

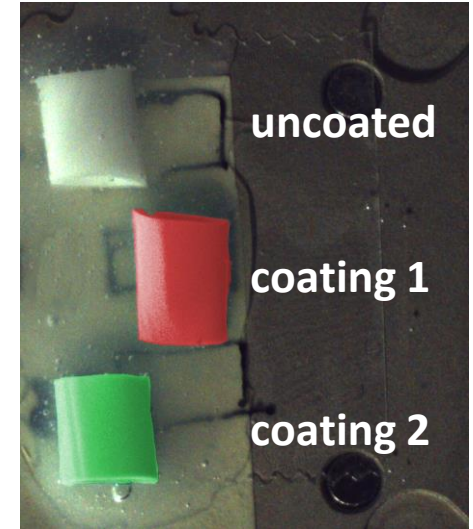
Nanomechanical investigation on polymer- coated medical tubings

Polymeric Coatings in Medical Devices

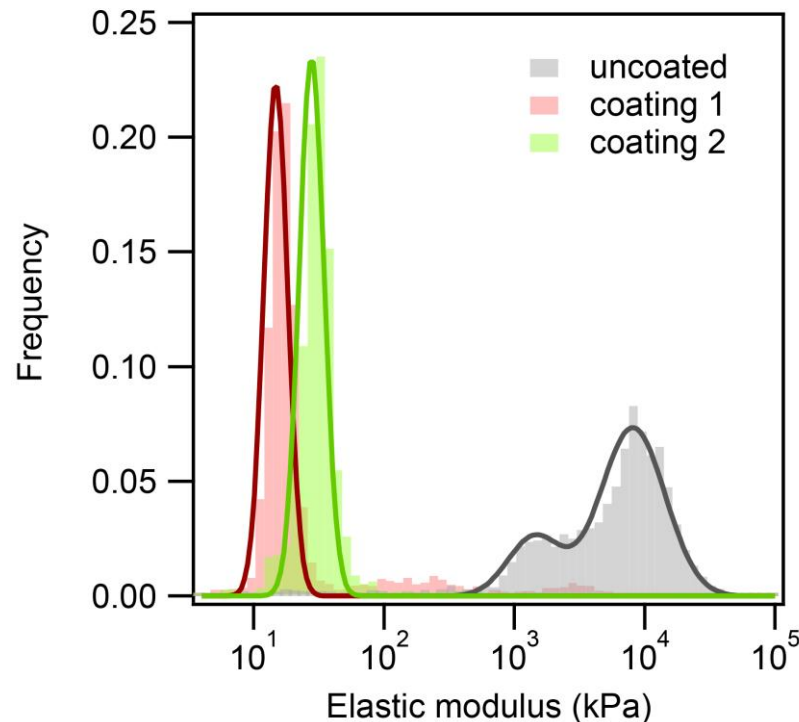
- Implanted medical devices are often coated with polymeric materials for various reasons
 - Improved lubrication
 - Improved wettability
 - Anti-fouling / anti-microbial properties
 - Drug delivery
 - Improved biocompatibility / foreign body response for implants
- Coatings could be e.g. polymeric layers, polymer brushes, or hydrogels
- Nanomechanical analyses help understanding the effects of such coatings

Flex-ANA Measurement Conditions

- Tubing samples were mounted in a plastic petri dish using two-component epoxy glue
- Samples were rehydrated in PBS for 16h prior to measurements in PBS
- Measurements were performed on a Flex-ANA system equipped with gold-coated Nanosensors ContSCAuD
- Cantilever calibration prior to Flex-ANA measurements:
 - Spring constant: 0.154 N/m
- Parameters of Flex-ANA measurements:
 - Ramp size: 2 μm
 - Ramp velocity: 4 $\mu\text{m/s}$
 - Force setpoint: 2 nN
 - Map dimensions: 15 μm x 15 μm , 32x32 curves



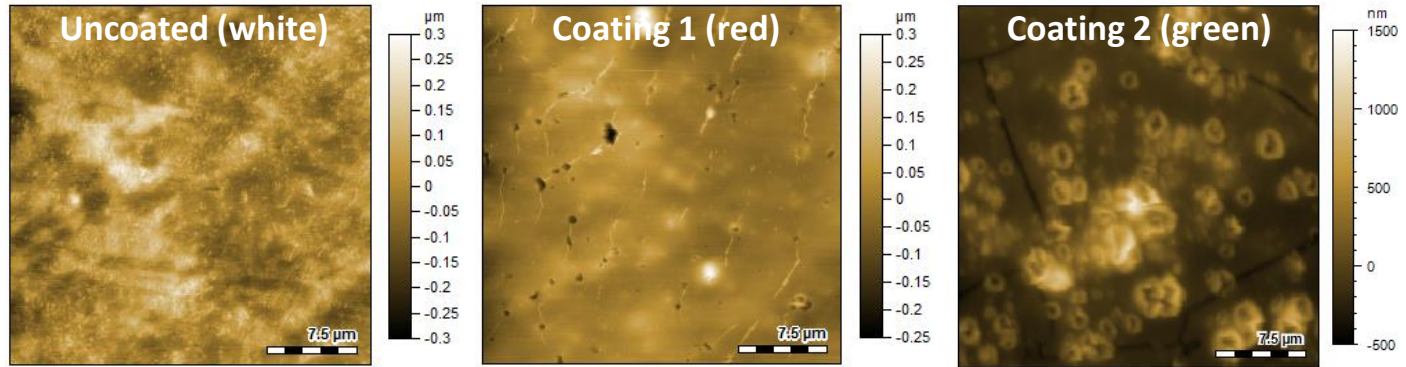
Elastic Modulus From Flex-ANA Measurements



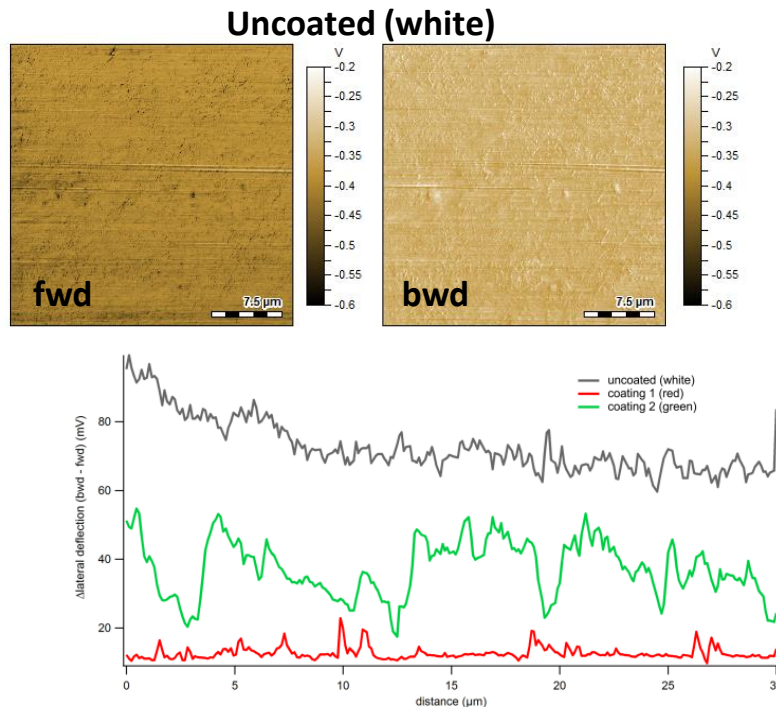
- The histograms show the results of 3-4 areas investigated for each sample. The areas were 15 μm x 15 μm in size and on each area 1024 single measurements were recorded.
- The elastic modulus of the uncoated sample varies depending on the area investigated, which in the pooled data of the histogram results in a bimodal distribution.
- The elastic modulus determined on the uncoated sample is about two orders of magnitude higher than for the polymer-coated samples.
- The elastic modulus of sample with coating 1 is about a factor of two smaller than that of sample with coating 2

Additional Information From AFM Imaging

Topographical information and sample roughness



Friction properties from lateral deflection measurements



- Polymer coating reduces the surface friction of the tubing.
- The different coatings reduce friction to different degrees.