Gelatin hydrogel elastic modulus measurements

nanosurf

On Hydrogels

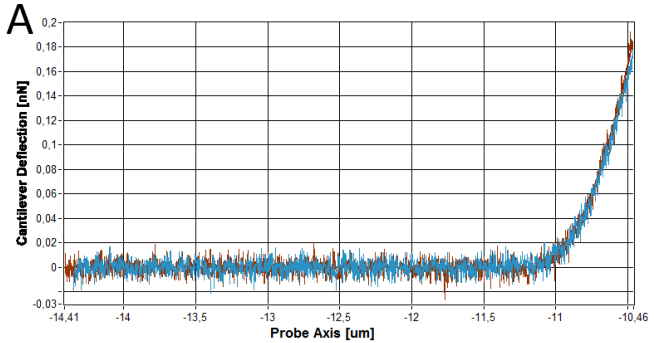
- Hydrogels are composed of two components – a cross-linked polymeric structure and water that causes swelling
- Hydrogels can be used to mimic biological media and tissues
- Properties of hydrogels can be tuned for their mechanical properties under stress to range from very elastic to very viscous
- Hydrogels are used in a variety of industries
    - Food, e.g. food packing, tuning of food texture, incapsulation of oil
    - Pharmaceuticals, e.g. drug incapsulation and delivery
    - Medical devices, e.g. contact lenses, coatings on implants, biosensors
    - Biological sciences and tissue engineering, e.g. tunable cell culture substrates and matrices
- The gelatin gels tested here are supposed to be used as cell culture substrates. Cells respond to the properties of their surrounding, which can e.g. influence differentiation processes (Engler A et al. (2006) Cell 126(4) 677)

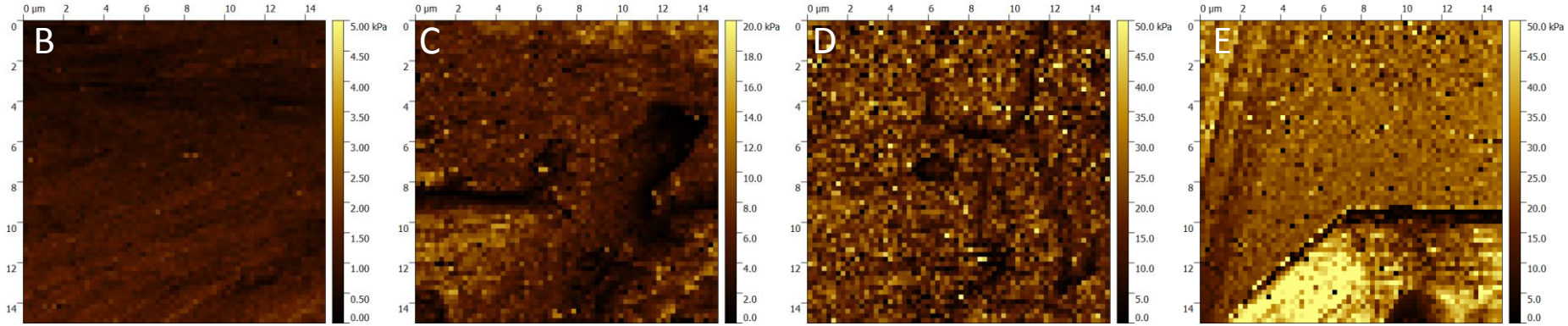
Measurement Conditions

- Measurements were performed using an automated Flex-ANA system equipped with Nanosnesors qp-SCONT cantilevers
- The gelatin gel samples were attached to a glass bottom petri dish and rehydrated in ddH_2O overnight
- Flex-ANA measurement parameters
  - Ramp size: 4 µm
  - Ramp velocity: 4 µm/s
  - Force setpoint: 200 pN
  - Map size: 30 x 30 μm^2, 64 x 64 force curves

Elastic Modulus Maps Obtained on Different Gelatin Gels

- Example force distance curve (A) recorded on the 0.2% gelatin gel shown in (B)
- Elastic modulus maps recorded on gels containting 0.2% (B), 0.3% (C), 0.4% (D), and 0.8% (E) gelatin
- Some minor contrast is visible in the modulus maps of all gels. This could be due to cutting the sample during preparation





Elastic Moduls Analysis

- Force distance curves (fwd direction) were analyzed using the Hertz model
- The elastic modulus increases with gelatin concentration
  - The modulus vs. concentration diagram (B) reports the mean ± SD modulus obtained from fitting the histograms (A)
  - The dashed line represents a linear fit to the data that is weighted by the SD