

Wear-resistant silicon nano-spherical AFM probe for robust nanotribological studies

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Supporting information

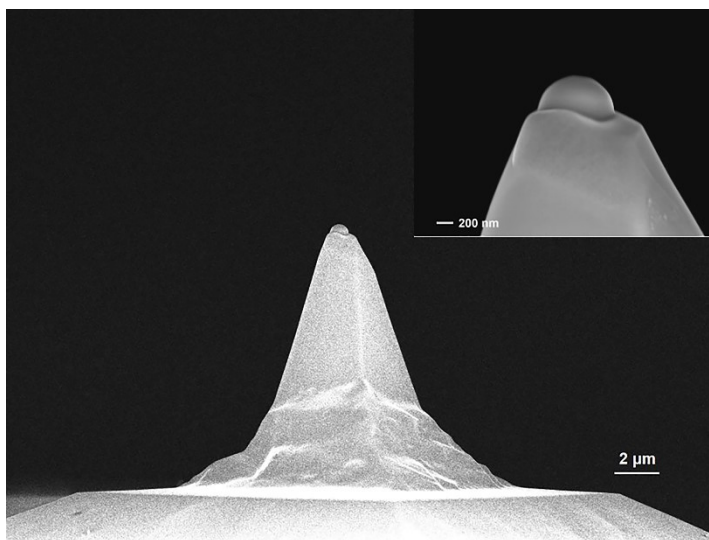


Figure S1. SEM image of the silicon nano-spherical tip. Insert is the magnified image of the tip.

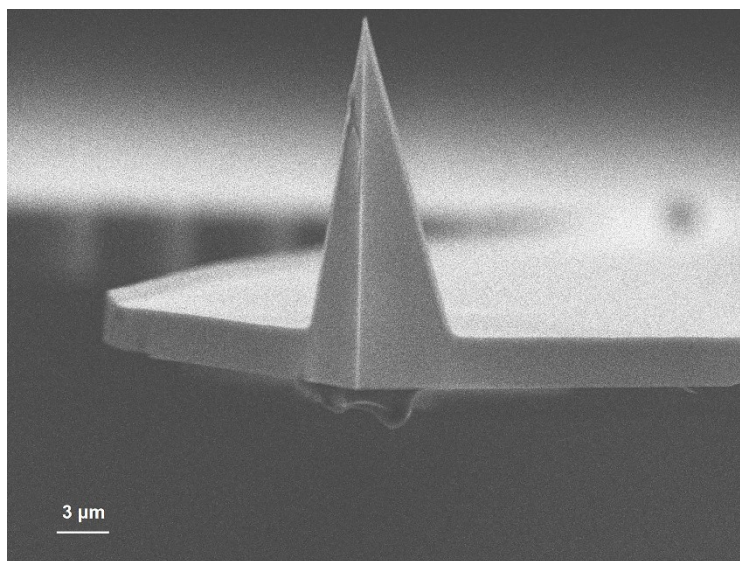


Figure S2. SEM image of the commercial silicon sharp tip.

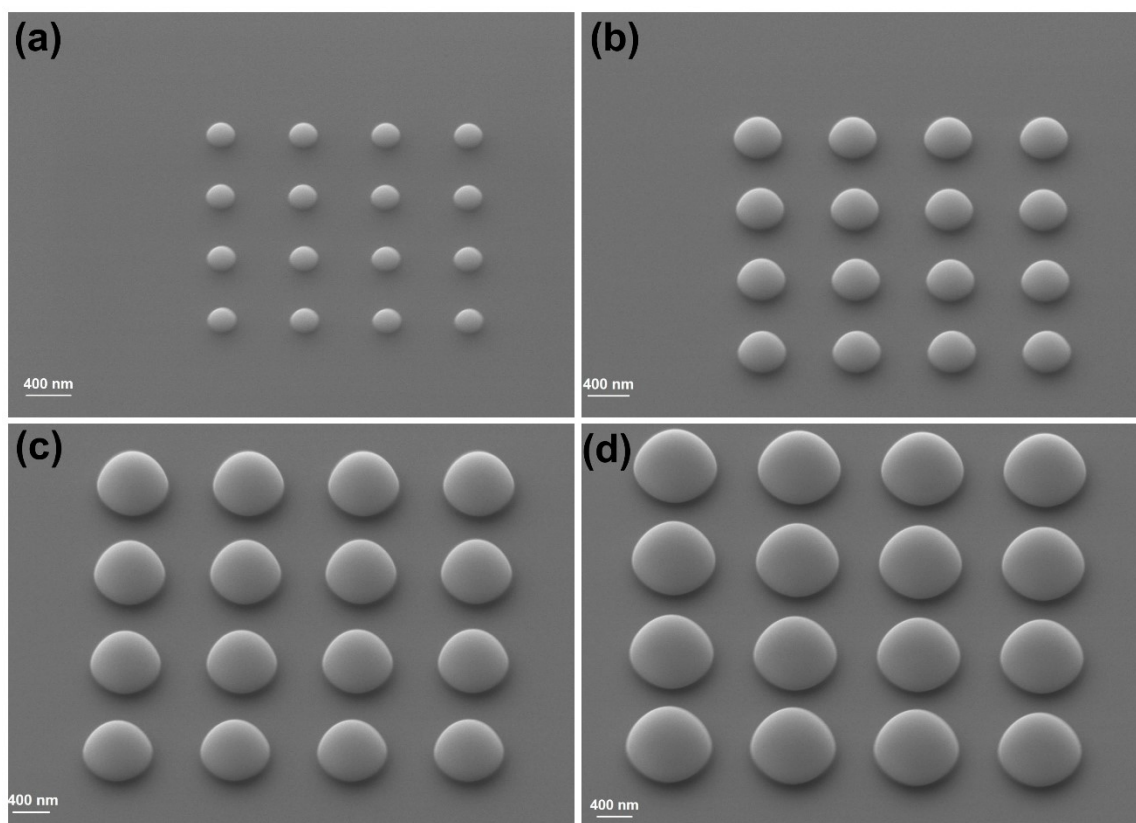


Figure S3. SEM images of the nanospheres fabricated on a silicon wafer. (a) to (d) shows the 200 nm, 400 nm, 600 nm and 800 nm diameter spheres.

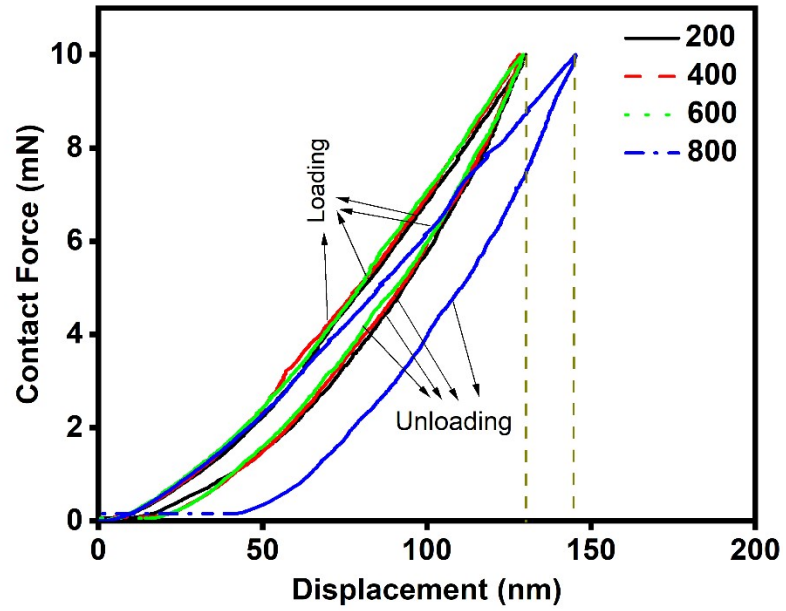


Figure S4. Force-displacement curve at 10 mN maximum contact force and 0.2 mN/min loading and unloading rate.

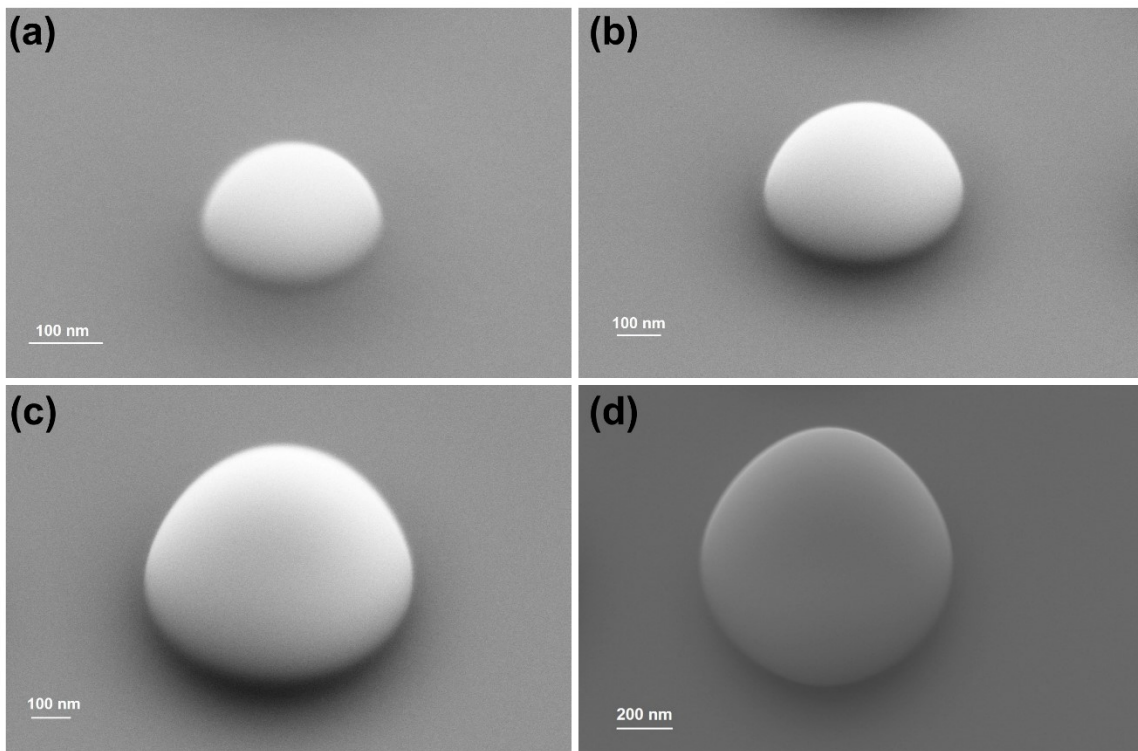


Figure S5. SEM images after the nanoindentation test. (a) to (d) shows the 200 nm, 400 nm, 600 nm, and 800 nm diameter spheres.

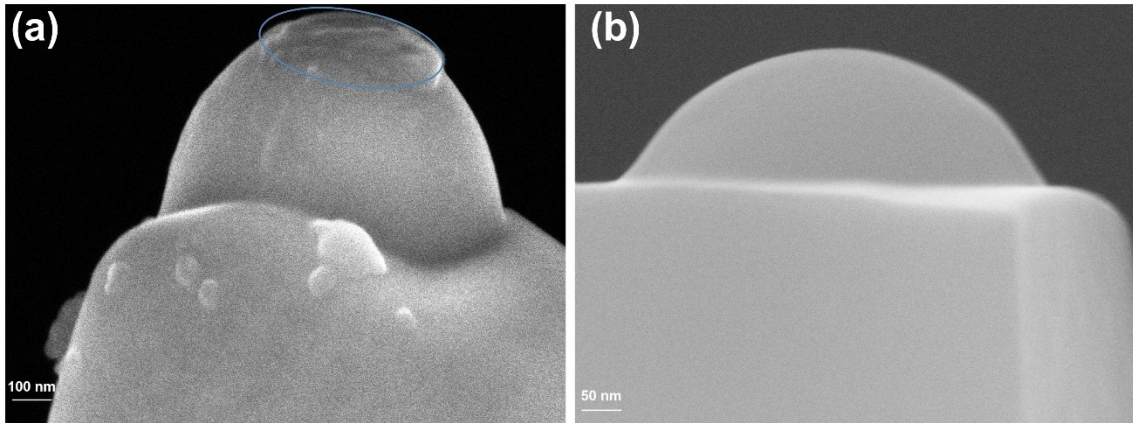


Figure S6. Magnified image of the nano-spherical tips after wear test. (a) the tip used to slide on the silicon wafer sample. The circled region is the wear debris from the wafer's surface. (b) the tip used to slide the quartz sample; there is no observable wear debris on the tip.

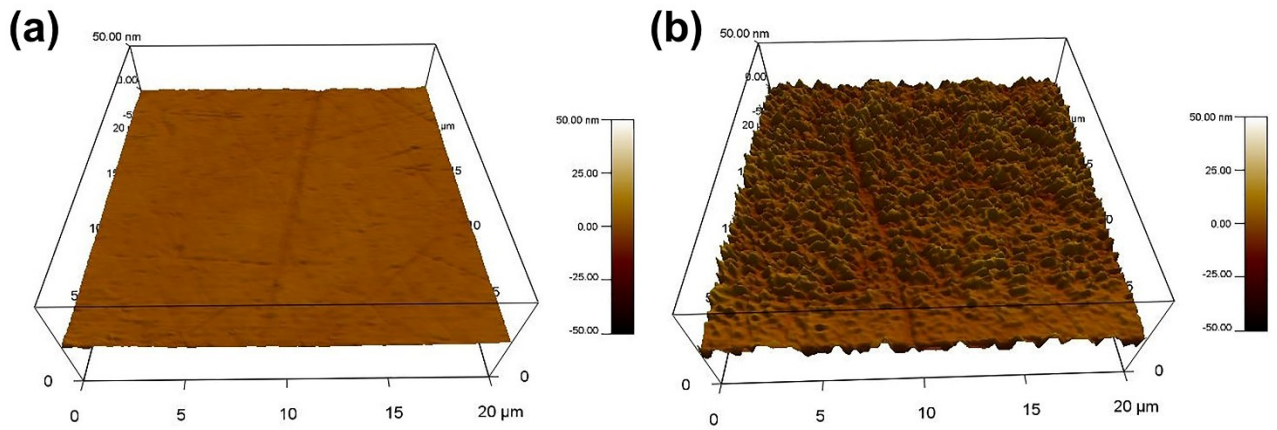


Figure S7. AFM images of the quartz surface (a) before and (b) after a few sliding cycles using the sharp tip.

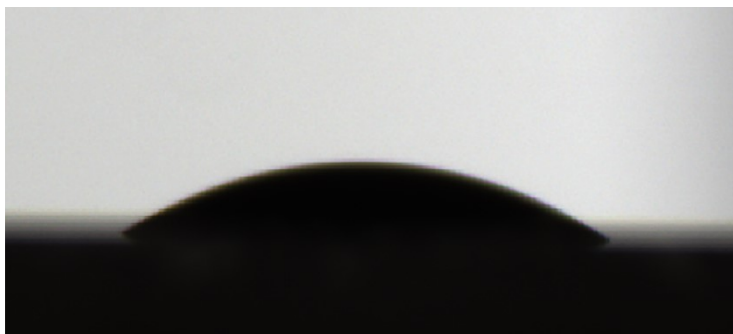


Figure S8. A photograph of a 5 μl water droplet on the quartz surface.

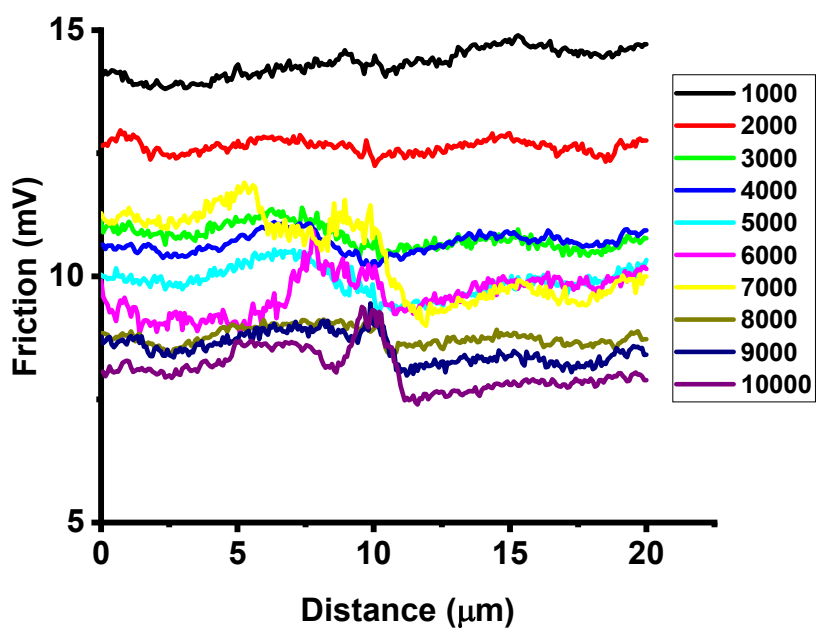


Figure S9. The plot of friction as a function of scanning distance using the nano-spherical tip. The friction was shown to decrease sharply at the initial stages of sliding cycle, then followed by a gradual but steady decrease at the later stages.