

Polymer brushes are special kind of coatings, where polymer chains are densely attached resembling forest or a brush. They have unique lubricating and antiadhesive properties against contaminations. They have been applied as implant coatings reducing friction between joints, or in biological sensors. They may also be used as ship coatings to prevent attachments of marine organisms. Unfortunately, polymer brushes have limited stability and they tend to detach or delaminate. It is believed behind this instability is water reacting with chemical groups holding polymer chains. Typical solution involves an extra protective layer, impermeable to water. This, however complicates the synthesis and does not provide 100% protection. These groups are nevertheless a common feature of initiating groups used to generate polymer brushes.

This project explores poly(vinylidene fluoride) as initiating coating. Fluoropolymers are polymers of unbeatable thermal and chemical stability. Fluorocarbon elastomers, for example, are commonly used in fuel hoses and combustion engine gaskets. In these examples, standard isoprene rubber would fail. Fluoropolymers are rather uncommon initiating material, however surprisingly active for polymerization. Polymer brushes generated from fluoropolymers lack groups susceptible to reaction with water. High stability of fluoropolymers is also very advantageous. The application process on a substrate is simple. The strategy has therefore huge application potential.

The generated polymer brushes will be studied to assess their stability in water and organic solvents. They will be tested against adsorption of microorganisms, as antifouling coatings. They will also be tested for their antifogging and anti-icing properties. The thickness and morphology of the coatings will be assessed before and after the tests. The operating stability is expected to be multiple times increased. The developed polymer brushes could find application wherever fluoropolymers are already applied: coatings of skyscraper windows, antifouling coatings, gaskets and parts of engines, separating membranes or battery components.