

## Supplementary Data

### Characterization of functionalized MWNT arrays

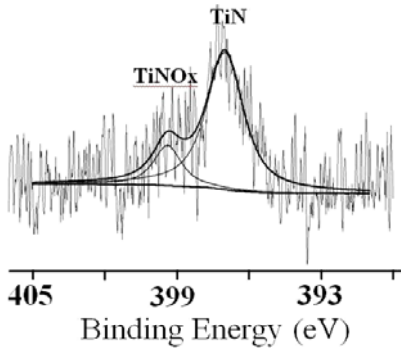
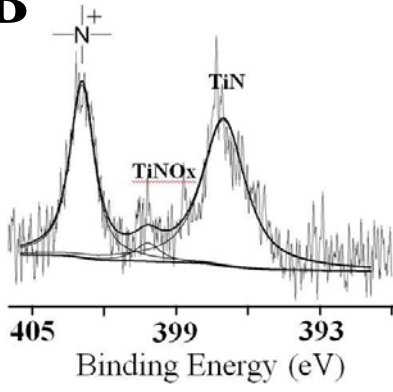
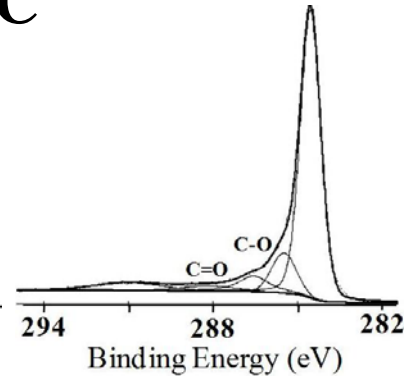
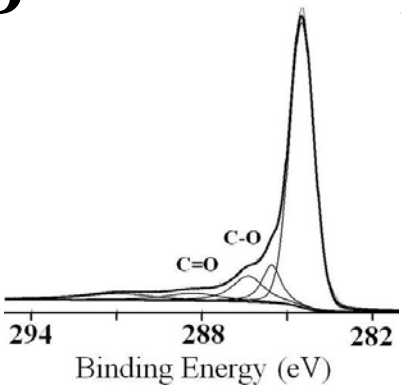
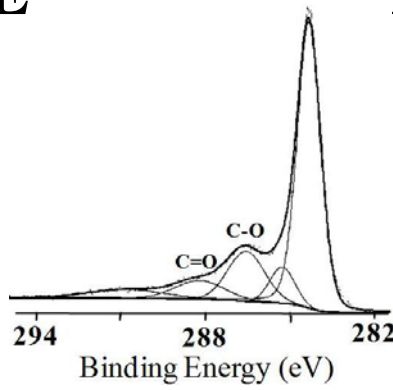
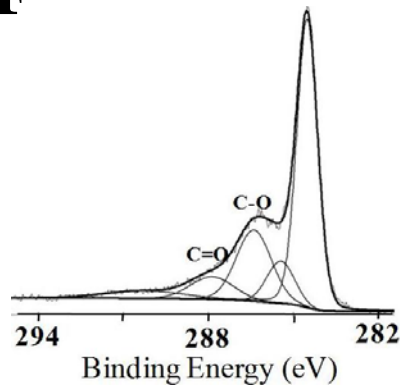
The functionalized samples were characterized by X-ray photoelectron spectroscopy (XPS). The control XPS N1s spectrum of MWNT-A<sub>0</sub> is illustrated in figure S1(A). For MWNT-A<sub>1</sub>, a new peak centered at 402.8eV arises in XPS N1s spectrum compared to that of MWNT-A<sub>0</sub> (figure S1(B)). This peak is attributed to the ammonium group of **1** molecules. The presence of ammonium groups shows that MWNT-A<sub>1</sub> is correctly functionalized by **1** molecules. For all other chemistries, we performed a decomposition of XPS C1s spectrum that was compared to the control MWNT-A<sub>0</sub> spectrum (figure S1(C)). For MWNT-A<sub>2</sub>, we observed an increase in peak intensity of the 288.9eV component relative to the peak centered at 286.4 eV (figure S1(D)). This component is attributed to the carboxylate group of **2** molecules, indicating the appropriate functionalization of MWNT-A<sub>2</sub>. The increasing of the 288.9eV component is relatively low suggesting a low yield of functionalization. The characterization of MWNT-A<sub>3</sub> has been described previously [29]. On MWNT-A<sub>3</sub> surface, the functionalization is expected to be best on portions of nanotubes with the lowest defects (straight portions). For MWNT-A<sub>4</sub>, the percentage of oxygen (O %) of MWNT-A increased from 2.4 to 12.8% after O<sub>2</sub> plasma treatment. The decomposition of XPS C1s peak shows that this treatment creates C-O and C=O bonds at the surface of MWNT-A (figure S1(E)). These C-O and C=O bonds are under the form of carboxyl, carbonyl and hydroxide groups. Increasing the time or power of plasma treatment does not further increase O % or C-O, C=O composition, but had deleterious effects on the length of MWNT-A and was thus avoided (data not shown). The coupling of carboxylic groups of MWNT-A<sub>4</sub> with amino-terminated PEG to yield MWNT-A<sub>5</sub> further increased O % to 16.6%. We also observed a further increase in intensity of the C-O component relative to the peak centered at 286.4 eV in the XPS C1s spectrum of MWNT-A<sub>5</sub>

(figure S1(F)). As there are plenty of C-O bonds in PEG molecules, these data illustrate the efficacy of our method for the grafting of PEG molecules on MWNT-A arrays. On MWNT-A<sub>5</sub>, we expect that PEG functionalization occurs homogeneously over the entire surface.

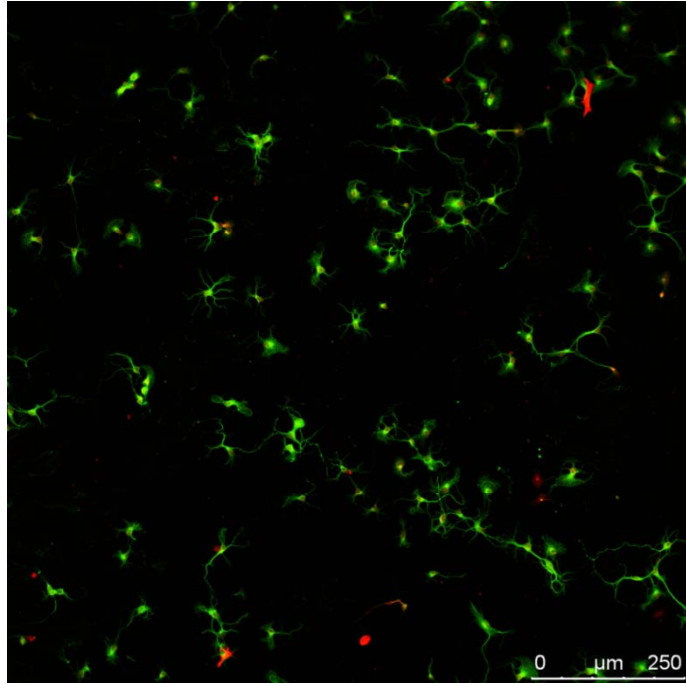
### **Supporting figure legends**

Figure S1. XPS N1s peaks and spectrum decomposition of MWNT-A<sub>0</sub> (A) and MWNT-A<sub>1</sub> (B). XPS C1s peaks and spectrum decomposition of MWNT-A<sub>0</sub> (C), MWNT-A<sub>2</sub> (D), MWNT-A<sub>4</sub> (E) and MWNT-A<sub>5</sub> (F).

Figure S2. Confocal microscopy images of hippocampal cells cultured on coverslip covered by PDL. (A) 3 DIV. (B) 8 DIV. Bar: 250  $\mu\text{m}$ .

**A****B****C****D****E****F**

**A**



**B**

