

One pot method for the simultaneous synthesis and anchoring of organic monolith inside COC microchip channel

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Monolith synthesis in COC microchip

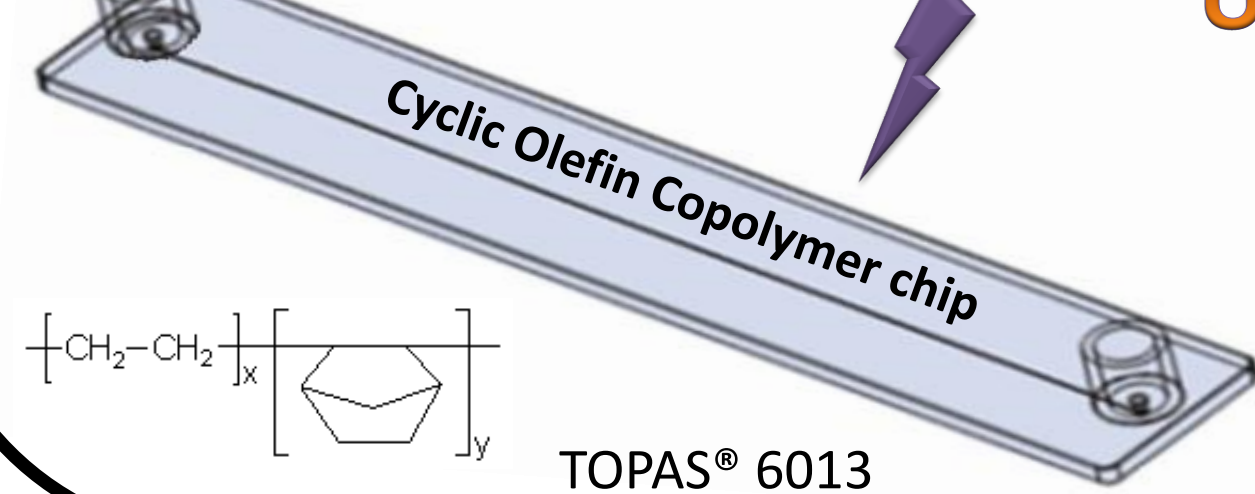
Polymerization mixture

- Hexyl acrylate
- 1,3-butanediol diacrylate
- AMPS
- Acetonitrile/ethanol/phosphate buffer 5 mM
- Benzoin methyl ether (BME)

Introduction
by
capillarity

UV irradiation at 365 nm

2 min only !



Mechanism of BME under UV irradiation

Major mechanism :

homolytic bond cleavage
→ Polymerization in solution

Monolith synthesis

Minor mechanism :

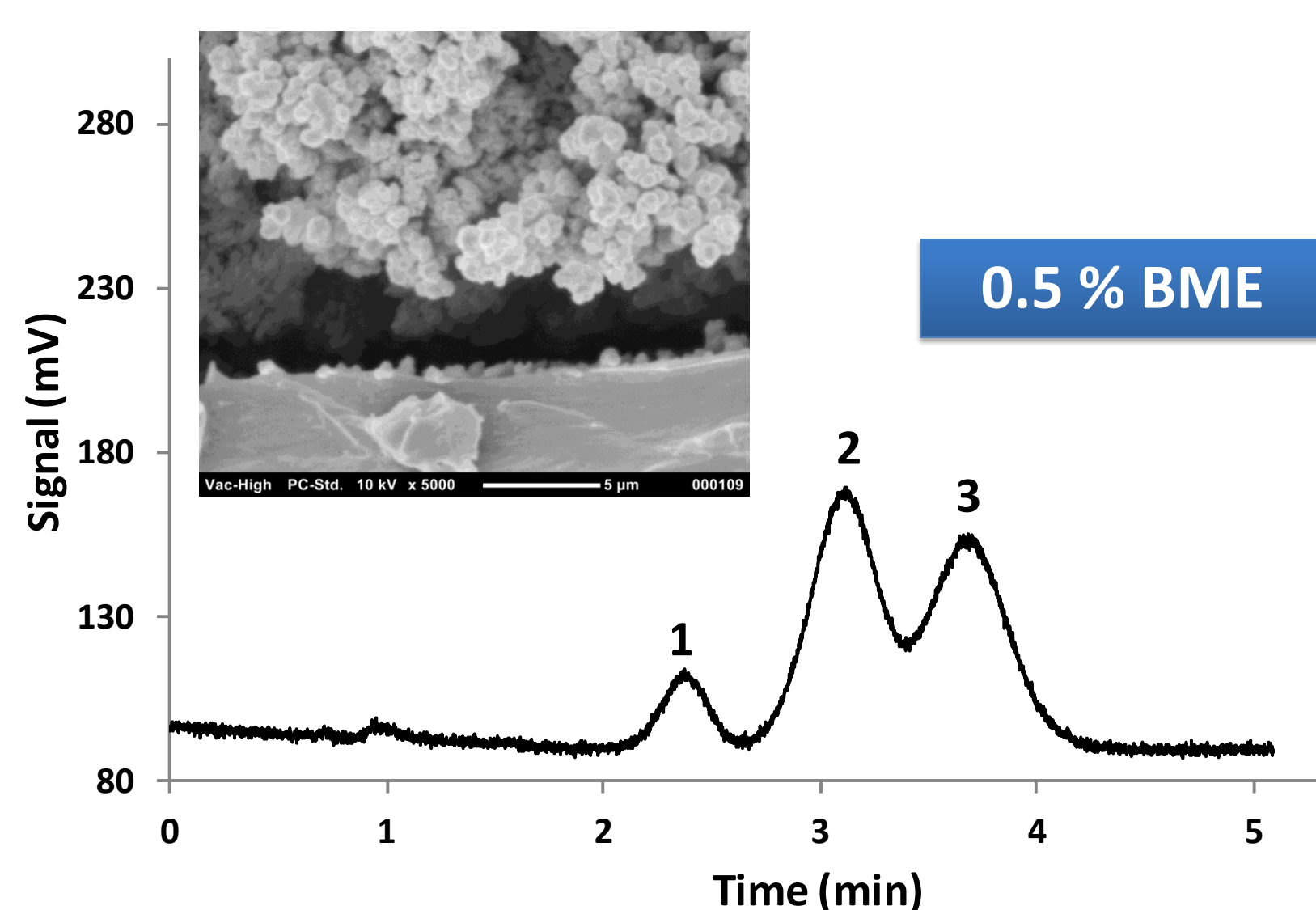
Hydrogen abstraction from COC
→ Grafting monomers from COC

Anchoring on COC

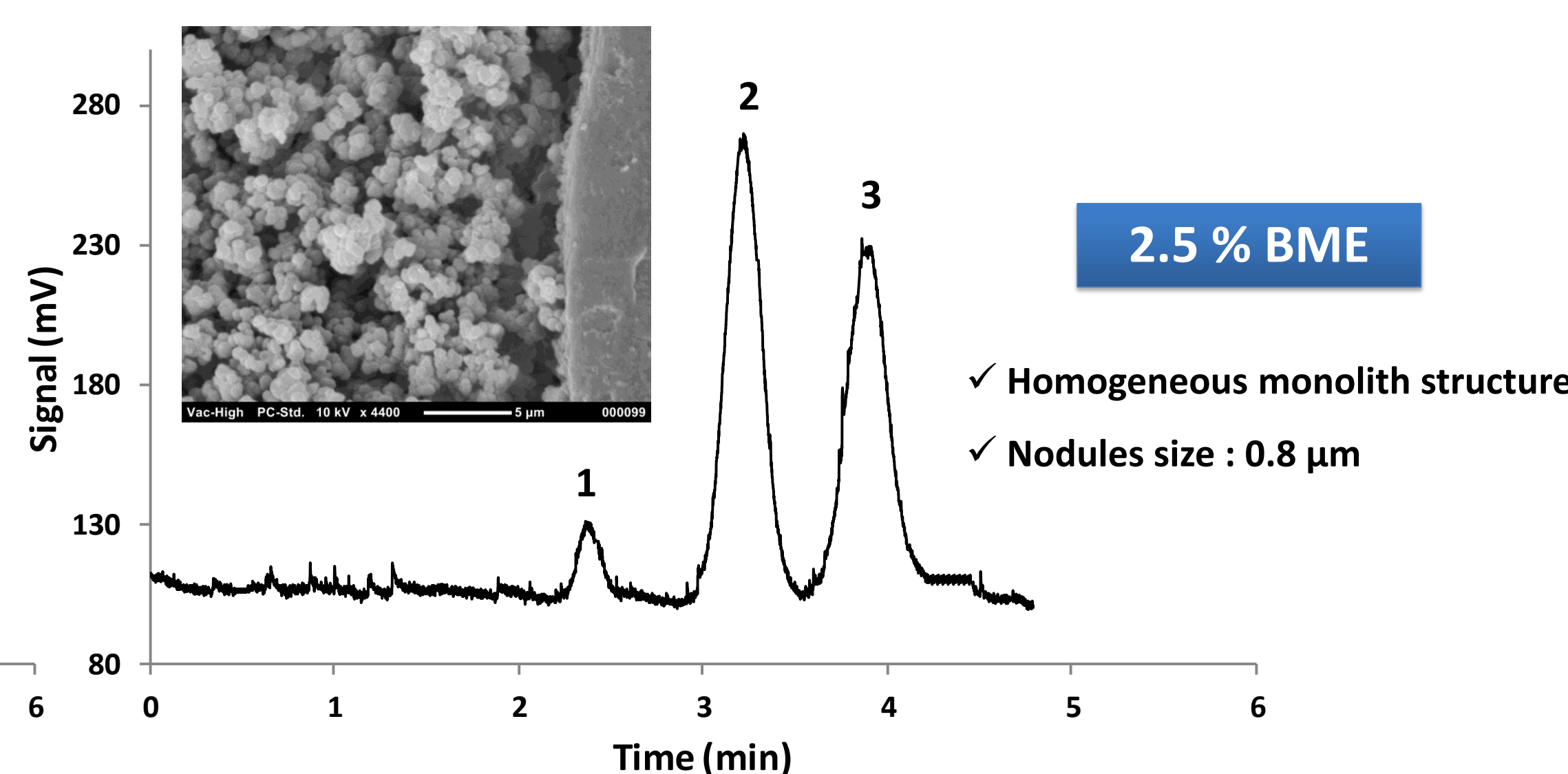
One pot method to synthesize and to graft monolith on COC

✓ Impact of minor mechanism depends on BME concentration

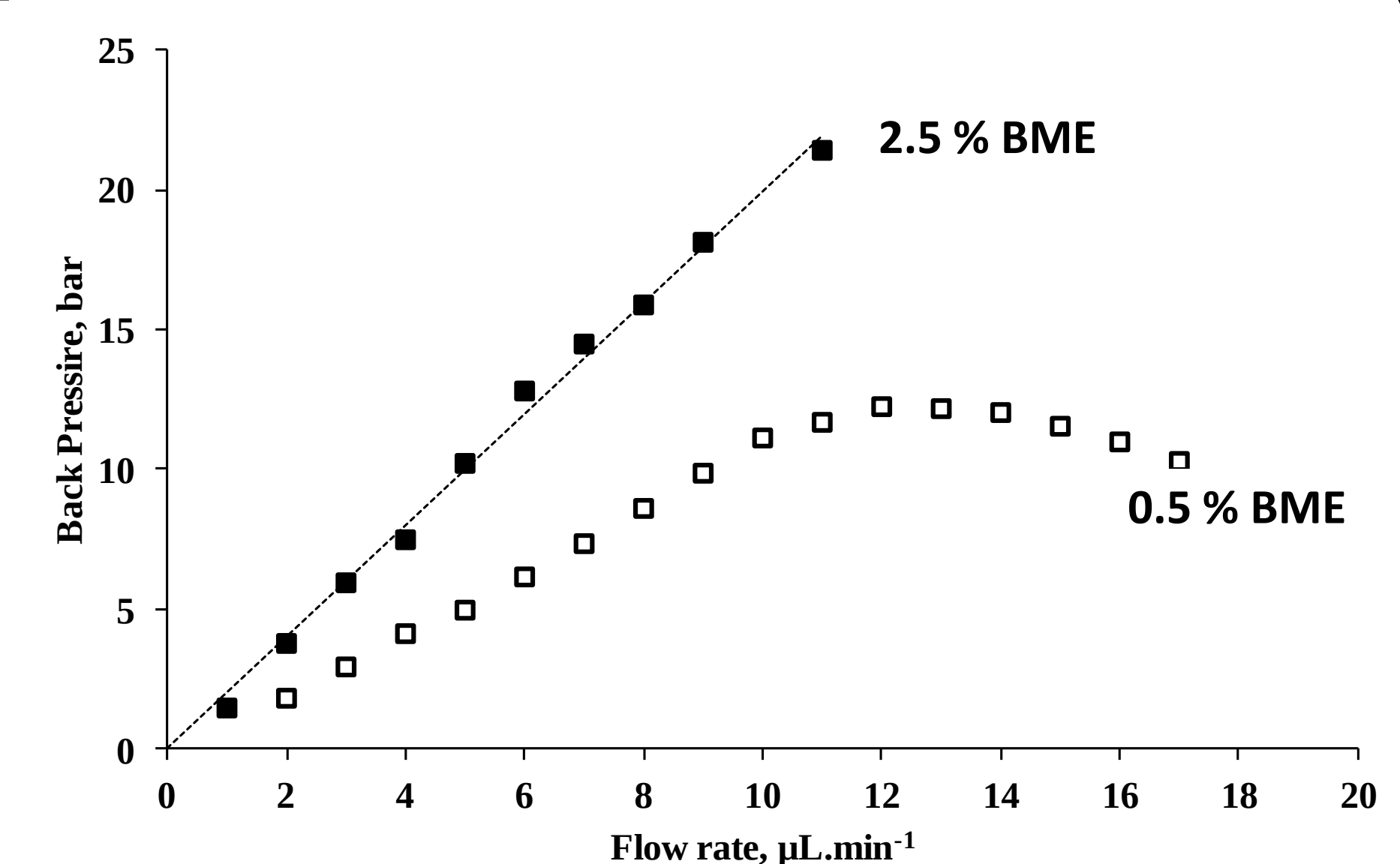
Influence of BME concentration on performances



Separation of 3 polycyclic aromatic hydrocarbons (1. anthracene, 2. fluoranthene, 3. pyrene). Mobile phase 70/30 (v/v) ACN/water + 2 mM $\text{NH}_4\text{H}_2\text{PO}_4$ + 5 mM LIDS. Electric field : 370 V/cm. Channel of 75 μm x 75 μm x 8.1 cm.



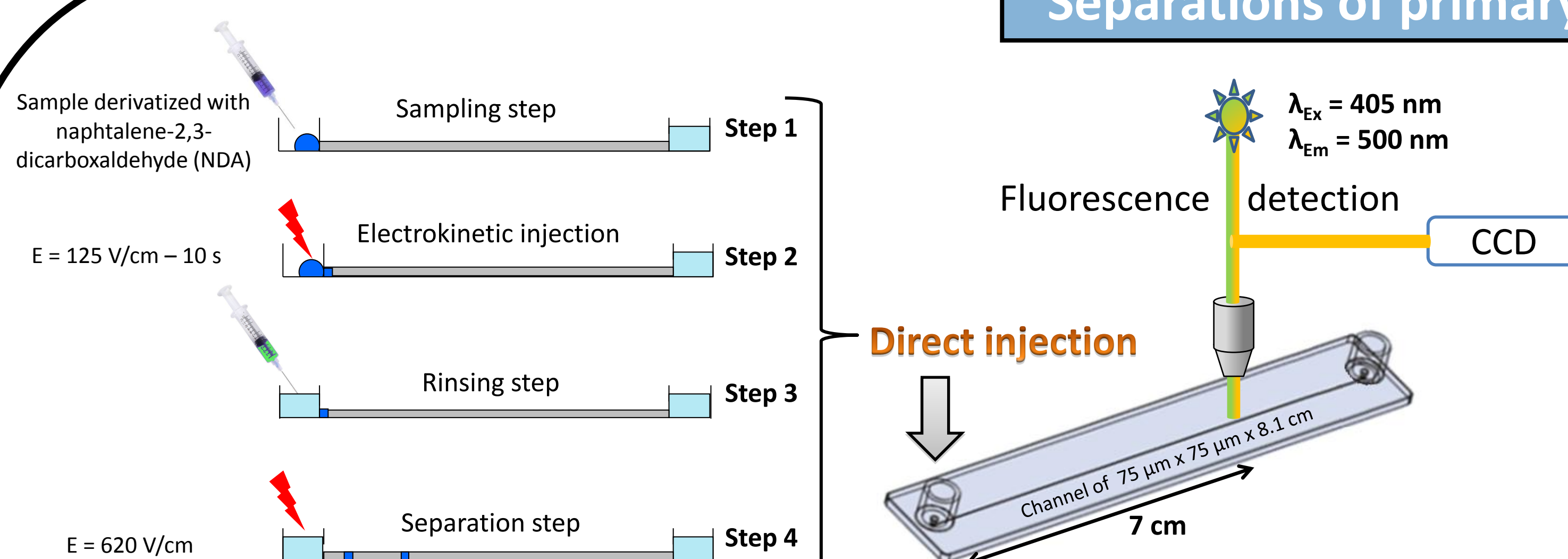
✓ Homogeneous monolith structure
✓ Nodules size : 0.8 μm



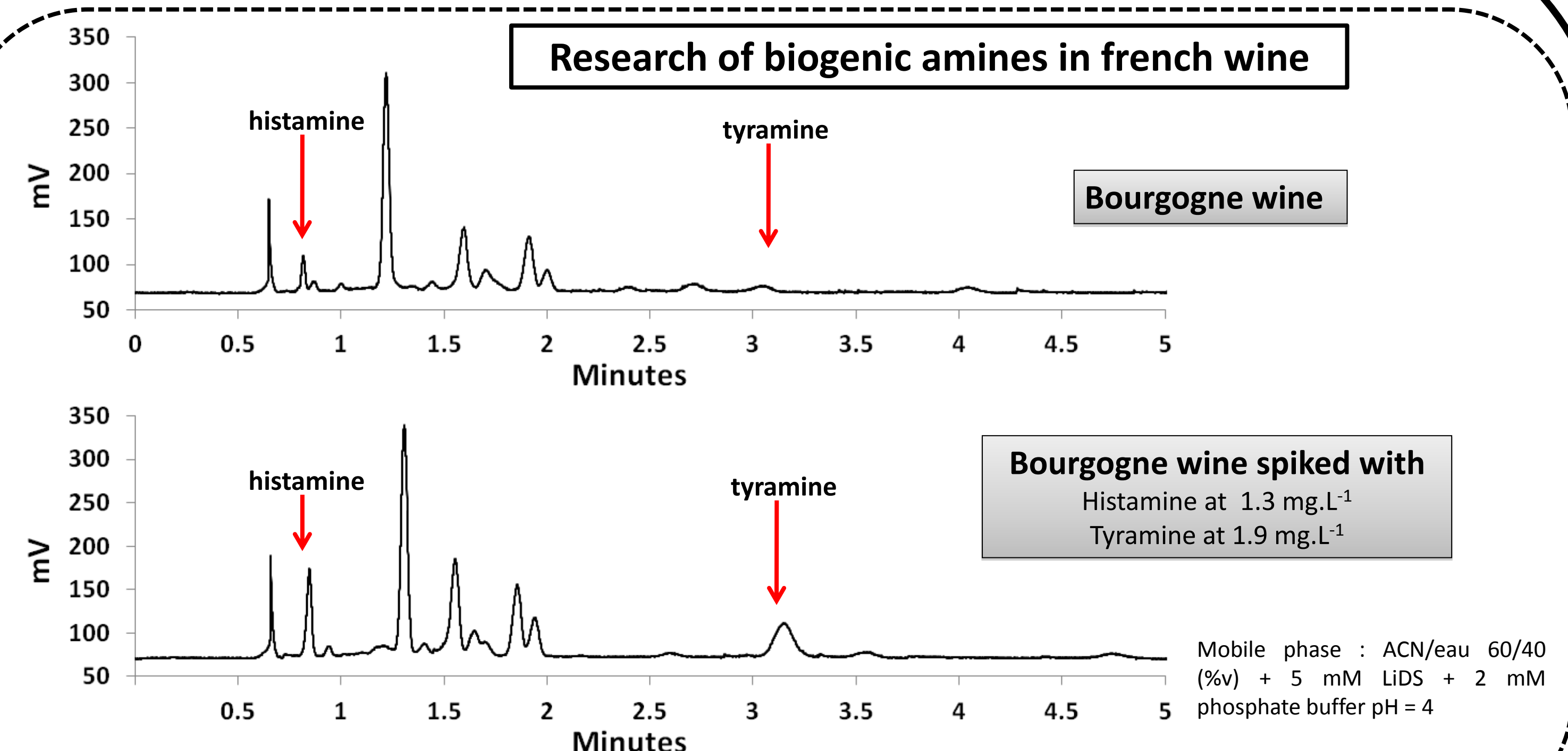
Channel of 250 μm x 450 μm x 4.5cm. Mobile phase : 100% ACN

✓ Good grafting = good separation + pressure resistance

Separations of primary amines in COC microchip

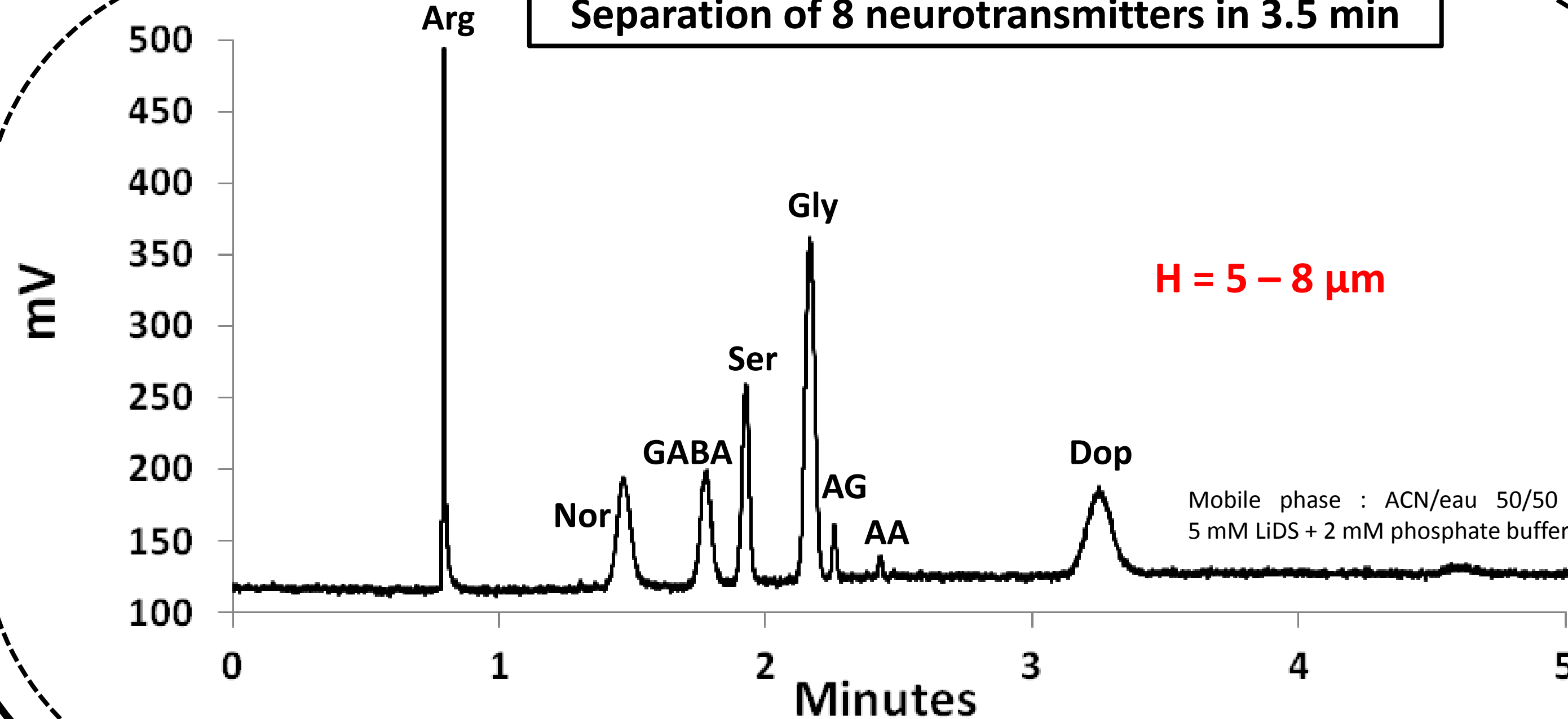


Research of biogenic amines in french wine



✓ Presence of 0.6 mg/L of histamine and 0.4 mg/L of tyramine in Bourgogne wine

Separation of 8 neurotransmitters in 3.5 min

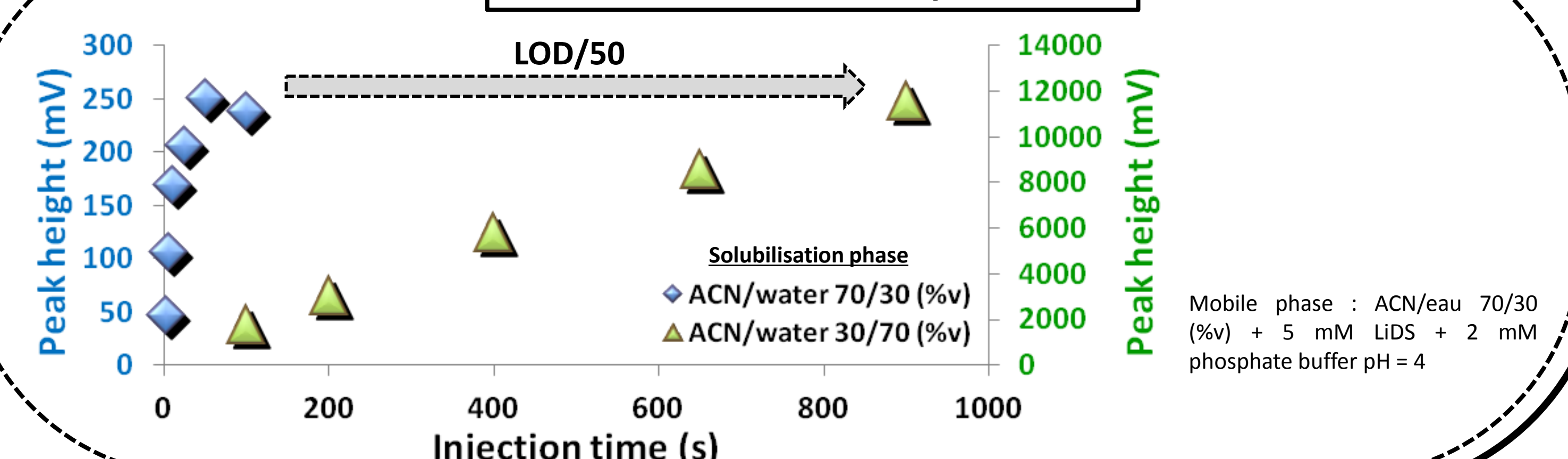


H = 5 – 8 μm

Mobile phase : ACN/eau 50/50 (%v) + 5 mM LIDS + 2 mM phosphate buffer pH = 4

✓ Others separations : biogenic amines, catecholamines, amino acids

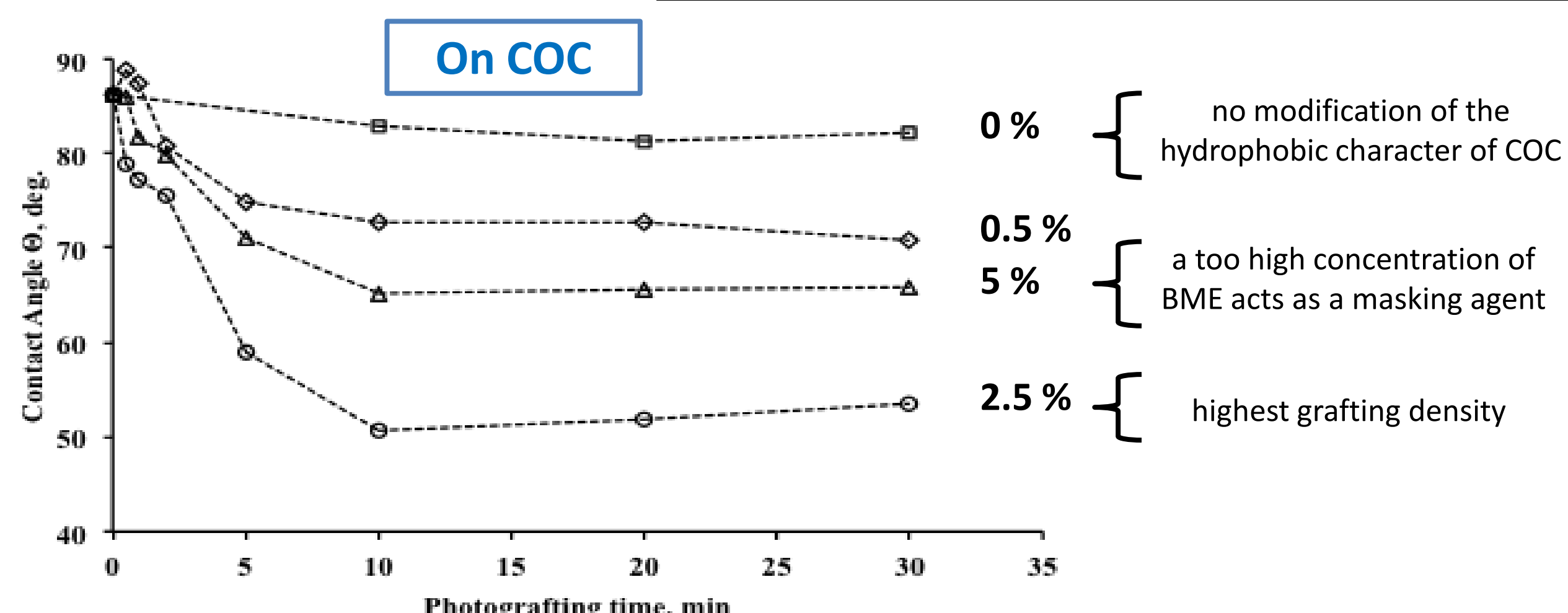
Preconcentration of tyramine



Mobile phase : ACN/eau 70/30 (%v) + 5 mM LIDS + 2 mM phosphate buffer pH = 4

Other applications of the one-pot method : hydrophilic modification with PEGMA

On COC



Effect of irradiation time and initiator concentration on average water droplet contact angles (n=3). Initiator (BME) concentration from 0-5 wt %. 0.1 M PEGMA in acetone.

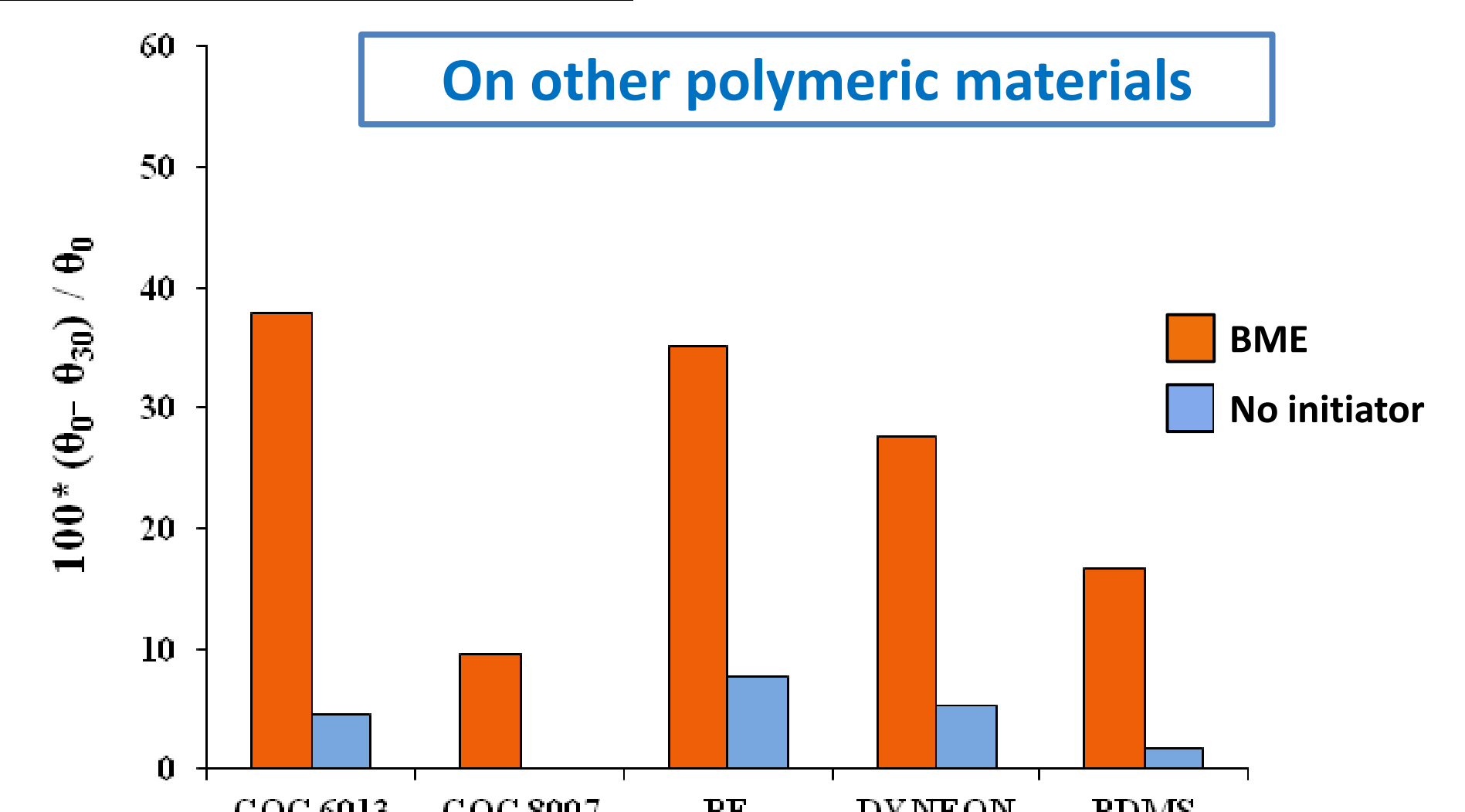
Other possible monomers

- ✓ PEGDA
- ✓ MAPS
- ✓ GDMA
- ✓ Acrylic acid
- ✓ All hydrophilic monomers !

Other possible photoinitiator

- ✓ AIBN

On other polymeric materials



PEGMA 0.1 M. Irradiation 30 min (2.7 J/cm²). Photoinitiators : 2.5 % (w/w of monomers).