

Supporting Information for

**Enhanced charge storage properties of ultrananocrystalline
diamond films by contact electrification–induced hydrogenation**

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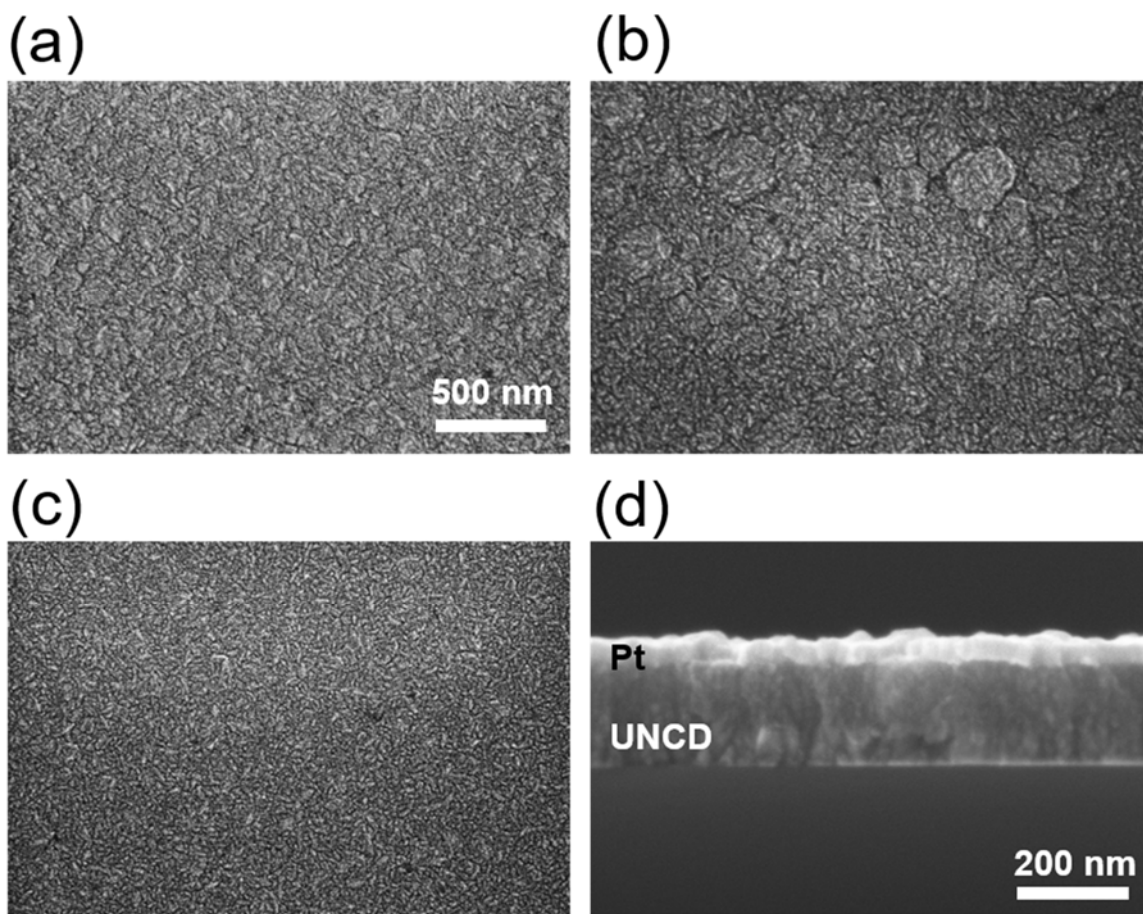


Fig. S1 FE-SEM images of (a) UNCD (b) O-UNCD and (c) H-UNCD. (d) Cross-sectional SEM image of 50 nm-thick Pt deposited UNCD films

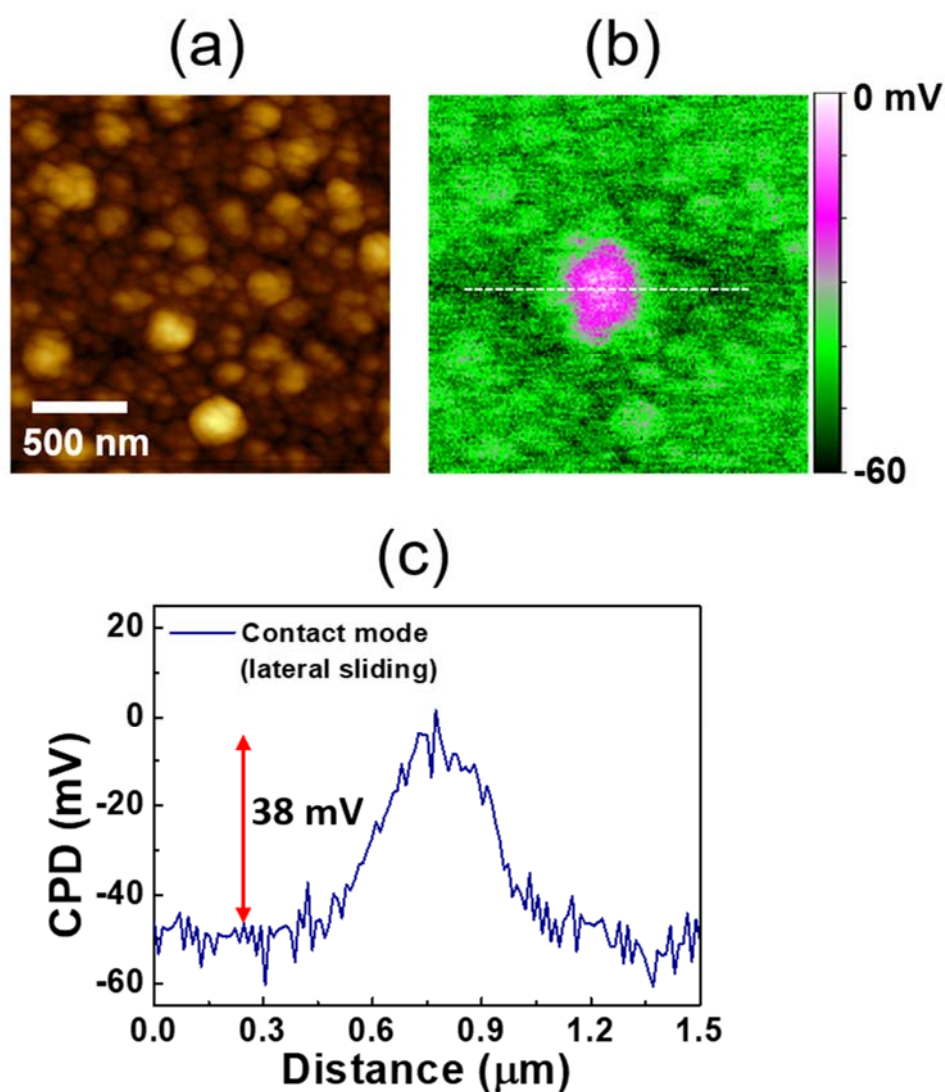


Fig. S2 (a) Topography and (b) surface potential images of as-scratched UNCD surface. The higher CPD value at the written area means that the area became negatively charged by contact electrification with Pt-coated tip. (c) CPD line profile of white dotted line in (b).

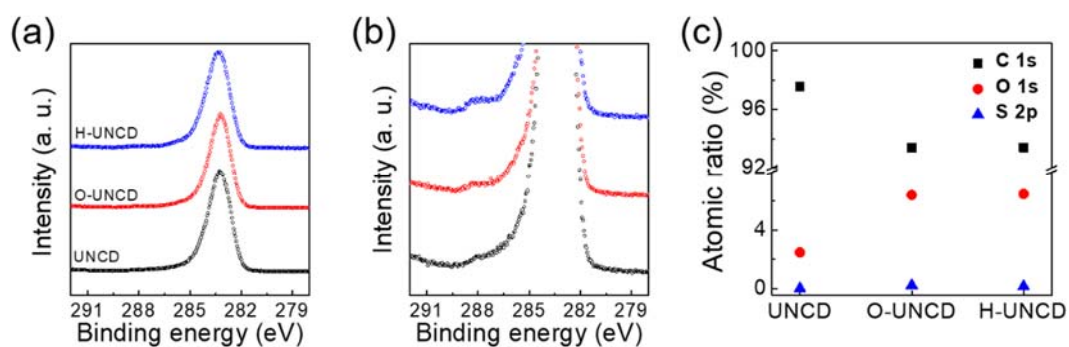


Fig. S3 (a) XPS C 1s spectrum of UNCD, O-UNCD, and H-UNCD. (b) magnified XPS C 1s spectrum of UNCD films in order to see the increased shoulder at 288 eV, indicating oxidation of UNCD because of sulfuric acid. (c) The atomic ratio of bare, H₂SO₄ treated and hydrogenated UNCD after rinsing. We confirmed that there is no sulfuric acid residue on the surface.

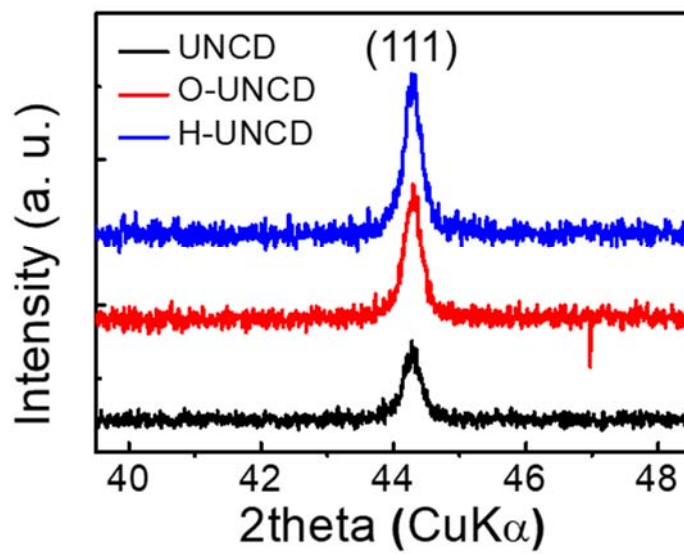


Fig. S4 X-ray diffraction (XRD) of UNCD films. It indicates that all samples exhibited a diamond structure.

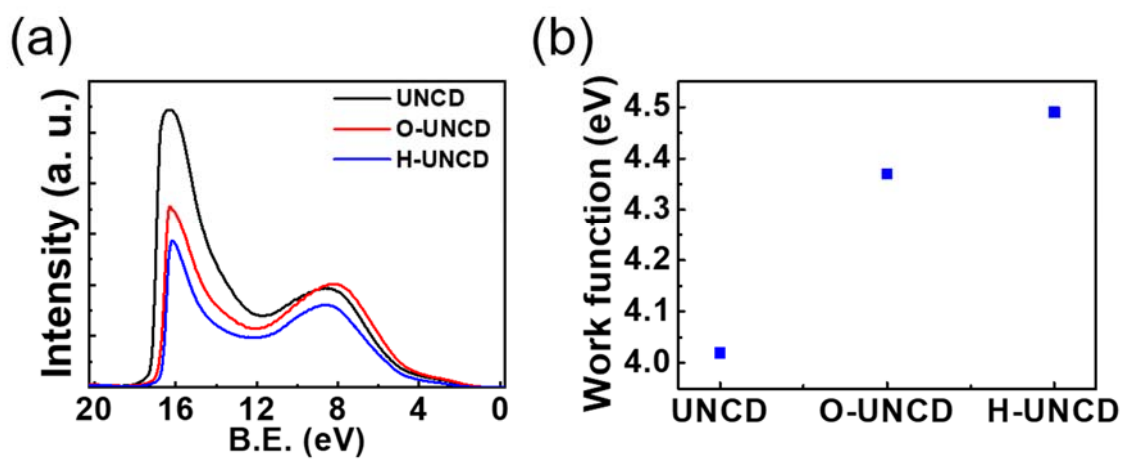


Fig. S5 (a) UPS spectra of UNCD, O-UNCD, and H-UNCD. (b) Work function calculated from UPS spectra by the equation: $[21.22 - (E_{\text{cutoff}} - E_{\text{F}})]$ eV. The work function increased by oxidation and hydrogenation.

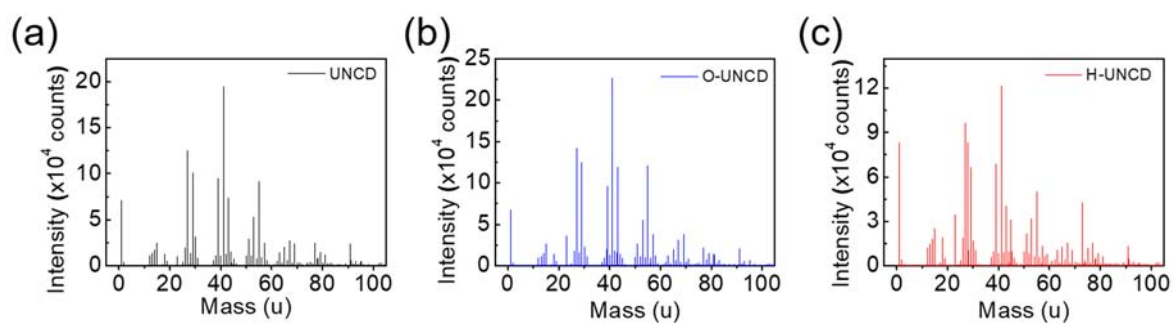


Fig. S6 TOF-SIMS spectra of (a) UNCD (b) O-UNCD by sulfuric acid and (c) H-UNCD.

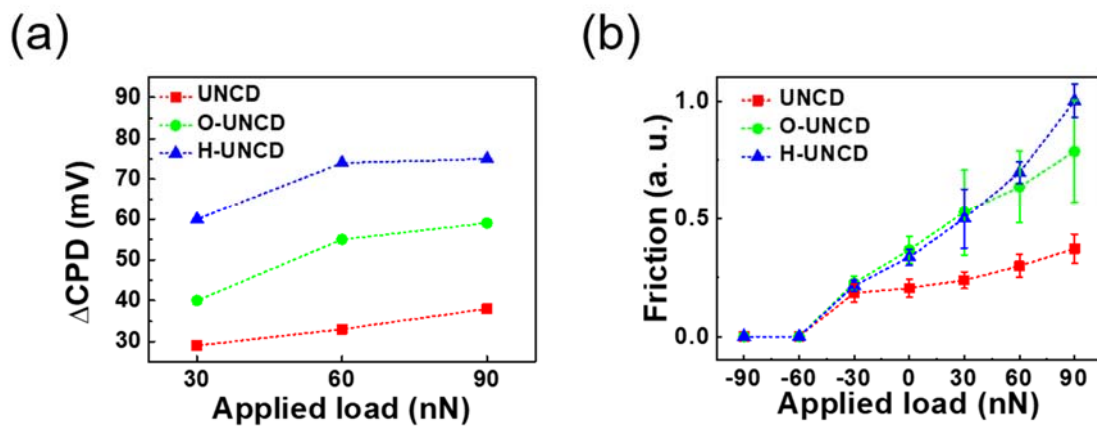


Fig. S7 Load dependence on (a) tribocharges and (b) friction forces of UNCD, O-UNCD and H-UNCD as a function of applied loads measured by KPFM.

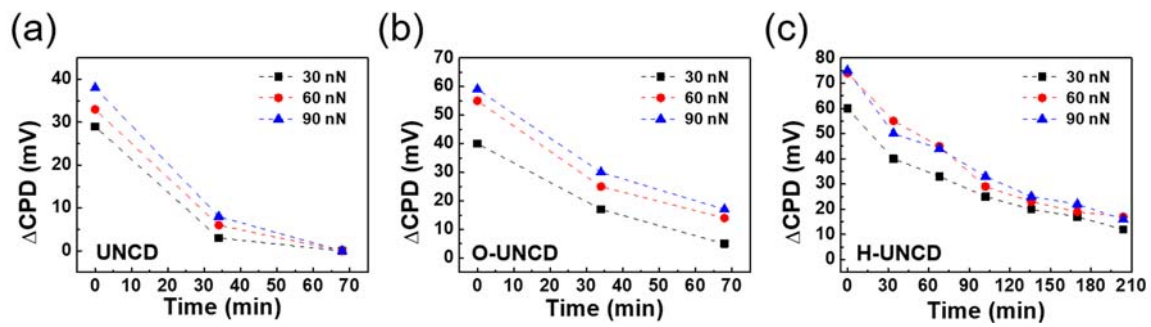


Fig. S8 Charge dissipation of UNCD samples as a function of time. The as-stored charges exhibit clear load dependence.

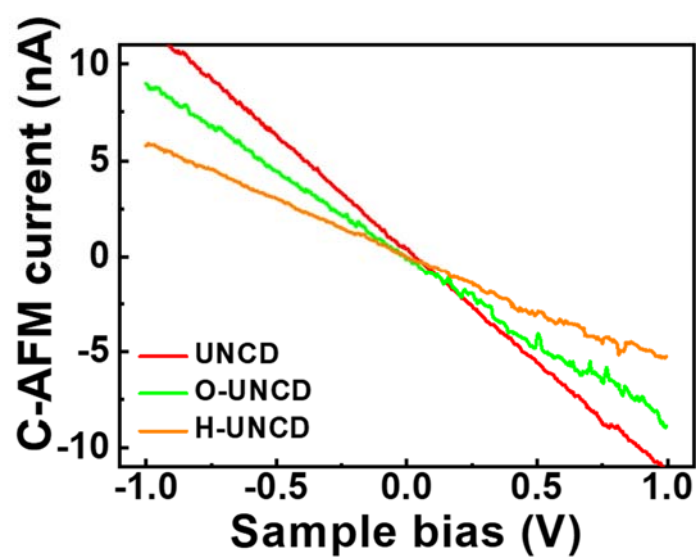


Fig. S9 Current-voltage ($I-V$) characteristics of UNCD samples measured by C-AFM using Cr-Pt coated cantilever.