Micron scale toner particle characterization

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SCOPE
Senior Capstone Program in Engineering

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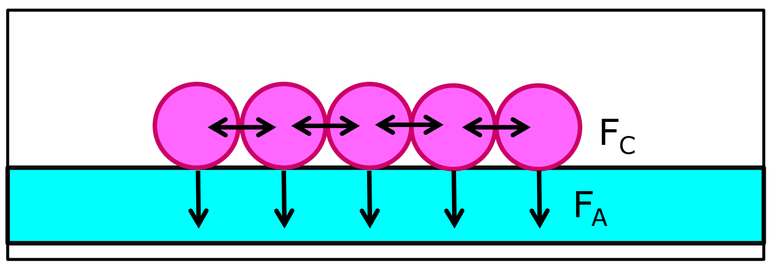
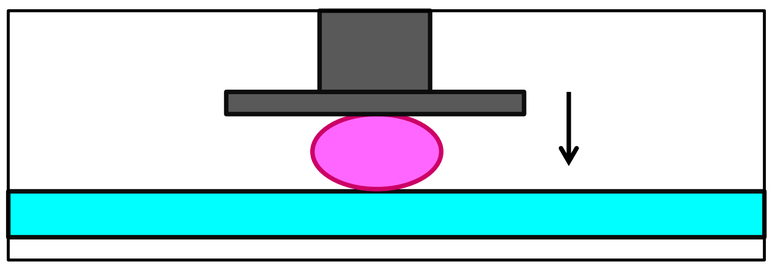
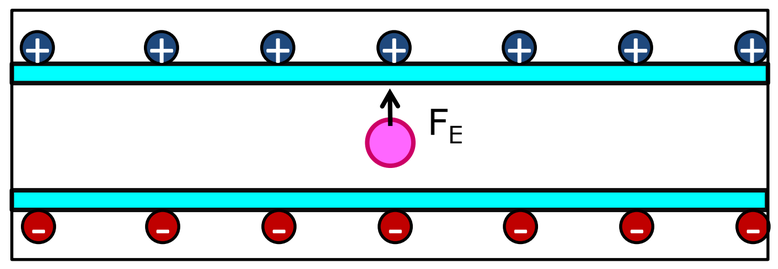
Goal: Better understand the microscale properties of toner

Research the effectiveness and viability of using colloid probe atomic force microscopy as a method for characterizing relevant toner properties on a microscale







Adhesion/Cohesion- The tendency of toner particles to stick to other toner particles and substrates.

Stiffness/Damping- Resistance of toner to stress and the energy absorbed by a strained particle.

Electrical Properties- The surface charging and field response of a toner particle.

Colloid Probe AFM

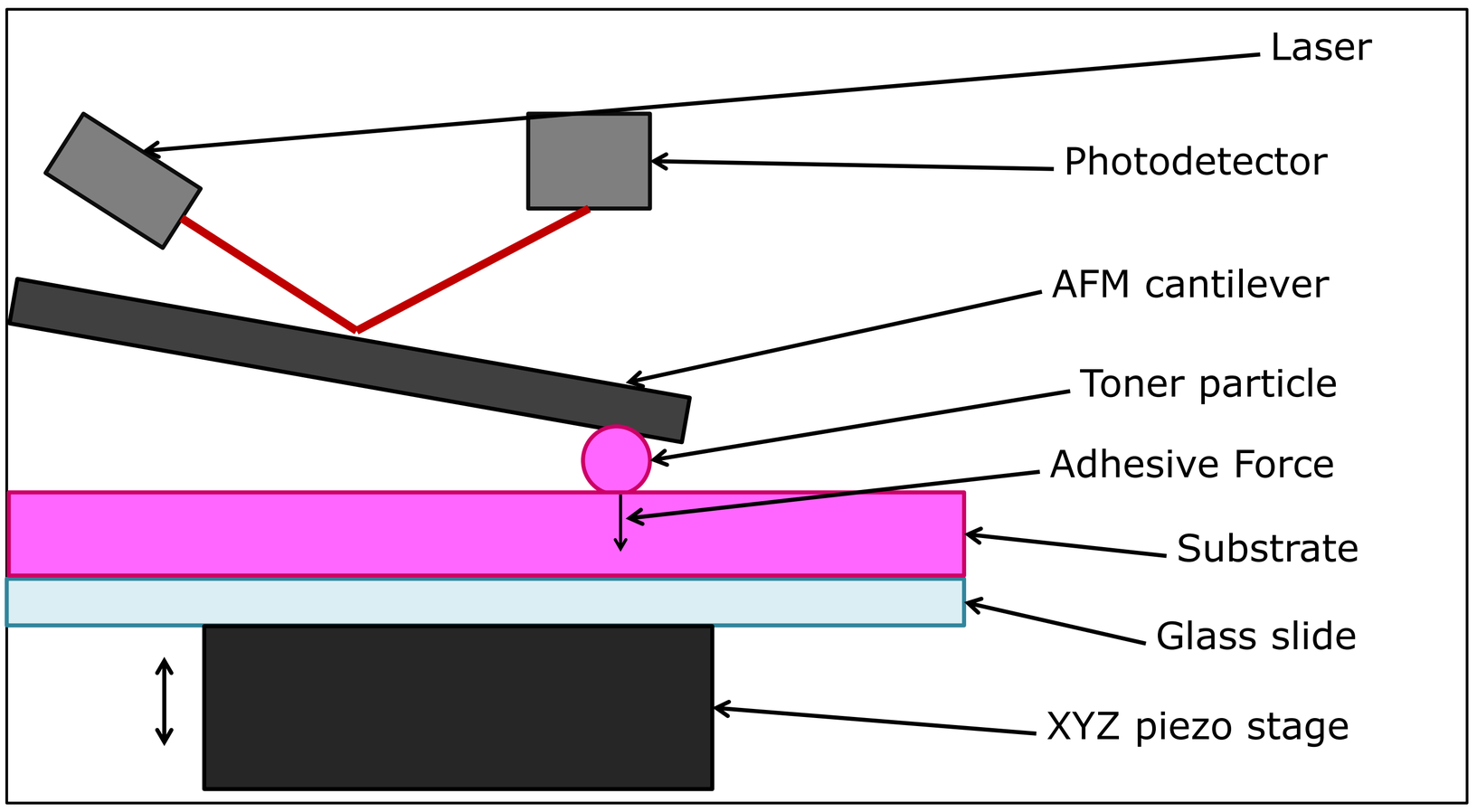
Colloid probe atomic force microscopy is a method of measuring forces on colloidal particles.

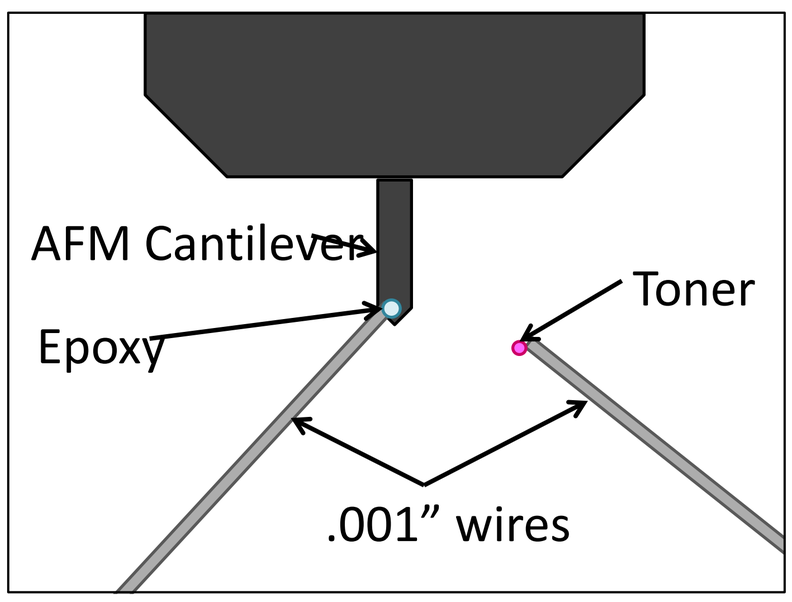
1. Toner particle is attached to AFM

2. Cantilever is loaded into AFM, brought in contact with substrate

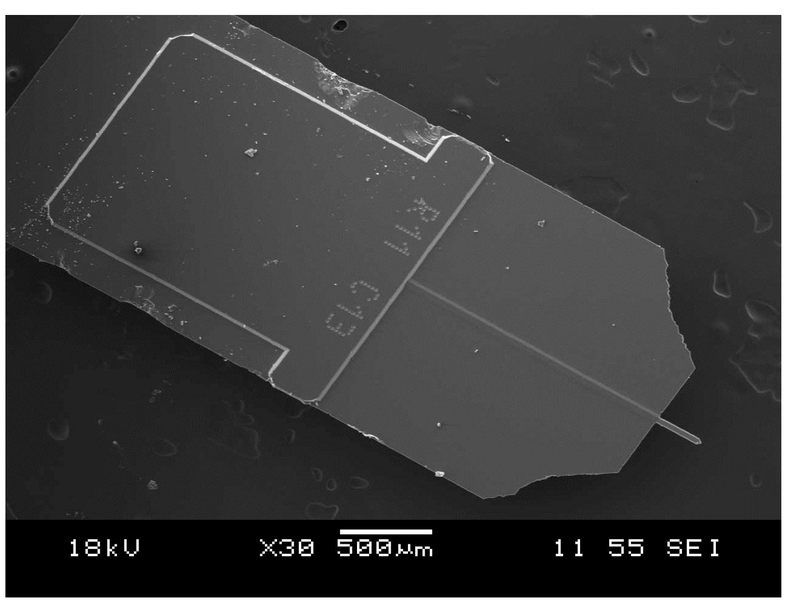
3. Substrate moved away, adhesive force causes cantilever bending

4. Bending measured by laser position sensor, used for force calculation

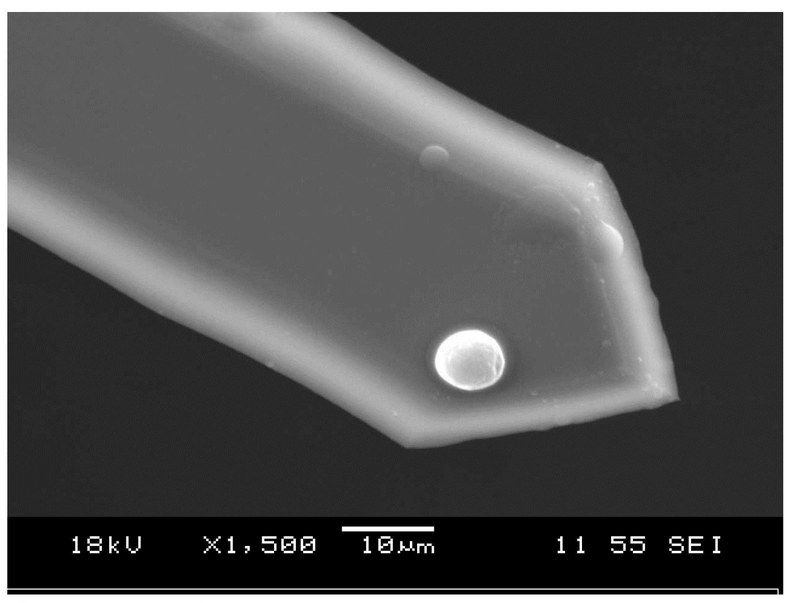




Toner Attachment process- platinum wires were used to transfer epoxy and a toner particle to the cantilever.



AFM cantilever with an attached toner particle. The cantilever is approximately 40 microns wide.



Closer view of epoxy and toner particle on AFM cantilever. The toner particle is seven microns in diameter.

Conclusions

1. Relevant toner properties can be measured with literature methods, such as colloid probe AFM and nanoindentation

2. Colloid probe atomic force microscopy can be used to measure toner adhesion, cohesion, and electrical properties

3. Colloid probe AFM is an effective but expensive and time-intensive way to study microscale toner properties