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Lattice-resolved frictional pattern probed by tailored carbon nanotubes[1] SHU-CHENG CHIN, Institute of Physics, Academia Sinica, WEI-CHIAO LAI, YUAN-CHIH CHANG, LI-YIN CHEN, CHIA-SENG CHANG — In this study, we demonstrate a high-resolution friction profiling technique using the synchronous atomic/lateral force microscopy (AFM/LFM). The atomic resolution is achieved by our special carbon nanotube (CNT) probes made via in situ tailoring and manipulation inside an ultra-high vacuum transmission electron microscope (UHV TEM). The frictional pattern mapped on graphite displays a periodic distribution similar to the atomic (0001)-oriented graphite lattice structure. Furthermore, the electro-thermal process in the UHV TEM renders a graphite-caped CNT tip, which delivers the nanotribology study within two graphite layers by the LFM measurement on graphite. The synchronous AFM and LFM images can discern a spatial shift between the atomic points and local friction maxima. We further interpret this shift as caused by the lattice distortion, which in turn induces irreversible energy dissipation. We believe this is the origin of atomic friction in the sub-nanonewton scale.

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