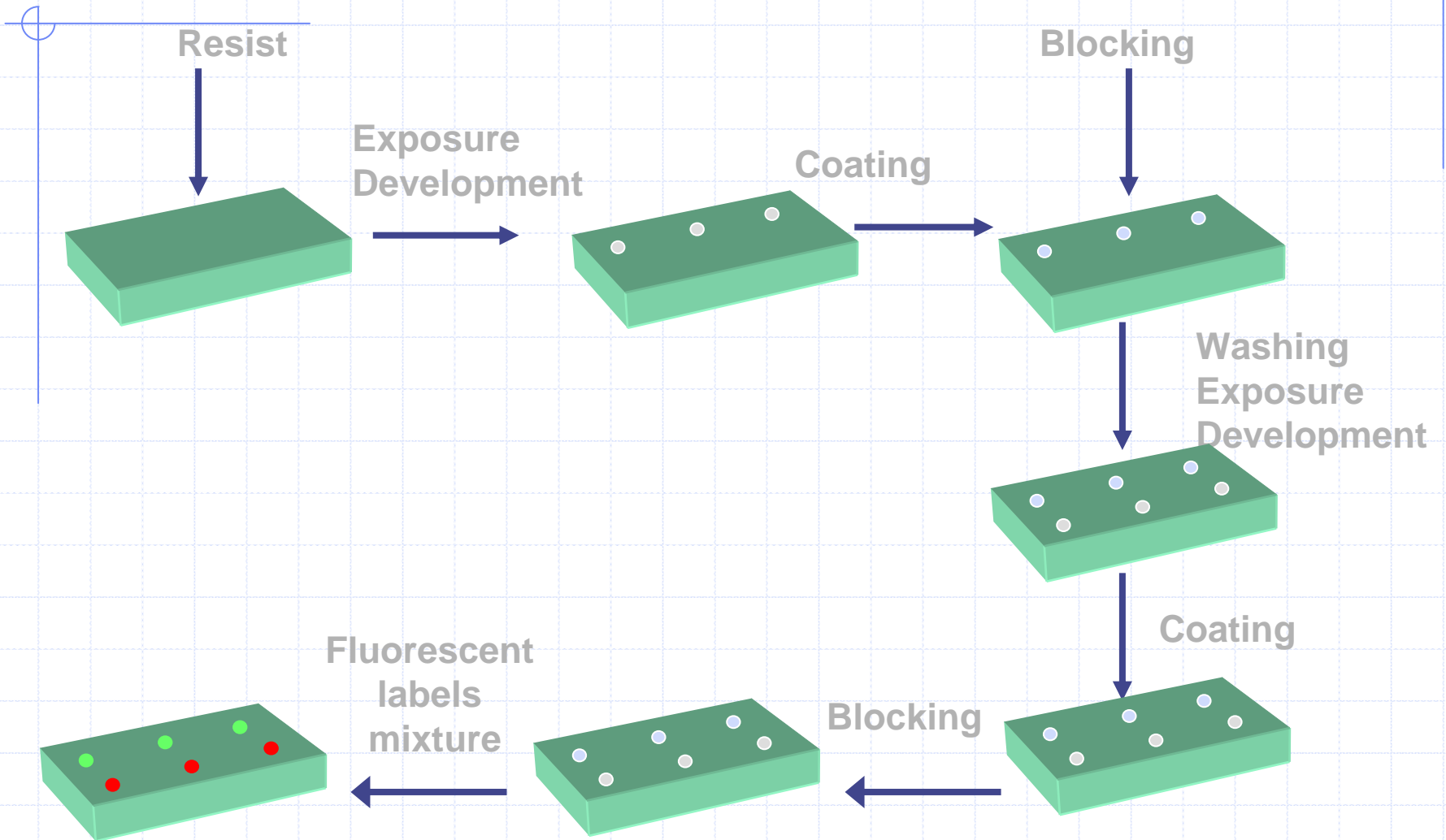


Photolithographic patterning by biocompatible photoresist for single protein deposition onto the tips

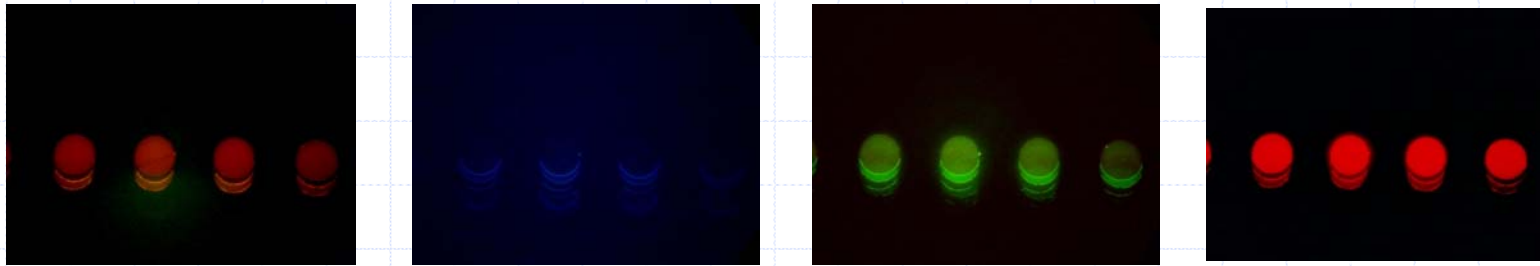


5 μm spots

Immobilization of different proteins through photolithography



Combination of fluorescence images for each individual dye to create the image for the protein array



Fluorescein-rabbit IgG
Mouse IgG
Biotinylated BSA
DNP-HSA
BSA (blank)
Biotinylated BSA
Mouse IgG
Fluorescein-rabbit IgG

