Supplementary Material for Chemical Communications

Supplementary Information

Experimental details

High-resolution transmission electron microscopy images were obtained on a JEOL 2010F instrument equipped with an Oxford INCA EDS system at an accelerating voltage of 200 kV. Samples were dispersed in ethanol and drop cast onto a 300 mesh Cu grid covered with a lacey carbon film.

Mid-IR spectra were acquired using a ZnSe single reflectance ATR accessory, equipped with a KBr beamsplitter and a DTGS KBr detector on a Nicolet 670 Nexus system. The UV-visible-near-IR spectra of the nanotube-nanocrystal heterostructure, formed using these tubes were characterized by the loss of transitions between van Hove singularities due to the perturbation of electronic structure, which had been induced by sidewall functionalization. No CdSe exciton peak is distinctly resolvable within that of the heterostructure, which could be due to (a) the peaks being obscured by the broad nanotube background absorption as well as (b) the large polydispersity in size and shape of the crystallites on the SWNT surface.

The samples for X-ray photoelectron spectroscopy were attached to stainless steel holders using conductive double-sided tape and placed in the vacuum chamber of a model DS800 XPS surface analysis system (Kratos Analytical Plc, Manchester, United Kingdom). The chamber was evacuated to a base pressure of ~5×10^{-9} torr. A hemispherical energy analyzer was used for electron detection. XPS spectra were first collected using a Mg K X-ray source at 80 eV pass energy and at 0.75 eV steps. High-resolution spectra were collected at a pass energy of 10 eV and in 0.1 eV steps.

Raman measurements were made on a Kaiser Raman microprobe with 632.8 nm laser excitation with a power of ~5 mW. Samples were dispersed in ethanol and placed onto a silicon wafer.

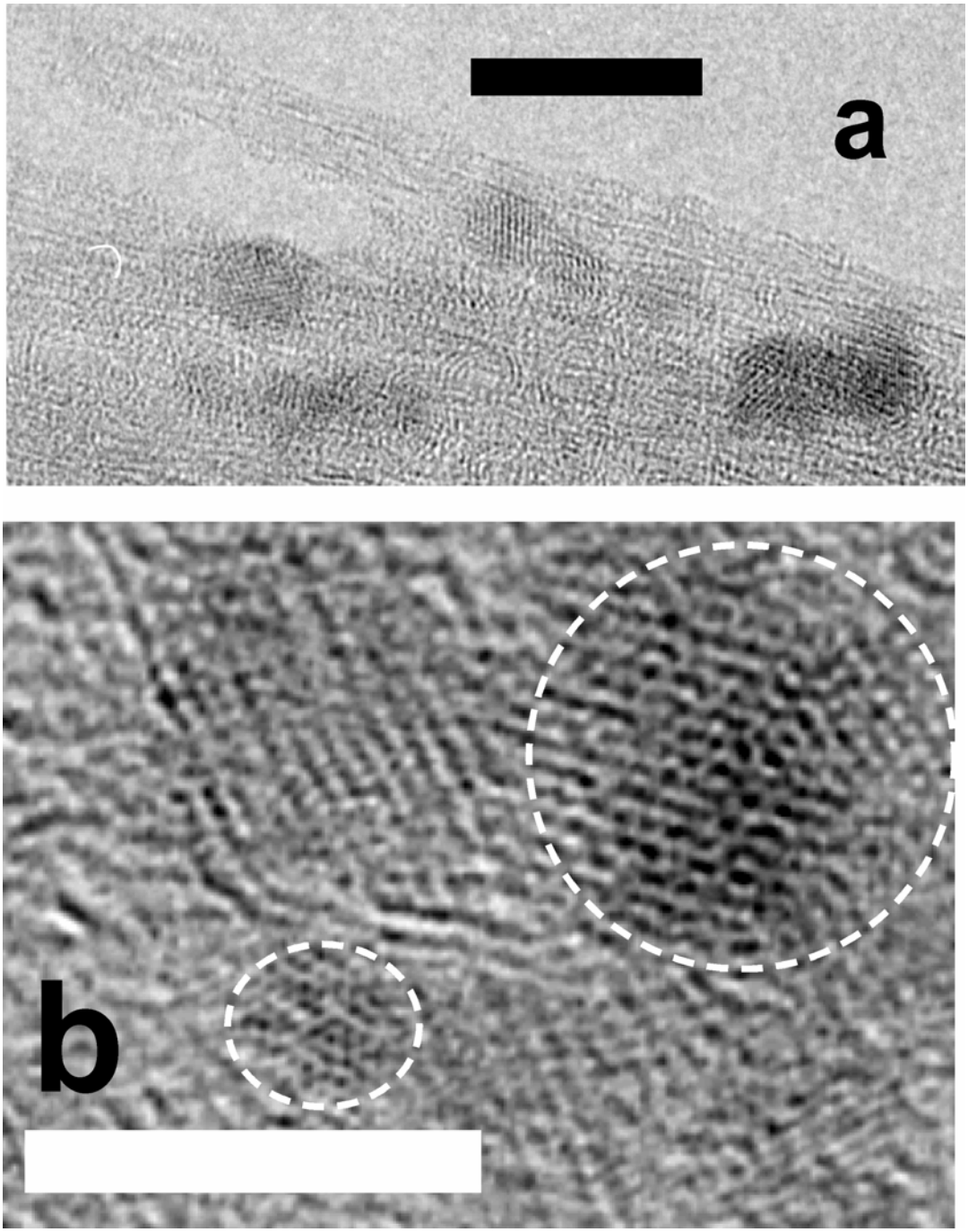

Figure S1. High-resolution TEM images of CdSe-SWNT heterostructures indicating (a) coverage along sidewalls and nanotube junctions. Interfaces (b) between lattice-resolved quantum dots (white circles) and nanotubes are clearly visible. Scale bar represents 10 nm for (a) and 5 nm for (b).

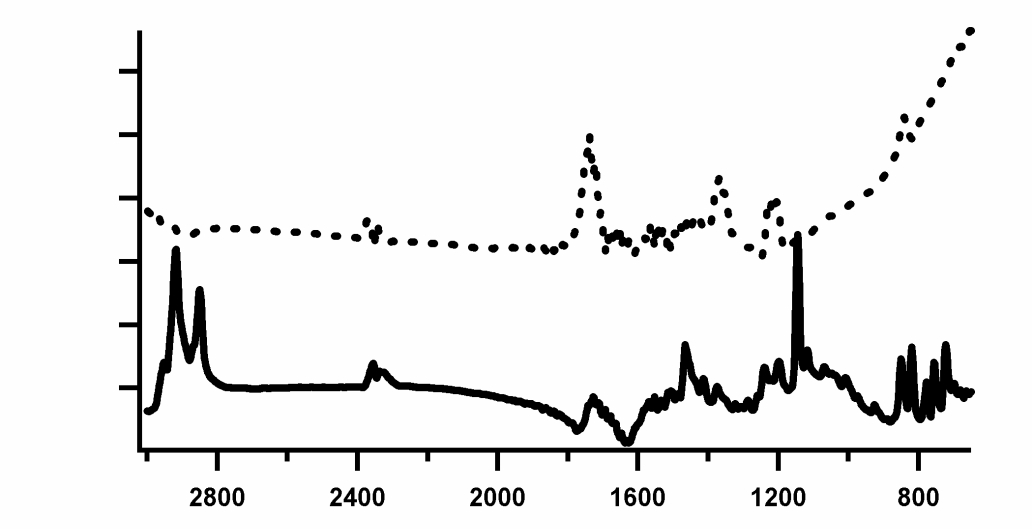

Figure S2. Mid-infrared spectrum of ozonized nanotubes (dashed-line) and CdSe-ozonized SWNT heterostructures (solid). The ozonized nanotubes show peaks arising from oxygenated functional groups, such as carboxylic acids. The heterostructure adduct shows optical signatures arising from oxygenated functional groups as well as from tetradecylphosphonic acid (TDPA), which is used in addition to SWNTs, to enable the *in situ* growth of CdSe nanocrystals.

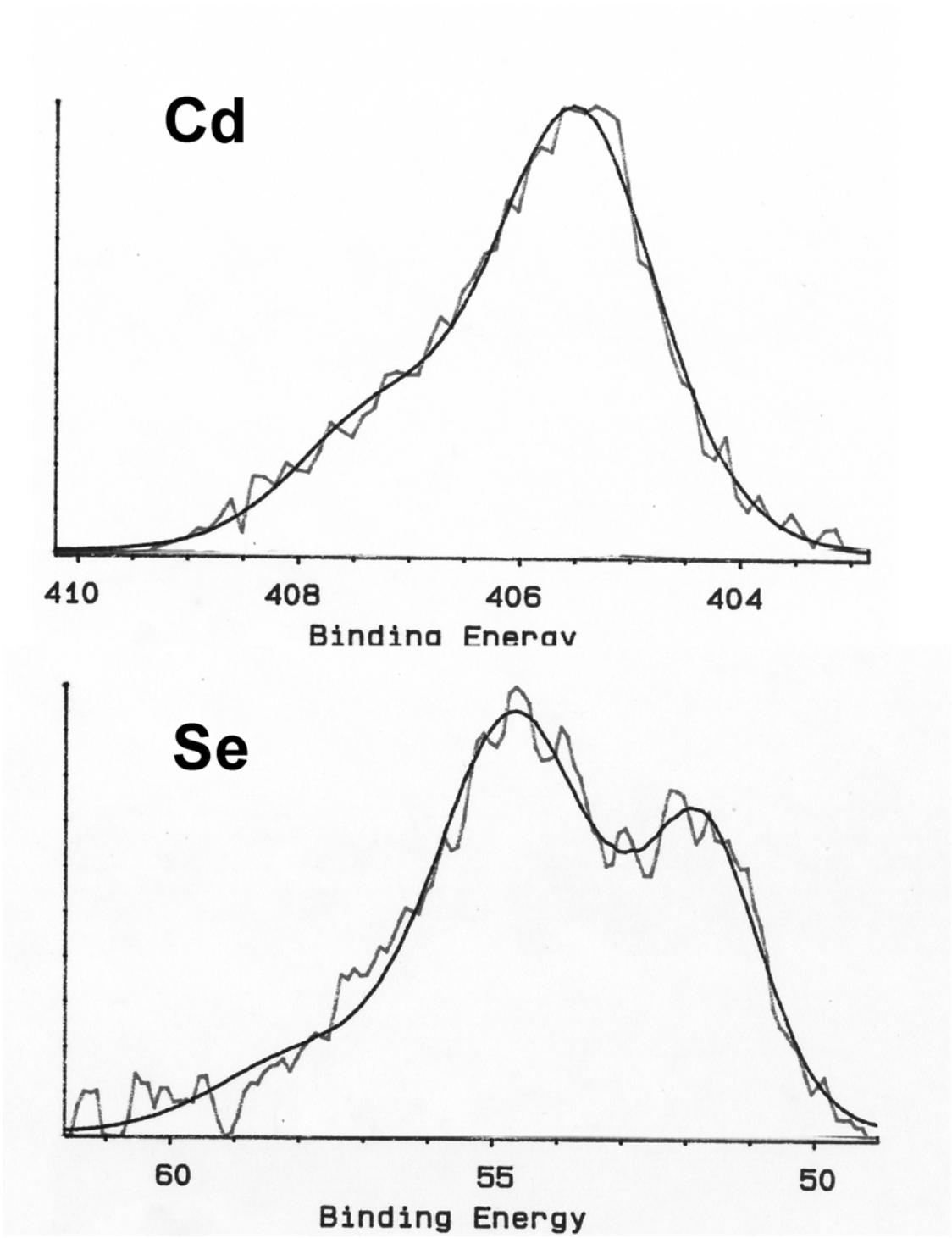

Figure S3. X-Ray photoelectron spectra (with binding energy in eV) showing Cd $3d_{5/2}$ and Se $3d_{5/2}$ regions for CdSe grown onto mildly oxidized SWNTs.