Electronic Supplementary Information (ESI)

Improved adhesion of printed Ag electrodes for flexible transparent display applications

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1. Method

(1) Fabrication of Ag electrodes

We used DragonFly IV (NanoDimension, Israel) to print SL and DL electrodes on glass and flexible PES substrates. The electrode fabrication process was performed by dispensing AgCite conductive ink (CI 90072) and dielectric acrylate ink (DI 1092) through piezo drop-on-demand inkjet printheads. The structures printed with Ag ink and dielectric ink were rapidly cured using UV and IR lamps.

(2) Adhesion test using 3M Scotch 610 tape

The adhesion tests were conducted using 3M Scotch 610 tape, as specified in the ASTM-D3359 standard. This standard requires a crosscutting of the coating before applying and removing the tape. However, as the substrate used here is PES, crosscutting would cause the substrate to tear, making it impossible to measure resistance. Therefore, we adopted the procedure that uses fresh tape for each adhesion test without crosscutting.

2. Results of the adhesion tests

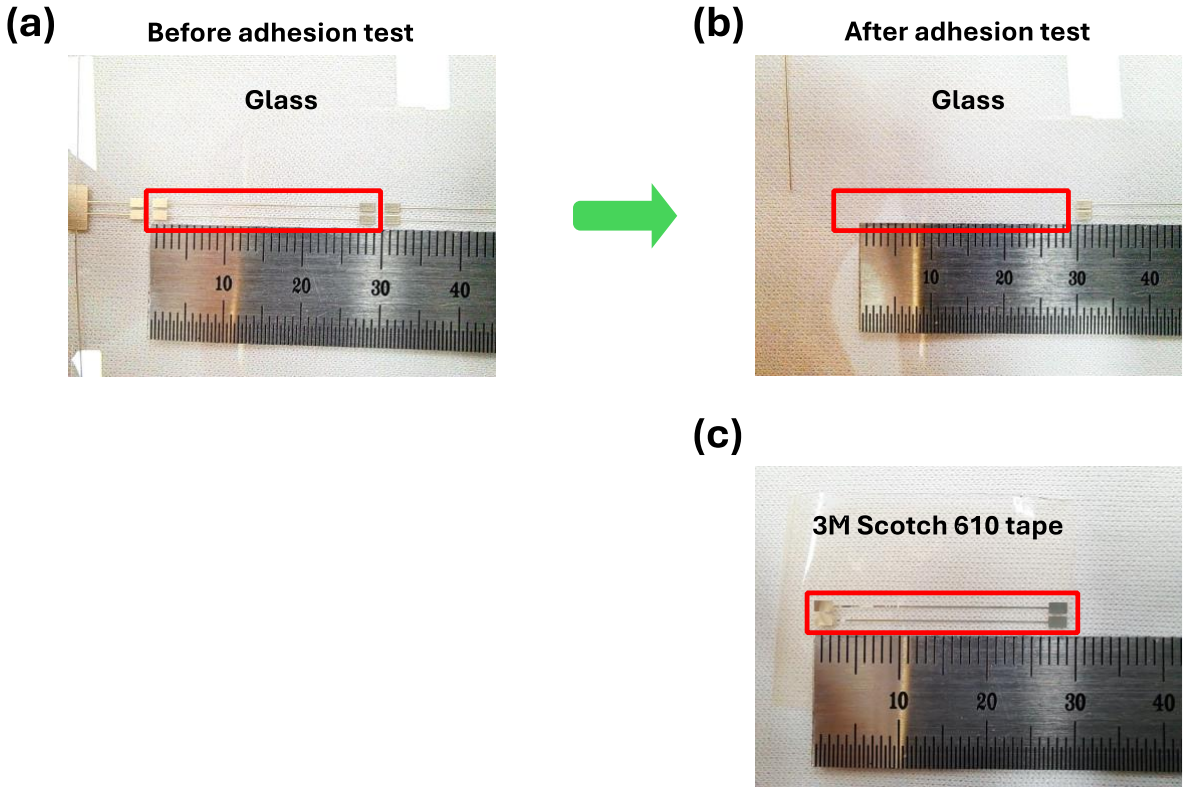

Fig. S1 Results of the adhesion test performed on the SL electrode printed on a glass substrate. (a) SL electrode before the test. (b) SL electrode after the test. (c) SL electrode that detached from the glass substrate and adhered to the tape after the adhesion test.

3. Results of the concave tensile bending tests

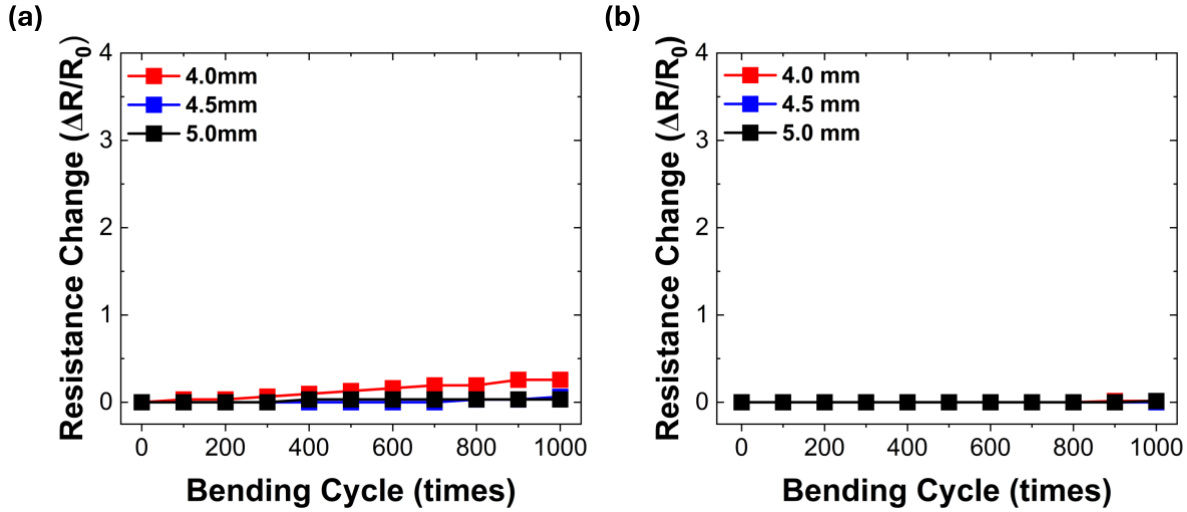

Fig. S2 Normalized change in resistance as a function of the 1000 cycles of the concave tensile bending tests conducted at radii of 4.0, 4.5, and 5.0 mm for (a) the SL and (b) DL electrodes.

4. Results of the DL electrode height measurement

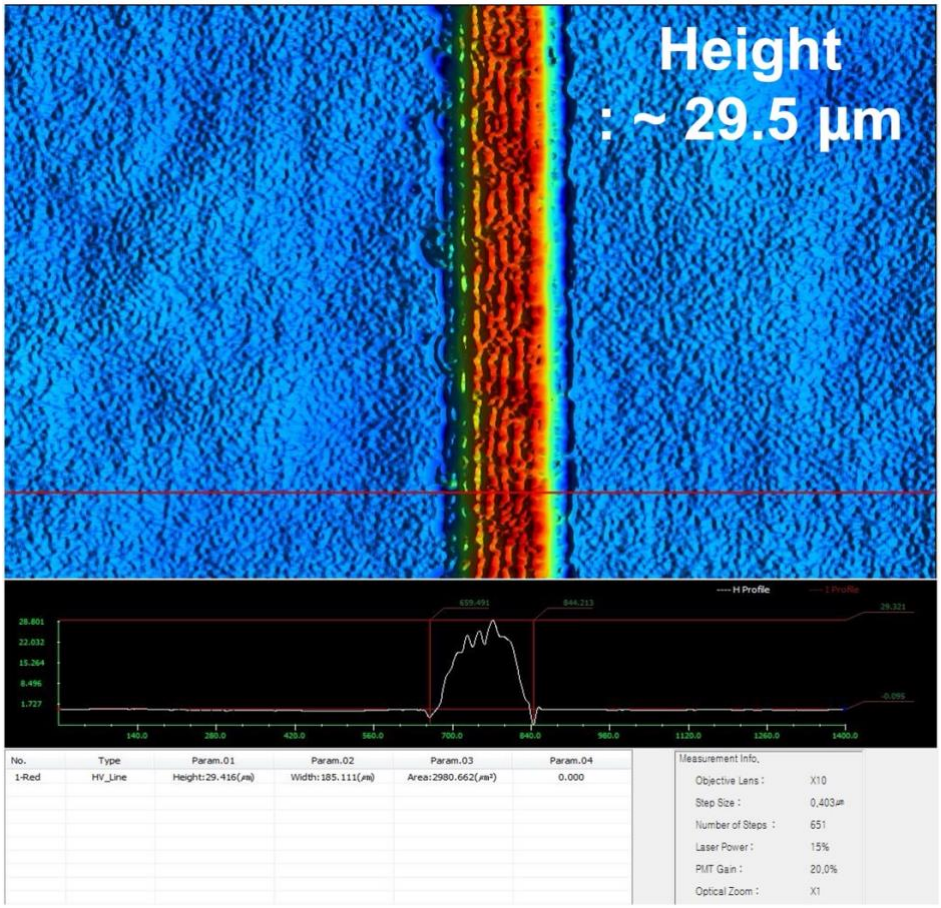

Fig. S3 Image of the DL electrode captured using a confocal laser microscope to measure the electrode height, which was approximately 29.5 μm.

5. Cross-sectional profile analysis of DI and DL electrode

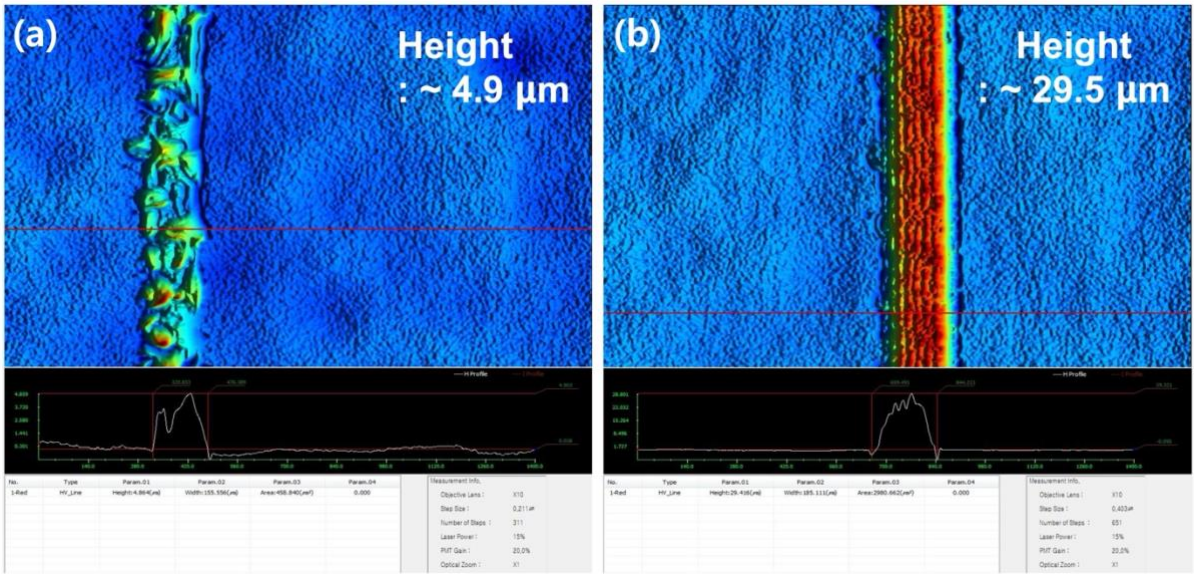

Fig. S4 Cross-sectional profiles of (a) DI printed on the substrate and (b) the DL electrode, measured using a confocal laser microscope.

6. Cross-sectional profile analysis of DL electrode at three points

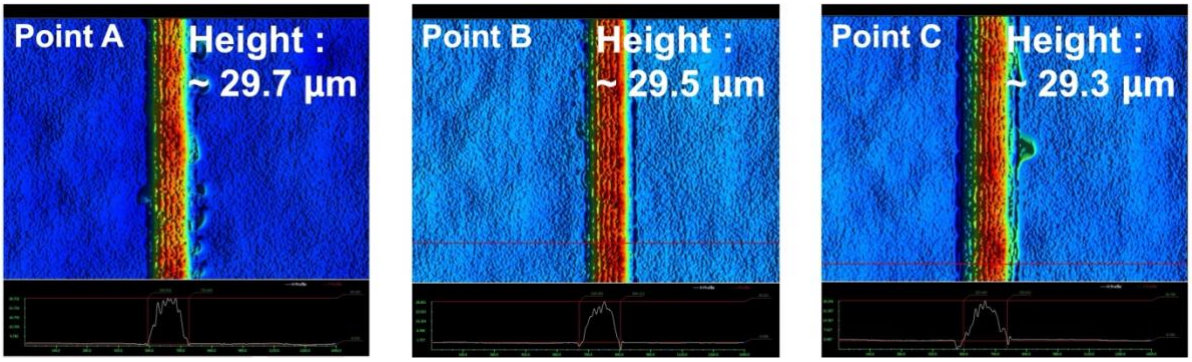

Fig. S5 Cross-sectional profiles of the DL electrode measured at three randomly selected points (A, B, and C) using a confocal laser microscope. Uniform line heights of approximately 29.7, 29.5, and 29.3 µm were observed at each point, respectively, confirming consistent layer thickness.

7. Adhesion test results of SL, only adhesion layer, and DL printed on PES substrate

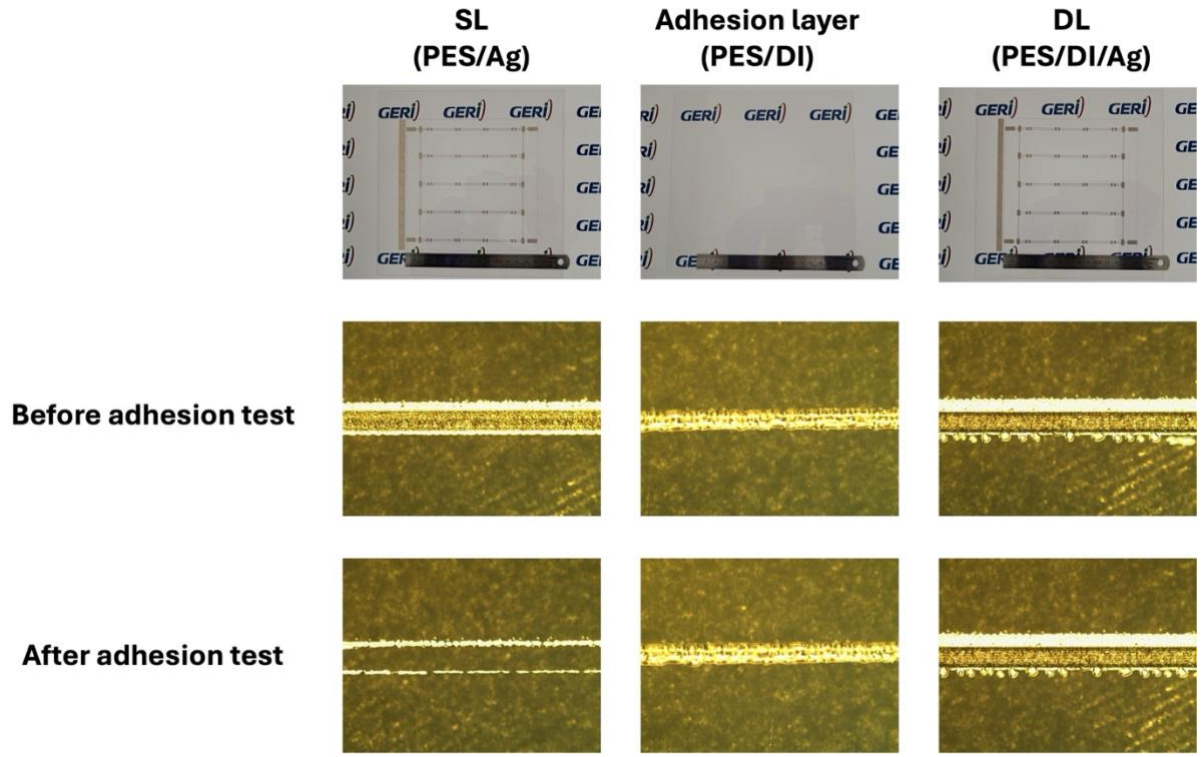

Fig. S6 Adhesion test results for samples printed on a PES substrate, including SL, only adhesion layer, and DL, respectively.