Electronic Supplementary Material (ESI) for Energy & Environmental Science

A free-standing aligned-carbon-nanotubes/nanocomposite foil as efficient counter electrode for dye solar cells

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Morphological characterization of the VACNTs film

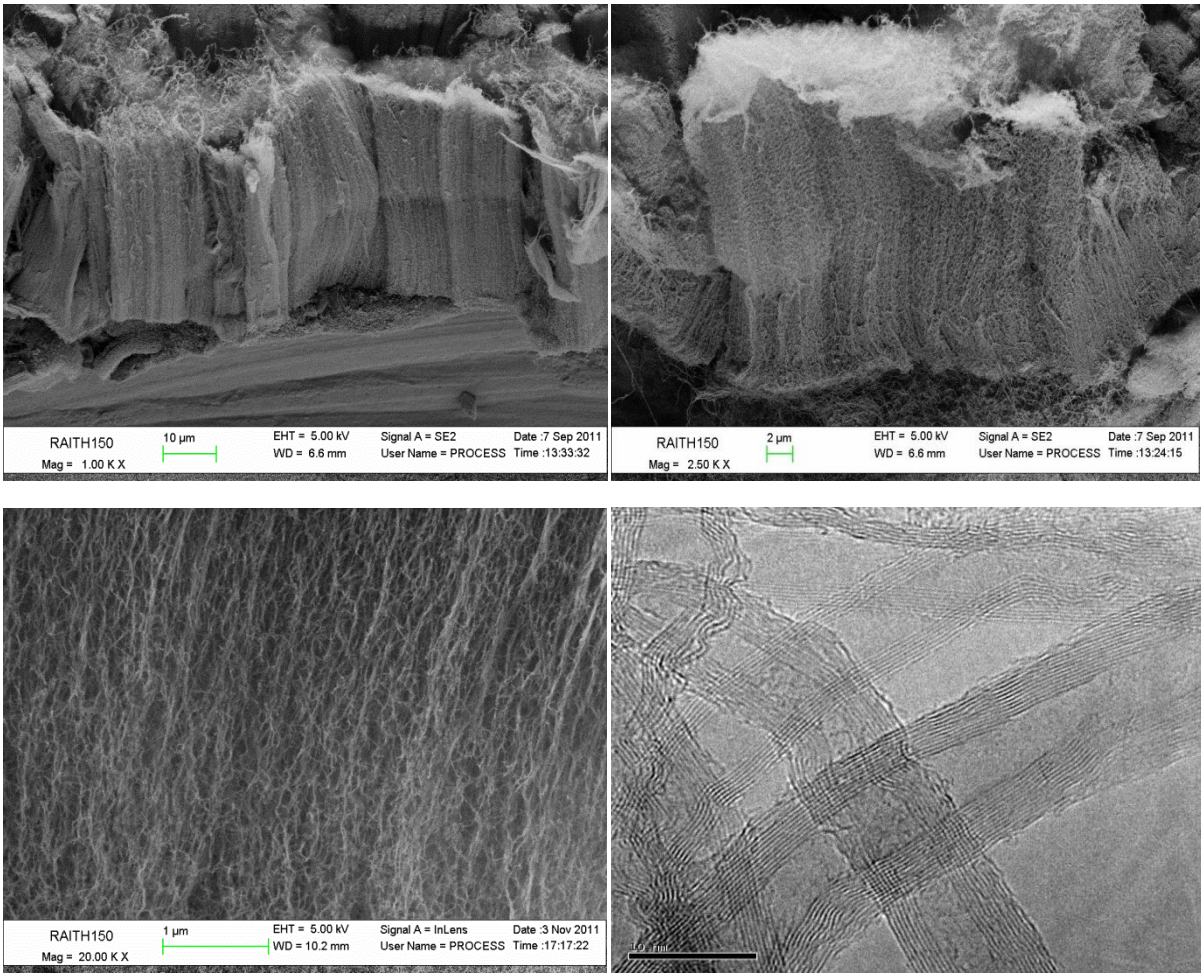
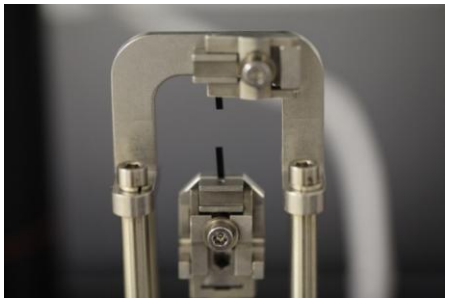


Figure S1. *a), b) SEM micrographs showing the top layer of a VANC foil. c) cross-sectional view of the CNT-s forest ; d) TEM micrograph of the multi-walled CNTs (scale bar 10 nm).*

Mechanical characterization of the nanocomposite foils

To compare the mechanical properties of the here proposed nanocomposite foils, their tensile properties (E_t Young' modulus and σ_B stress at break) have been measured according to the procedure described by ASTM D882 - 10 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
The stress-strain curves have been detected by using a Q800 DMA system from TA Instruments. Measurements have been carried out at the following working conditions:
control force regime ; pre-load= 0.01N, T=25°C ; force rate 0.5N/min up to 18N.

	Et (MPa)	σ_B (MPa)
NC	705.6±30.2	18.3 ± 0.3
NC-Etch	755.7±33.6	19.5 ± 0.6
VANC	780.1±27.3	19.2 ± 1.1



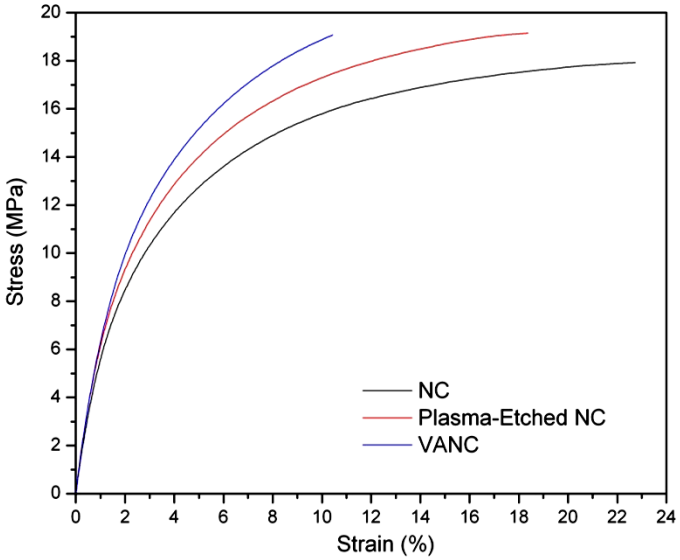


Figure S2: *Stress-strain curves measured for three different species of nanocomposite foils*

Electrical characterization upon vigorous bending

Sheet resistance of the VANC foil has been evaluated upon two different bending conditions by using a Keithley unit (Model 2400 Source Meter). The nominal value of Rs was thus determined by averaging fifteen measured data over 3 different samples. 20mm x 5mm-sized strips of VANC (thickness 360 μm) were used for this test. A specific run of fifteen I-V tests (in the range 0-10 V) was executed for each sample on different points of the surface both under concave and convex bending: a radius of curvature of 7 mm was adopted in both of the cases.

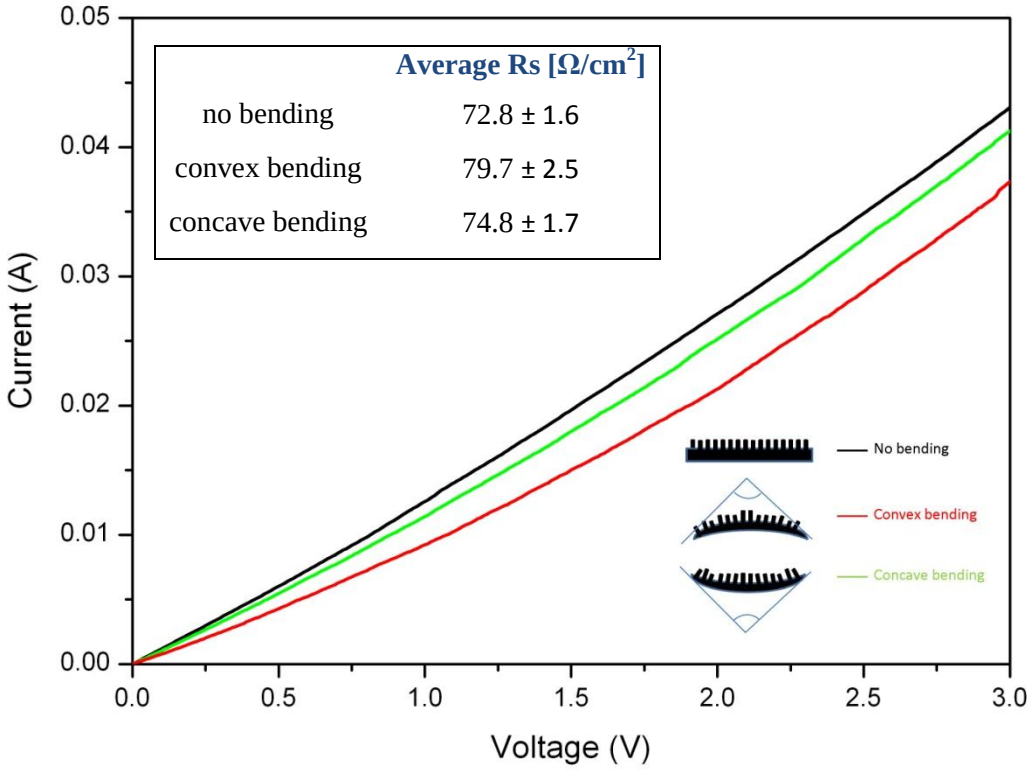


Figure S3. *I-V characteristics of a VANC foil which has been subjected to a specific flexural stress.*