

## Supplementary Material

# Investigation of ZnO-decorated CNTs for UV Light Detection Applications

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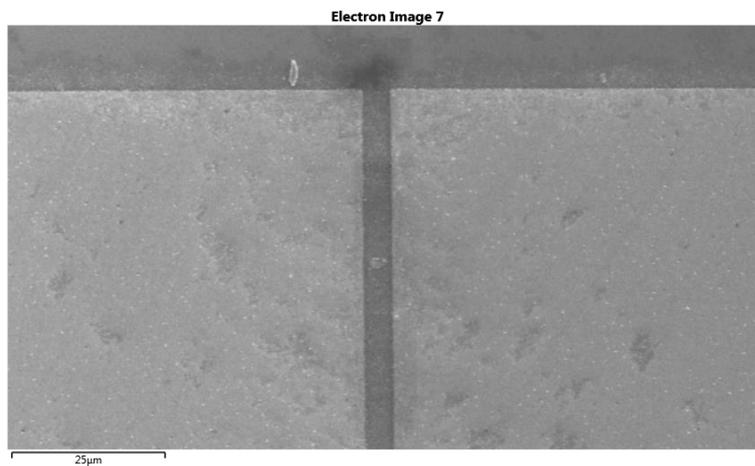
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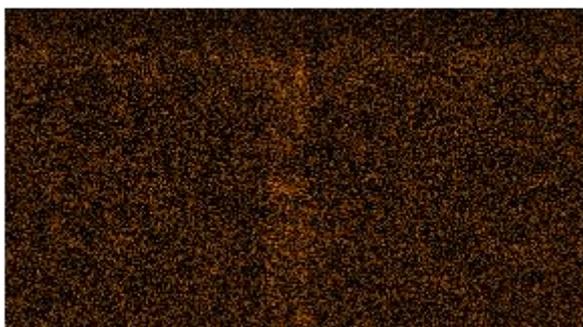
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### 1. EDX elemental mapping

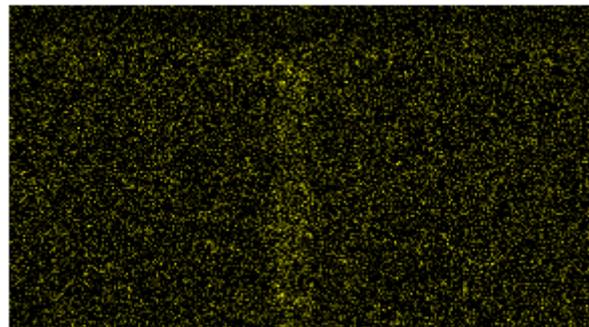
In Figure S1 the electron image and the element distribution of the inter-electrode region of a typical device is reported. The ZnO-CNT layer between the electrodes is clearly observed by the presence of Zn and C signal.

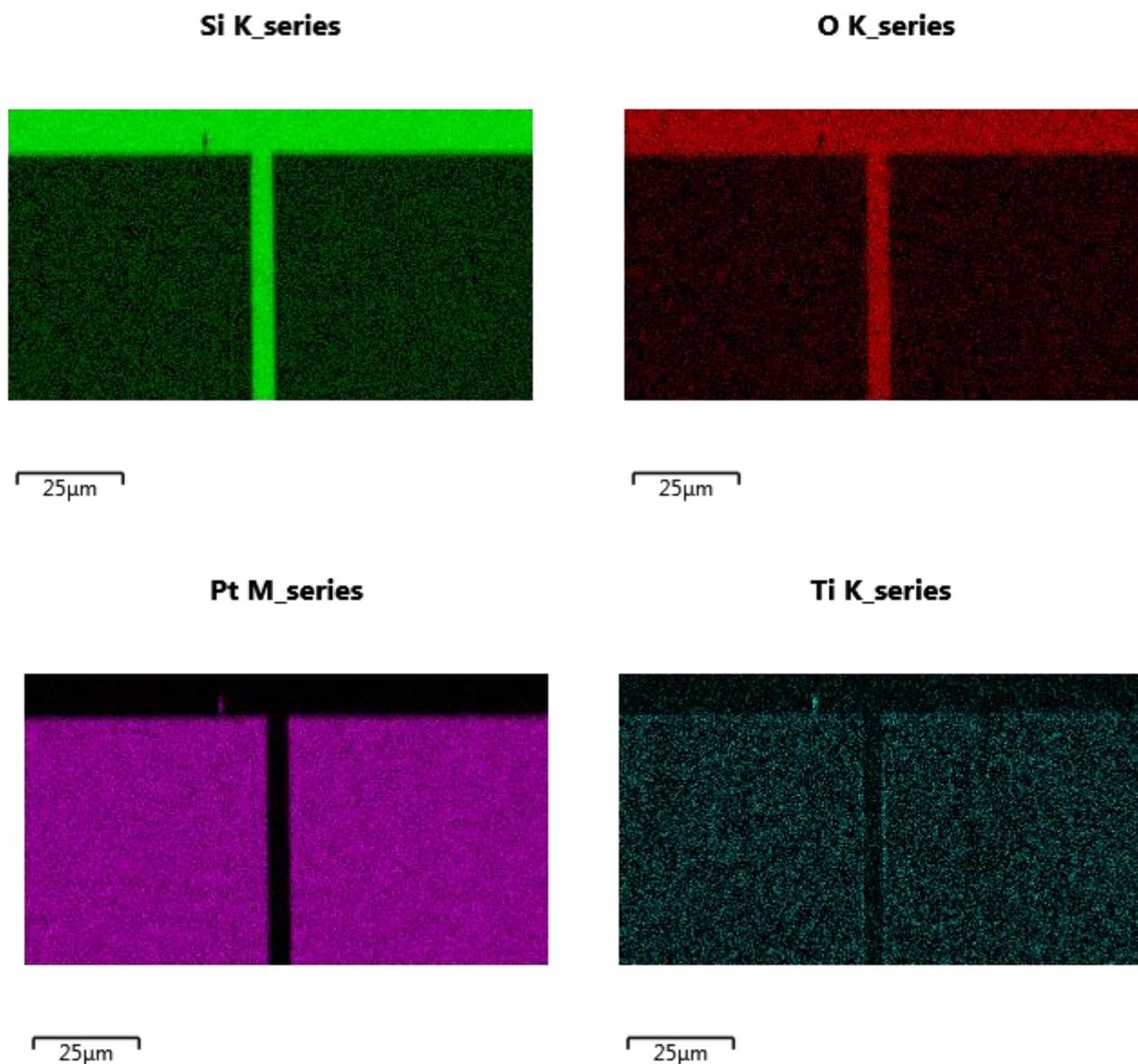


C K\_series



Zn L\_series





**Figure S1.** Electron image of the inter-electrode region and the spatial distribution of the signals due to C ( $K_{\alpha}$ ), Zn ( $L_{\alpha}$ ), Si ( $K_{\alpha}$ ), O ( $K_{\alpha}$ ), Pt ( $M_{\alpha}$ ), Ti ( $K_{\alpha}$ ).

## 2. TEM and EELS analysis

TEM analysis was performed in a probe aberration-corrected JEOL JEM ARM200CF microscope at a primary beam energy of 60 keV, operated in both conventional TEM (CTEM) and in scanning TEM (STEM) modes. The electron gun is a cold-field emission gun with an energy spread of 0.3 eV and the probe size was 1.0 Å. STEM micrographs were acquired in Z-contrast mode (High-Angle Annular Dark Field, HAADF).

A GIF Quantum ER was used for Electron Energy Loss Spectroscopy (EELS) measurements. Both low- and core-loss EELS spectra were acquired with the DualEELS capability through Gatan Digital Micrograph software. The use of Fourier logarithmic deconvolution on a full spectrum obtained by splicing together low- and core-loss EELS allows removing thickness-related plural scattering [1].

### 3. UV irradiation

The UV irradiation was performed by the Deuterium Light Source Spectral Products ASBN-D130. The spectrum of the lamp used for irradiation was acquired by the Fiber optic spectrometer AvaSpec-ULS2048L-USB2-FCPC (75 mm AvaBench, 2048 pixel CCD detector, USB/RS-232 interface) with grating UA - 300 lines/mm and bandwidth 200-1100 nm. The irradiance was varied, as shown in Fig.S2, and the calculated values are reported.

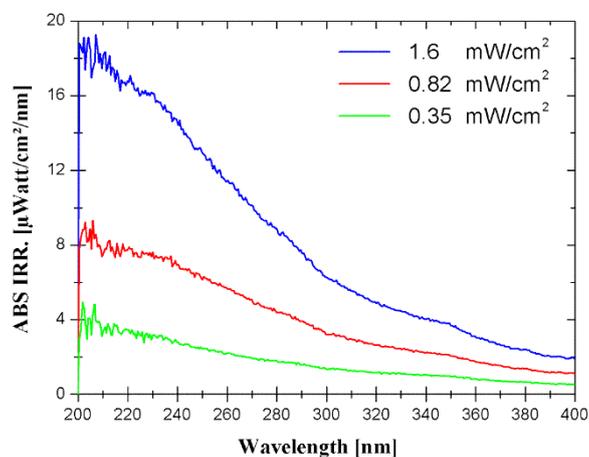


Figure S2. Spectra of the UV lamp used for the irradiation experiments.

### 4. I-V characteristics of ZnO-CNT layers

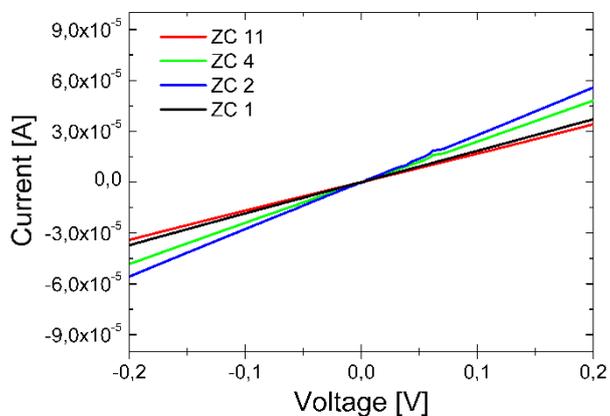
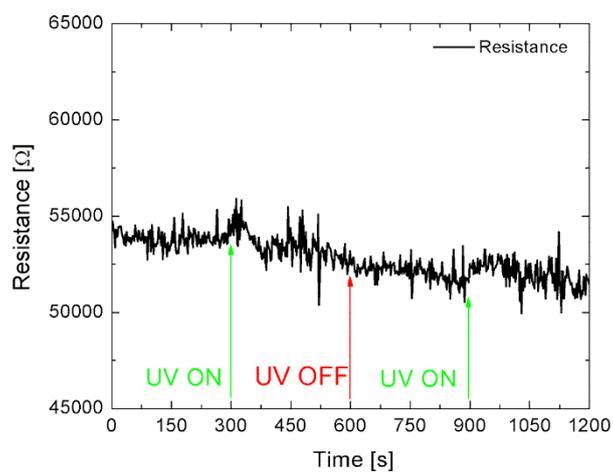


Figure S3. I-V curves obtained for different nanocomposite layers in dark condition.

## 5. Electrical behaviour of a bare CNT layer under UV illumination



**Figure S4.** Resistance measured for a bare CNT layer during UV ON-OFF cycling at  $V=2\text{mV}$ .

### Reference

- [1] J. Scott, P.J. Thomas, M. MacKenzie, S. McFadzean, J. Wilbrink, A.J. Craven, W.A. Nicholson, Near-simultaneous dual energy range EELS spectrum imaging, *Ultramicroscopy*, 108 (2008) 1586. DOI: 10.1016/j.ultramic.2008.05.006.