Materials for nanofiber- based probes

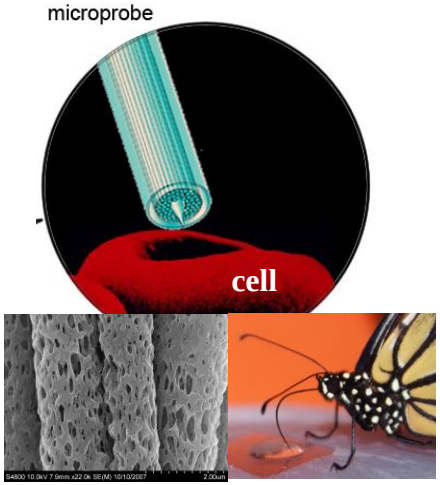
This research helps develop a new class of fiber-based materials and devices capable of probing and transporting previously impossible-to-reach liquids, such as those drawn from a single cell or tissue. The basic principles can be used in a wide range of absorbent materials, as in applications requiring low-volume fluid retrieval and analysis coupled with controlled manipulation, such as environmental monitoring and biomedical and forensic probing.

Materials for nanofiber-based probes

Kornev's lab

- **Strategic goal:** Design of the nanofiber-based probes for extraction of minute amounts of biofluids from microcapillaries and cells

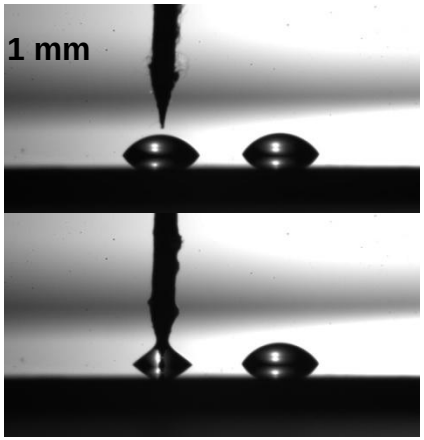
Current focus on:
Study of wetting and absorption properties of these probes. Research on absorption-induced stresses as the signature of absorption process.

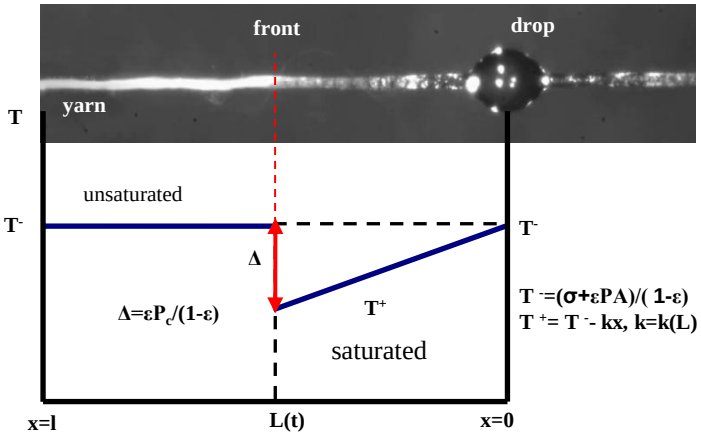


Microyarn as a probe

The microprobe is equipped with a nanosharp tip for cell piercing. In order to pick the bofluid, we use the principle of liquid absorption used by butterflies and moths. Because of the strong capillary action, the fiber pores pull the biofluids inside.

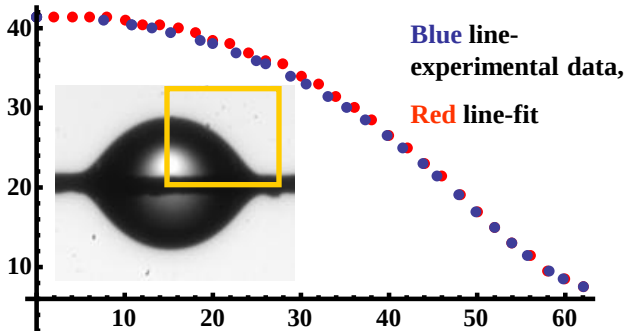
Drop absorption by probes





Tension distribution in the yarn during wicking experiment. JCIS,2010

3-D contact angle fitting for drop on the fiber.

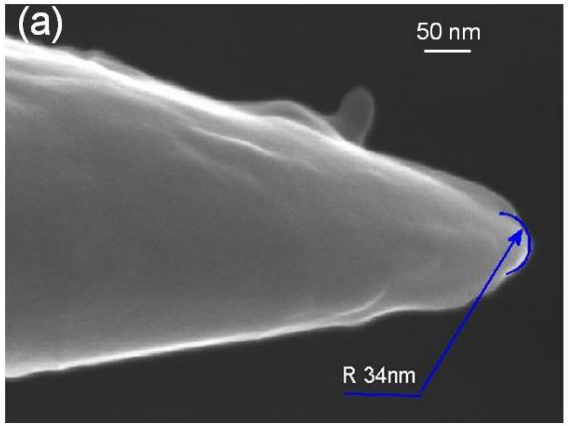


Group members: Monaenkova, Andrukh, Tsai

Collaborators: Adler (CU), Luzinov (CU)

Tip profile

Using electropolishing, we produced sharp nanotips with conical shape and smooth surface with radius less then 50 nm (Fig. 3 (a,b)), also by controlling current we can obtain different length of the tips from 0.3 to 1.8 mm (Fig.3 (c,d)).



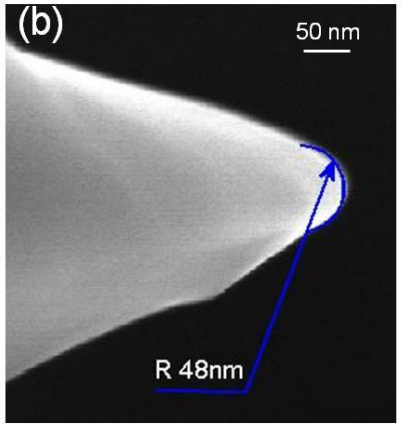


Figure 3. SEM images of tungsten tips
a) radius of the tip 34nm,
b) radius of the tip 48nm,
c) ~380μm length of the tip,
d) ~1300μm length of the tip