Poster

BOTTOM-UP NANOLITHOGRAPHY BASED ON THE FORMATION OF NANOMETER-SIZE ORGANIC LIQUID MENISCI

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Nanometer-size menisci of organic liquids such as octane and *1*-octene have been formed and used to confine chemical reactions. The application of a bias voltage between a conductive scanning probe tip separated a few nanometers from a silicon surface allows the field-induced formation of nanometer-size liquid menisci which can subsequently be used to fabricate nanometer-size structures. We report the fabrication of sub-10 nm nanostructures in 0.1 ms. Growth kinetics studies reveal that the nanostructure composition and its formation mechanism is liquid dependent. Both voltage polarities can be used to grow nanostructures although the growth rate is significantly higher for positively biased samples. These experiments allow to produce in the same sample a large variety of chemically different nanostructures that are easily addressed, positioned and have sub-10 nm features.

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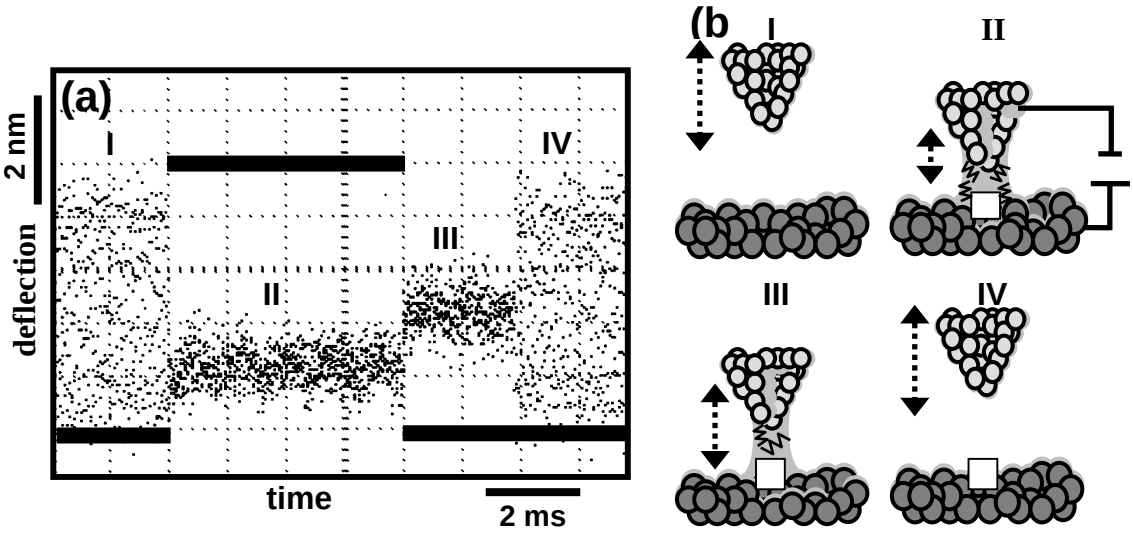

Figure 1. (a) Cantilever-tip oscillation (deflection) before (I), during (II) and after the application of a voltage pulse in an environment saturated with *1*-octene vapor. Each dot represents the instantaneous AFM tip amplitude. Once the pulse is off, the octane meniscus holds the cantilever (III). Re-establishing the feedback, breaks the meniscus (IV). Because the capillary force is smaller than electrostatic force, the cantilever moves its average position away from the surface. Solid line represents the voltage pulse. (b) Interpretation of the deflection changes observed in (a) and schematic of a single nanofabrication process.

References

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