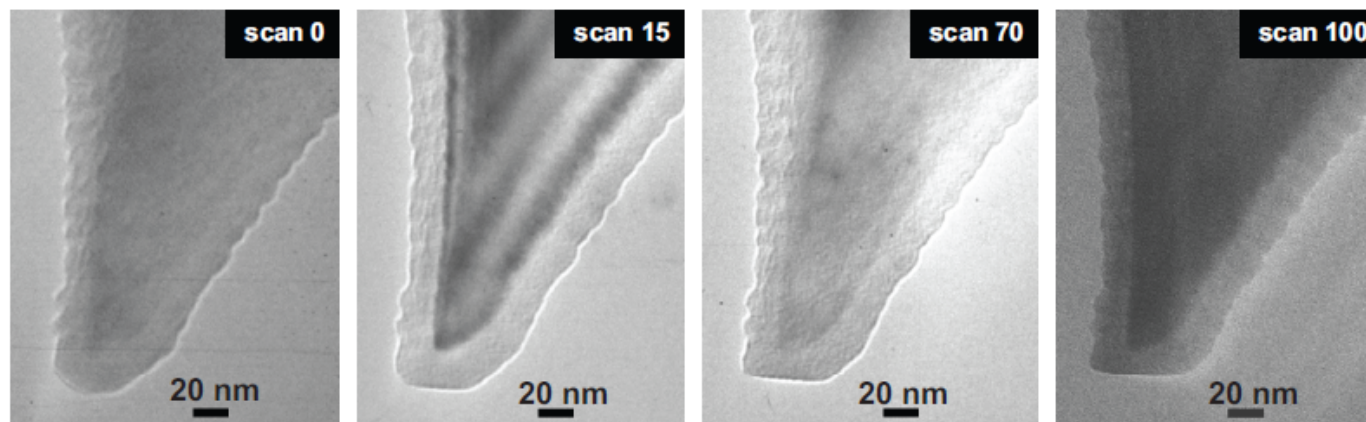


# Understanding and mitigating the wear of probes in tip-based metrology and nanomanufacturing processes

K.T. Turner<sup>1</sup>, D.S. Grierson<sup>2</sup>, T. Jacobs<sup>1</sup>, Y. Jiang<sup>1</sup>, J. Liu<sup>3</sup>, V. Vahdat<sup>1</sup>, and R.W. Carpick<sup>1</sup>

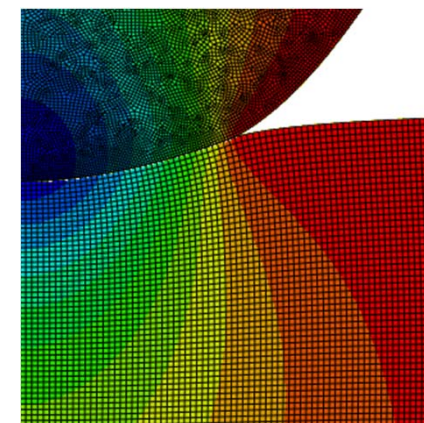
<sup>1</sup>U. of Pennsylvania, Philadelphia, PA, <sup>2</sup>systeMECH, LLC, Madison, WI, <sup>3</sup>U. of Wisconsin, Madison, WI

- The mechanical stability of AFM tips is essential for realizing high repeatability tip-based metrology and nanomanufacturing processes
- Systematic experimental measurements of the tip wear of various materials (Si, Si<sub>3</sub>N<sub>4</sub>, DLC, UNCD) in contact and tapping modes
- Understanding of tip-sample contact mechanics and wear mechanisms through simulations and in-situ experiments.



Increasing sliding distance

Gradual wear of a DLC coated AFM probe due to contact mode scanning



Stress analysis of a tip-sample contact

