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Supplementary Materials

Experimental Details

Growth of VACNT

The VACNT were grown on nickel foil (Alfa Aesar, Ward Hill, MA, USA, 99+%, thickness: 50 µm), p-doped silicon wafer (Siltronic AG, Freiberg, Germany, orientation: 100, 250 µm), stainless steel (G.S. Stolpen GmbH, Stolpen, Germany, 1 mm), and C1737 glass (Delta Technologies, Loveland, CO, USA, 0.5 mm). The substrates were previously coated with an Al_2O_3 buffer (20 nm) and a $Fe_xCo_yO_z$ (35–40 nm) catalyst layer by a dip-coating procedure reported elsewhere (Dörfler *et al.*, 2011). By repeating the dip-coating step for Al_2O_3, or by increasing aluminum concentration of the precursor solution, thicker buffer layers of 54 nm were deposited.

The growth of VACNT was carried out in a quartz tube with a total length of 60 cm and a square area of 70 × 20 mm^2, surrounded by a customized three-zone batch furnace (HTM Reetz, Berlin, Germany). After heating the coated substrates under 3 slm argon (Linde AG, München, Germany, 5.0), to 750 °C process temperature, the CNT deposition was done for 20 min (if not stated differently) by using the following gas composition: 1.4 slm argon (Linde AG, 5.0), 0.23 slm ethene (Linde AG, 3.5), 0.91 slm hydrogen (Linde AG, 5.0) and a small amount of water-saturated argon (16 sccm). After the growth process, ethene, hydrogen, and water/argon gas flow was stopped, argon was set to 3.0 slm, and the heating was stopped. At 200 °C the reaction chamber was opened and the sample was taken out.

SEM and CM imaging

The characterization was done by SEM (Zeiss DSM 982 GEMINI, Carl Zeiss AG, Oberkochen, Germany) and confocal microscope (LEICA DCM 3D, Leica Microsystems, Wetzlar, Germany). For SEM, VACNT were partly removed by scalpel. The images were taken under an angle of the sample holder of 45 °.

For confocal microscopy, the VACNT were also partly removed by scalpel scratching without cutting the substrate. Subsequently, the sample was directly placed under the microscope. The focus was set to the substrate surface at twenty-fold magnification by using an integrated optical reflected light microscope. Then the modus was changed to confocal mode (light wavelength: 460 nm), light intensity was set to a low value at substrate and higher value at VACNT surface for running a bottom-up scan. The measured topography files were plotted and analyzed with the corresponding software LEICA-map.

The reflection (specular plus diffusive) was measured using a spectrometer (Perkin Elmer Lambda 900, PerkinElmer Inc., Waltham, MA, USA) equipped with an Ulbricht-sphere.

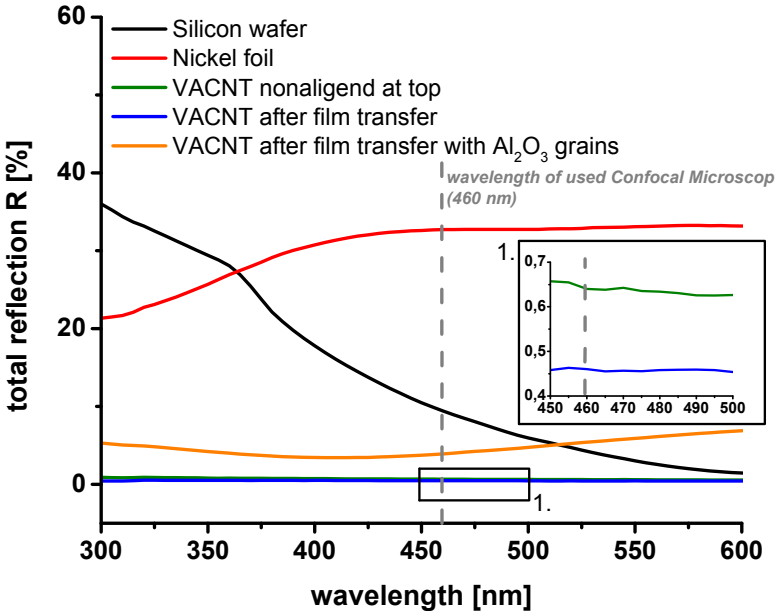

Figure S1. Spectra of total reflexion measurements of the substrates, grown VACNT at nickel foil, and VACNT at primer-coated aluminum foil after film transfer.

From the total reflection measurements it is not obvious that the VACNT sample on the original substrate can be analyzed by confocal microscopy, while this is not the case for the transferred sample. A possible explanation might be the ratio of diffusive and specular reflection. If the VACNT are not aligned at the top of the forest, the degree of specular reflection is higher than that of VACNT with good alignment after film transfer. In the latter case diffuse reflection contributes mainly to the total reflection being measured. For confocal microscopy, only the specular reflection of the sample contributes to the signals and, thus, the transferred sample cannot be measured.

Film Transfer

The film transfer was realized from sheet to roll by custom-made hot calendar. A primer-coated aluminum foil (thickness: 15 µm) was used as the target substrate. In a hot calendar two steel rolls rotate in opposite directions and roll velocity, roll pressing force, roll temperature, and gap between rolls can be varied. The target substrate was placed at the rolls in such a way that the primer-coating is not in contact with the rolls. By placing the VACNT sample on nickel foil between the aluminum foils while rotating, the VACNT are brought in contact with the primer layer aluminum foil. Thereby the primer is infiltrated into the VACNT surface. After drawing the aluminum from the nickel the transfer process of VACNT is finished. The process was carried out with VACNT with a carpet height of 150 µm and a sample size of 2.5 cm × 4.0 cm. For these samples, the best results were achieved with roll velocity of 2 mm/s, roll pressing force of 150 N per roll, roll temperature of 100 °C, and gap between rolls of 100 µm.