Supporting Online Material

Preparation of carbon nanotube master: A silicon wafer with a 100 nm thick layer of SiO_2 (thermally grown) provided a substrate for SWNT growth. Ferritin catalyst (Aldrich) diluted by deionized water at a volumetric ratio of 1:1000 was cast onto the wafer. This wafer was then immediately placed into a quartz tube furnace at 800°C for 2 min followed by purging with hydrogen gas at 900°C for 1 min. Flowing methane (500 standard cubic centimeters per minute (sccm)) and hydrogen (75 sccm) through the quartz tube at 900°C for 10 min grows the SWNT.

Making the molds and performing the soft imprinting: The SWNT/SiO2/Si master was placed in a vacuum chamber along with 100 μL of (tridecafluoro-1,1,2,2-tetrahydrooctyl)-1-trichlorosilane(United Chemical Tech) for 2 hr. The resulting silane layer (monolayer or sub-monolayer coverage is expected) prevents adhesion of the PDMS to the bare SiO_2.

h-PDMS (Gelest, Inc) was prepared as following: 3.4 g (7-8% vinylmethylsiloxane) (Dimethylsiloxane), 100 μg of (1,3,5,7-tetravinyl-1,3,5,7-tetramethylcyclotetrasiloxane) and 50 μg of platinum catalyst were mixed and placed in vacuum chamber for 5 min. 1 g (25-30% methylhydrosiloxane)(Dimethylsiloxane) was then added, mixed and then the resulting sample was placed back into vacuum for 5 min. This prepolymer mixture was spin cast onto the SWNT master at 1000 rpm for 40 s and then baked at 65°C for 4 min. s-PDMS (Sylgard 184, Dow Corning), prepared by mixing base and curing agent at a ratio of 10:1 was then poured onto the h-PDMS. Baking at 65°C for 2 hr completed the curing of the polymers. Peeling away the composite h-

PDMS/s-PDMS mold completed the process. Typical thicknesses were 1 μm for the h-PDMS and 3 mm for the s-PDMS.

The polyurethane (PU) (NOA 73, Norland Products) was spin cast onto a SiO2/Si wafer at 9000 rpm for 40 s. The mold was placed onto this thin film and pressed gently to ensure good wetting at the interface. Exposing the PU to ultraviolet light (350-380 nm; long wave ultraviolet lamp, UVP) at about 19 mw/cm^2 for 1 hr through the mold cured the PU and solidified the film. Peeling the mold away completed the process.

Characterization of the SWNT master and imprinted PU structure was carried out by AFM (Dimension 3100, Digital Instrument) and TEM (Philips CM200, FEI). The TEM pictures of the metal shadowed replicas were taken at 120 kV. The AFM measurements were executed in tapping mode with tips (BS-Tap300Al) from BudgetSensors. The resonant frequency of the tip was 300 kHz.

We note that the silane monolayer (or sub-monolayer) used above to prevent adhesion of PDMS to the SiO_2 has the potential to affect the fidelity of the molds. To investigate the possibility that defects in this layer contribute significantly to the roughness in the molded polymers, we drop cast and UV cured polyurethane on the surface of a silane coated silicon wafer whose surface roughness, measured before forming the silane, was 0.13 nm. The roughness of the polyurethane surface molded in this fashion was, as measured by AFM, ~0.19 nm. This value is much lower than that observed when PDMS molds are used (0.3-0.4 nm), which suggests that the roughness in the PDMS case is dominated by a mechanism that is not associated with the silane. The role of changes in the effective surface relief height presented by the SWNTs due to the presence of surrounding silane molecules is difficult to determine. Based on the close

correspondence between the heights of the SWNTs and the molded features, we speculate that the silane has a small effect, either due to incomplete coverage near the SWNTs or to the silane molecules lying flat on the substrate after they are coated with PDMS prepolymer.[1,2]

Preparation of TEM sample: Several drops of a methanol solution of polyacrylic acid (PAA) (30% wt) were placed onto a PDMS mold. The sample was left in this configuration, in open air, until the methanol evaporated (~10 hours was typically sufficient). The PAA film was then peeled away leaving an imprinted nanostructure on the surface of the PAA.

The sample was placed in the vacuum chamber of a thermal evaporator. The Pt/C source was located above the sample at an elevation angle of 30 degree. A few nanometers of Pt/C were deposited on the sample. Subsequently, carbon film with thickness of ~10 nm was evaporated on the sample.

The sample was soaked in DI water for several hours until PAA was dissolved. The Pt/C and carbon film was then floated on the water surface. They were later collected by a TEM copper mesh.

References:

1. Ulman, A.; *Chem. Rev*. **1996,** *96*, 1533.

2. Duwez, A. S.; Jonas, U.; Klein, H. *Chemphyschem* **2003***, 4*, 1107