Group : Responsive Polymers

Project : **Self-healing antifouling fluorinated polymer brushes**

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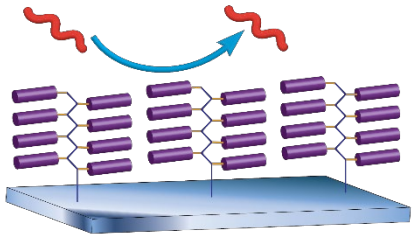
Introduction



The undesired deposition of material on surfaces can have large impacts on the performance of those surfaces. For example, deposition of particles on the nozzle can clog a print head, resulting in less defined edges or spray patterns when printing. To prevent this clogging, an antifouling coating is applied on the edges of the nozzle. The current coatings are all non-covalently applied, and are slowly washed off during usage. A covalent coatings is therefore preferred.

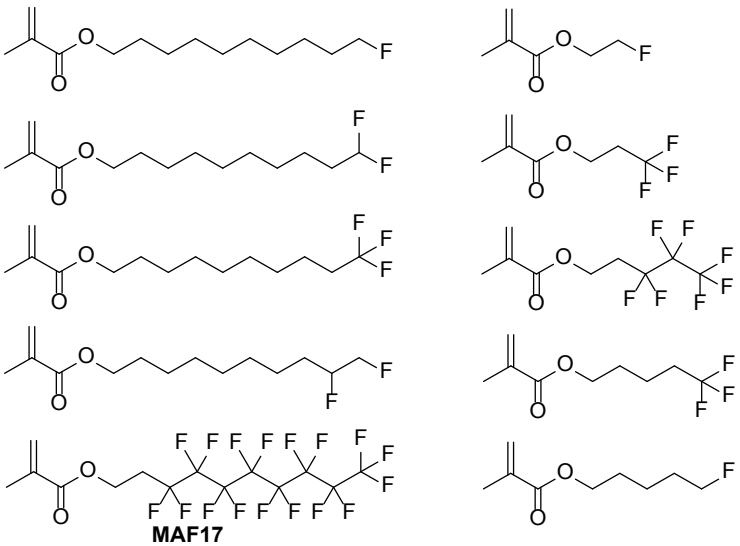
In this research, we aim to find a durable antifouling coating. For this, we investigate fluorinated polymers that are covalently bound to a surface. By being covalent, they are robust and can withstand the sheer forces that occur when spraying ink with high pressure. Fluorine is used to repel the polymeric nature of the ink[1] and so prevent clogging.

Currently, we have produced polymers with the monomer MAF17 (see figure below).[2] This coating shows good antifouling behavior, and has self-restoring properties, making it extra durable. It does contain a large amount of fluorines, which is environmentally undesired. Therefore, we would like to investigate whether methacrylates with less fluorines behave similarly.

Topics to be studied

Depending on the wishes of the student, one or more of these topics can be included in a thesis project:

- Design and synthesis of new monomers.
- Growth of polymers and copolymers onto a silicon surface.
- Testing the antifouling ability of one or more coatings with a selection of fouling solutions.
- Testing the self-healing ability of one or more coatings with a variety of damaging procedures.



Proposed monomers that may be investigated.

Techniques to be used

- General organic synthesis techniques such as reaction set-up, TLC, column chromatography, GC-MS and NMR.
- Surface modification techniques such as plasma cleaning, fluoride etching, grafting, ATRP.
- Surface characterisation techniques such as water contact angle measurements, Ellipsometry, XPS, XRD, AFM and IRRAS.

There is no need to be familiar to all these techniques beforehand.

References

(1) Wang, Z.; Pujari, S. P.; Van Lagen, B.; Smulders, M. M. J.; Zuilhof, H. *Adv. Mater. Interfaces* **2016**, *3* (4), 1–10.

(2) Wang, Z.; Zuilhof, H. *J. Mater. Chem. A* **2016**, *4* (7), 2408–2412.

More information

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