Nanocontact Electrification: Effects on Adhesion, Transfer, and Printing

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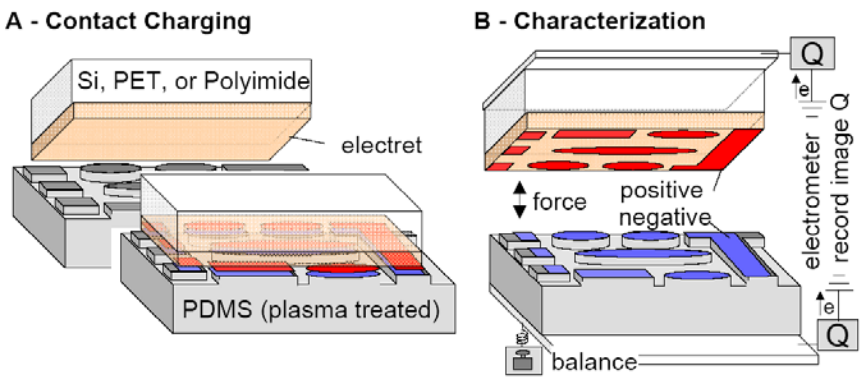
NNIN Facilities utilized: Characterization Facility & Nanofabrication Center

DESCRIPTION OF WORK

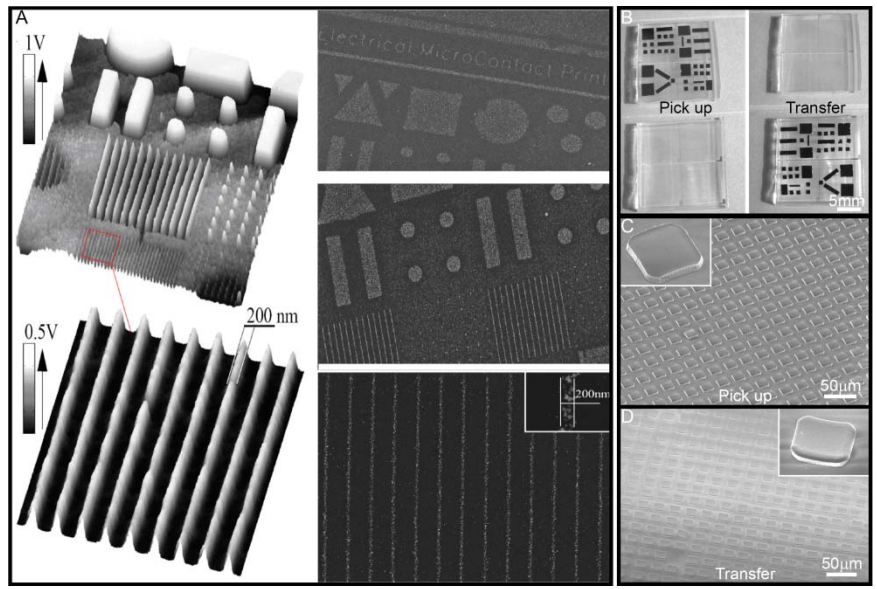
- Designed a contact electrification process in which a dielectric coated substrate is placed in contact with an oxygen plasma treated, patterned PDMS stamp. Charge transfer occurs at the areas of contact between both materials.

- Included in the new process is a charge transfer and electrostatic force of adhesion characterization procedure. An electrometer records the amount of accumulated image charges on metallic plates holding both the substrate and stamp. A connected balance records the weight reduction of the stamp as the charged substrate is separated, and then again during reapproach.



MAJOR OBSERVATIONS

- Through molecular surface functionalization, nanoscopic charge patterns are demonstrated that yield long range electrostatic adhesive forces exceeding the dielectric breakdown strength of air. At this magnitude, the force significantly directs the deposition and transfer of nanomaterials all the way up to macroscopic objects.



Publications

- Chad R. Barry, Xinyu Wang, Robert J. Knuesel, and Heiko O. Jacobs, *Science*, manuscript submitted (2008)