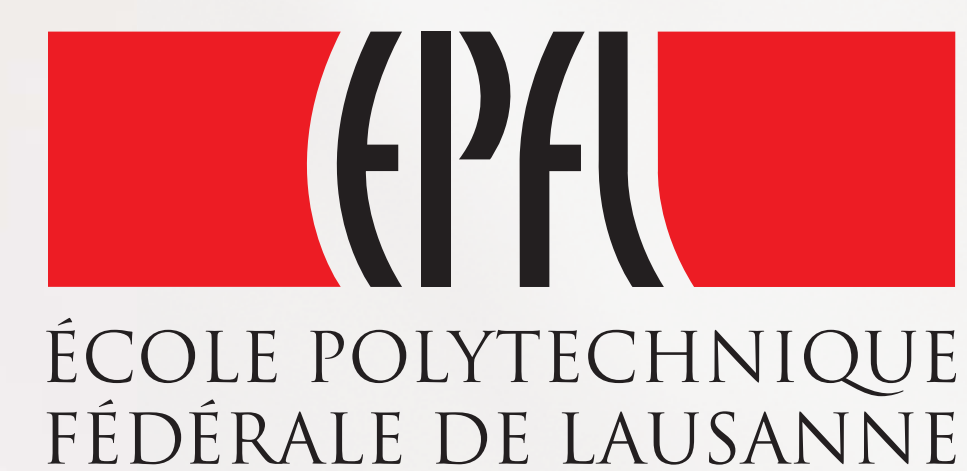


In-liquid pairwise self-assembly of SU-8 based building block

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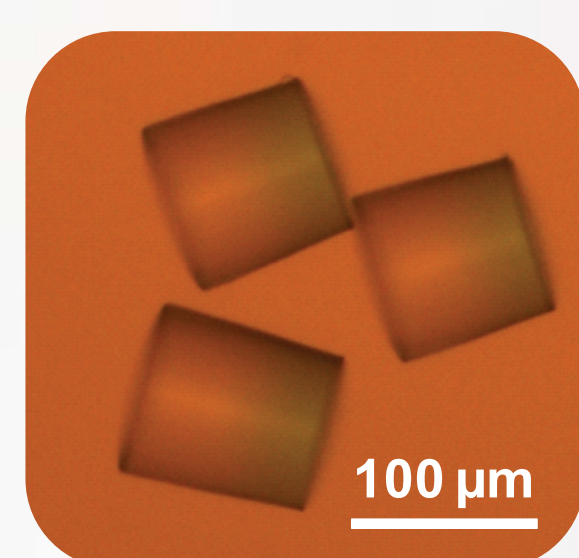
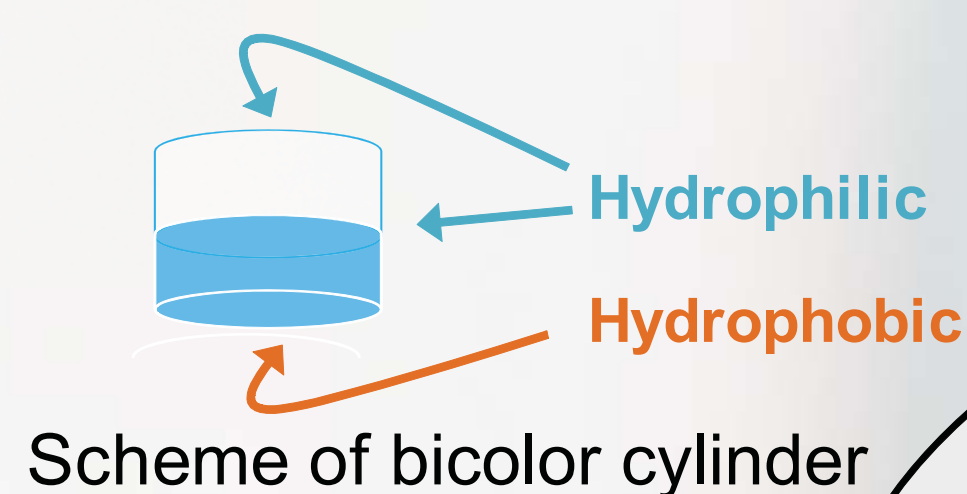
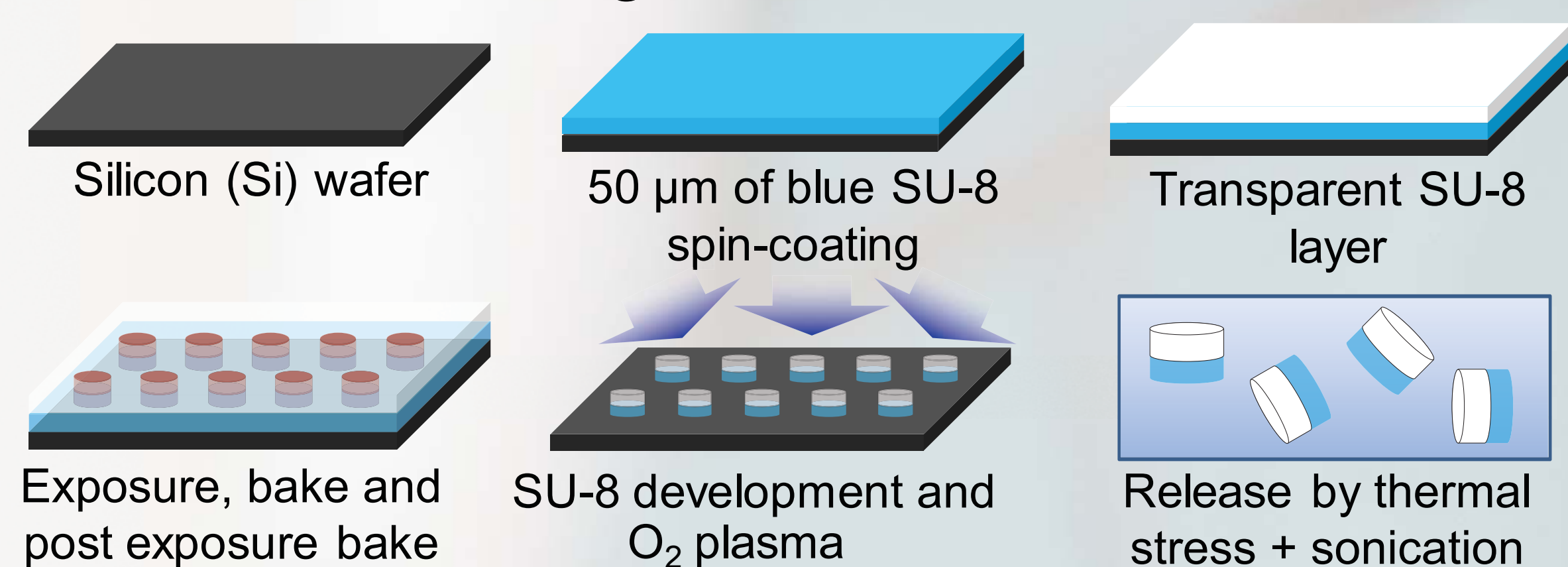


Abstract

Going from milli to micro scale, the traditional pick and place method for assembling compounds becomes very expensive and difficult. At micrometer scale it is then very important to have other assembling methods, such as liquid mediated self-assembly (SA). [Whitesides, 2002]

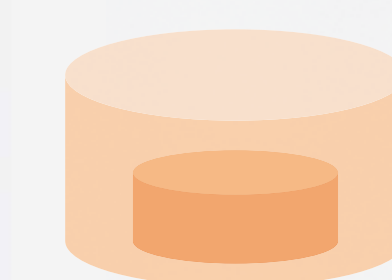
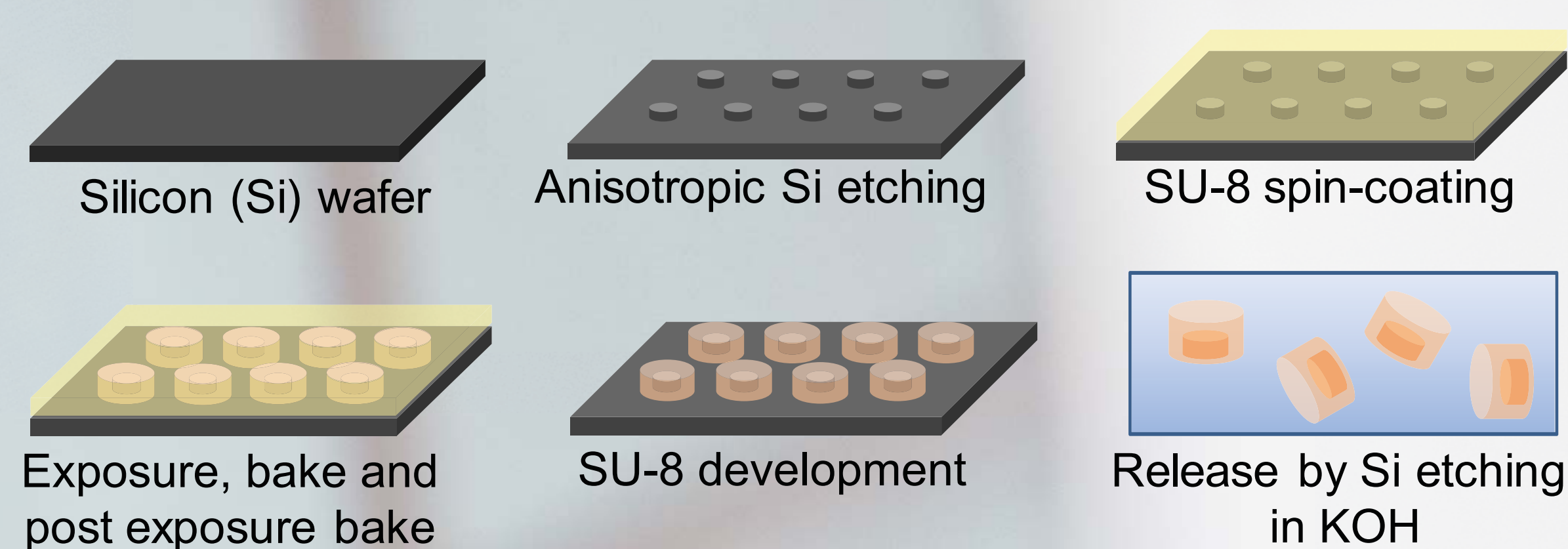
This work presents the ability to selectively self-assemble bicolor bulk cylinders using face-selective hydrophobic effect and to self assemble half-capsules using capillary forces that can be polymerized by UV curing. 98% of face selective SA was achieved.

Bicolor cylinder fabrication

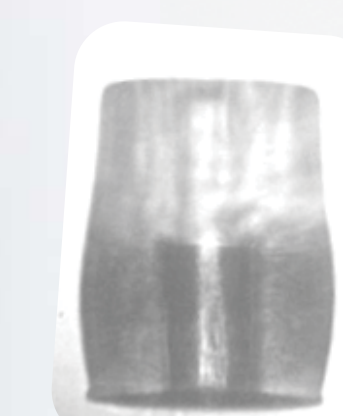


Optical image of cylinders

Half-capsule fabrication



Scheme of half-capsule



Optical image of half-capsule

Self-assembly (SA) driving forces

Principal forces used for milli- to nanoscale SA [Mastrangeli 2009]:

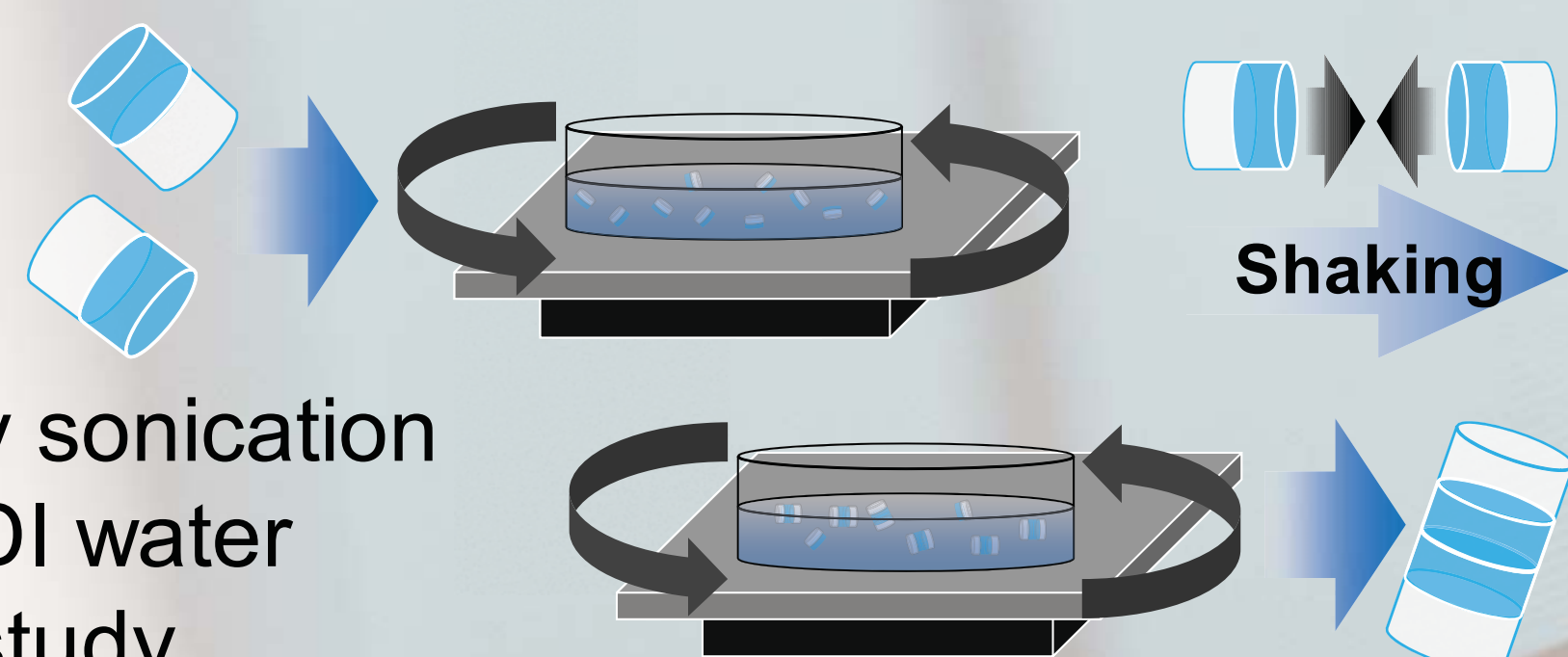
- Contact forces: **Capillary (intermediate phase)**
- Short range forces: **Hydrophobic effect**
- Long range forces: Capillary (liquid/gas interface), Magnetic, Electrophoretic, Dielectrophoretic

Hydrophobic effect

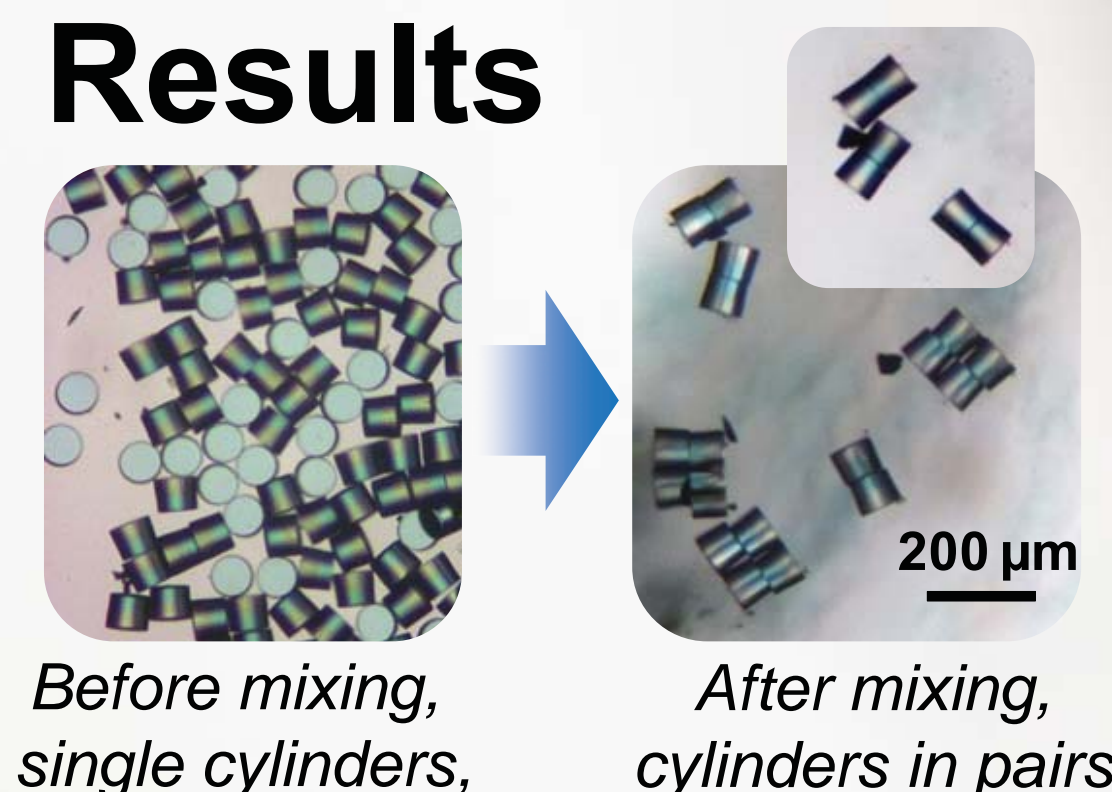
Experiment

Process:

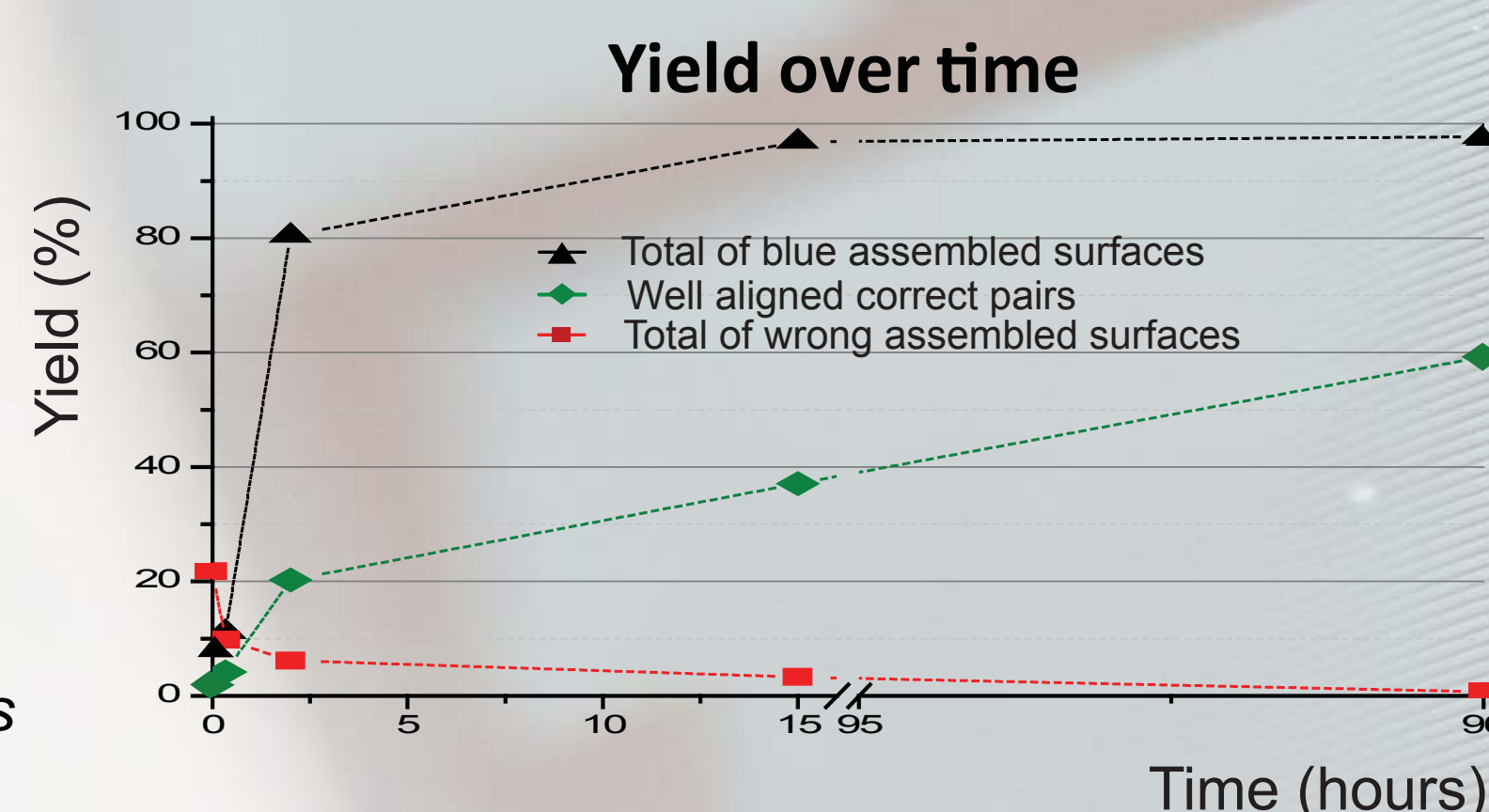
- Cylinder release by sonication
- Orbital shaking in DI water
- SA time evolution study



Results



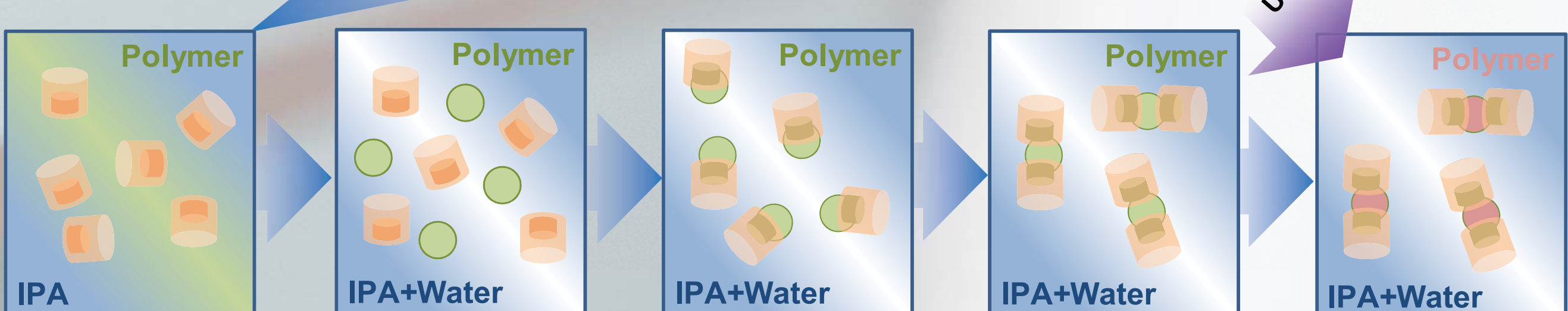
- 60 % of well aligned correctly assembled pairs
- 98 % of blue-blue surfaces met
- < 1 % white-white/white-blue
- Good reproducibility



Capillary interaction

Experiment

Process:



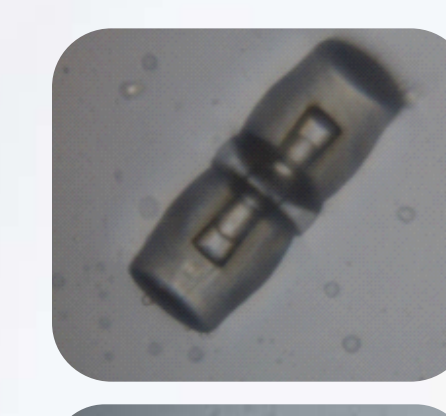
- Photocurable polymer dissolved in IPA with the half-capsules
- Adding DI water
- Polymer condenses onto surfaces
- Shaking → half-capsules assemble
- UV-curing

Results

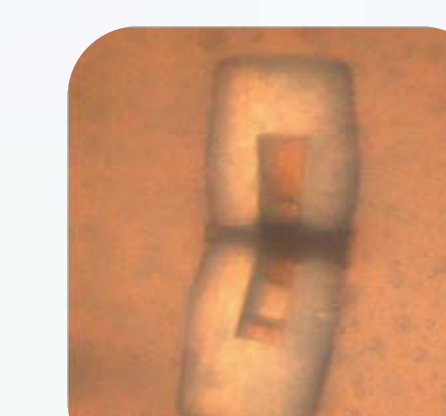
- Capsules sealed
- Half-capsules self-assembled



Polymer condensed



After shaking, self-assembled capsules



After UV curing, sealed capsules

Conclusions

- Face selective SA, yield of 98%
- SA using hydrophobic effect
- Pairwise SA
- Self-assembled half-capsules
- SA using capillary forces
- Solid capsules (sealed)

Acknowledgements

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