nanomaterials

Supplementary Information

Toxicity of Carbon Nanomaterials and Their Potential Application as Drug Delivery Systems: In Vitro Studies in Caco-2 and MCF-7 Cell Lines

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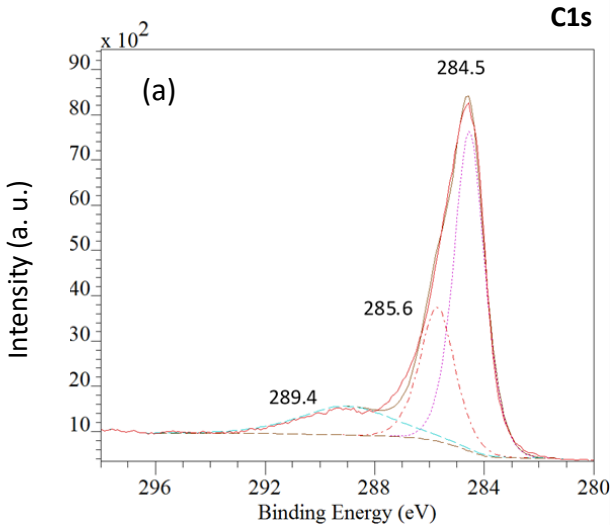
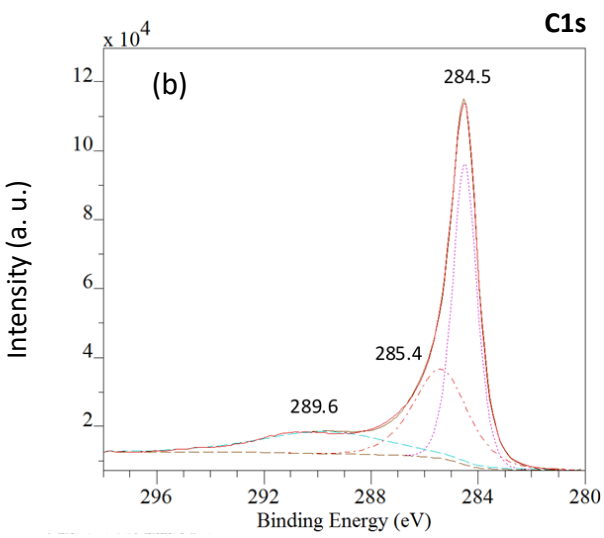
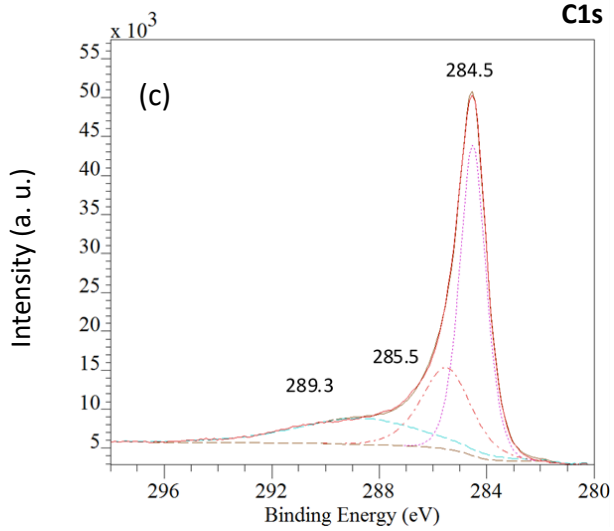
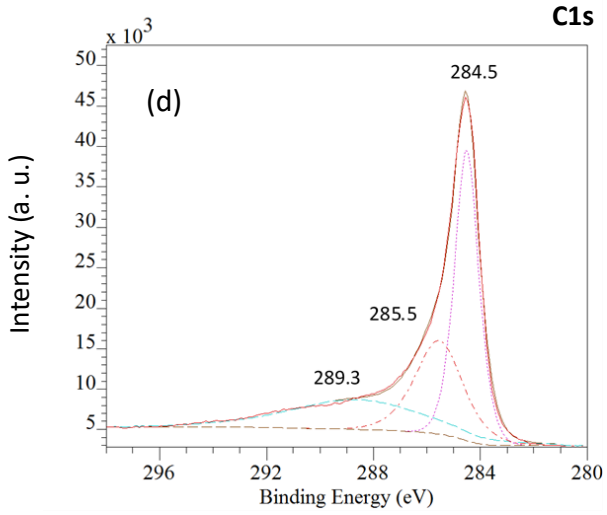
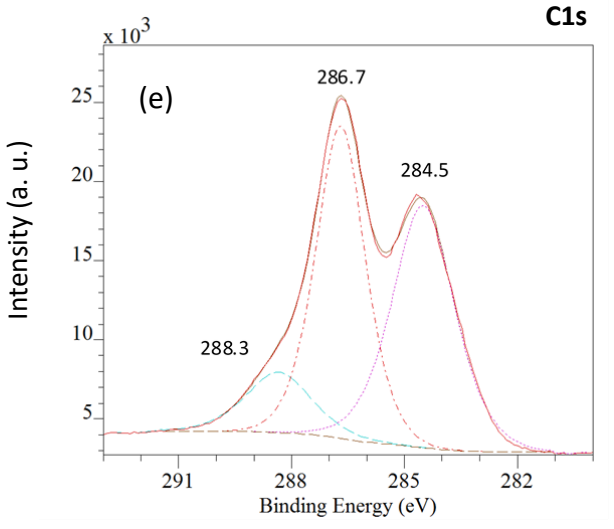
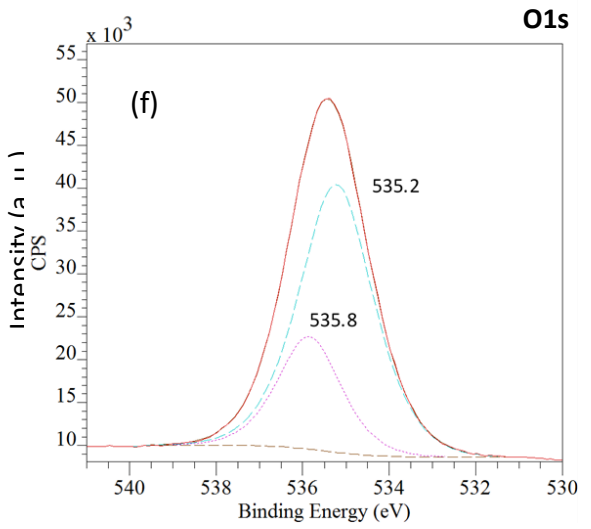

C1s
(a)
x 10^2
284.5
285.6
289.4
Intensity (a. u.)
Binding Energy (eV)


C1s
(b)
x 10^4
284.5
285.4
289.6
Intensity (a. u.)
Binding Energy (eV)


C1s
(c)
x 10^3
284.5
285.5
289.3
Intensity (a. u.)
Binding Energy (eV)


C1s
(d)
x 10^3
284.5
285.5
289.3
Intensity (a. u.)
Binding Energy (eV)


C1s
(e)
x 10^3
286.7
284.5
288.3
Intensity (a. u.)
Binding Energy (eV)


O1s
(f)
x 10^3
535.2
535.8
CPS
Binding Energy (eV)

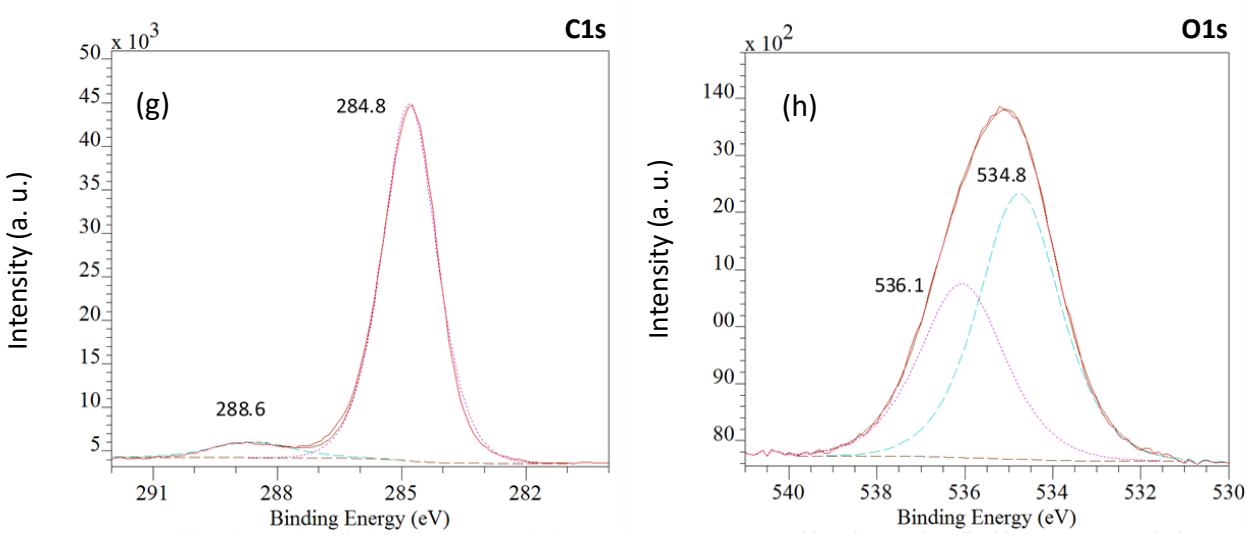


Figure S1. C1s and O1s regions in high resolution XPS spectra of carbon nanomaterials: (a) CNH, (b) CNT, (c) CNP, (d) RGO, (e, f) GO and (g, h) ND. In (a-d), C1s features at 284.5,~285.4, and ~289.5 eV are assigned to sp^2 C=C, sp^3 C-C, and π-π* transitions, respectively. In (e), C1s XPS spectra show a wide peak at 284.5 (sp^2 C=C, sp^3 C-C), at 286.7 (C-O-C, C-OH) and at 288.3 eV (C=O, COOH). In (g), C1s peaks at 284.8 and 288.6 eV correspond to sp^3 C-C diamond bonds and (C=O, COOH), respectively. Oxygen content (% at.) of these carbon nanomaterials, obtained from XPS spectra, are collected in Table 1.

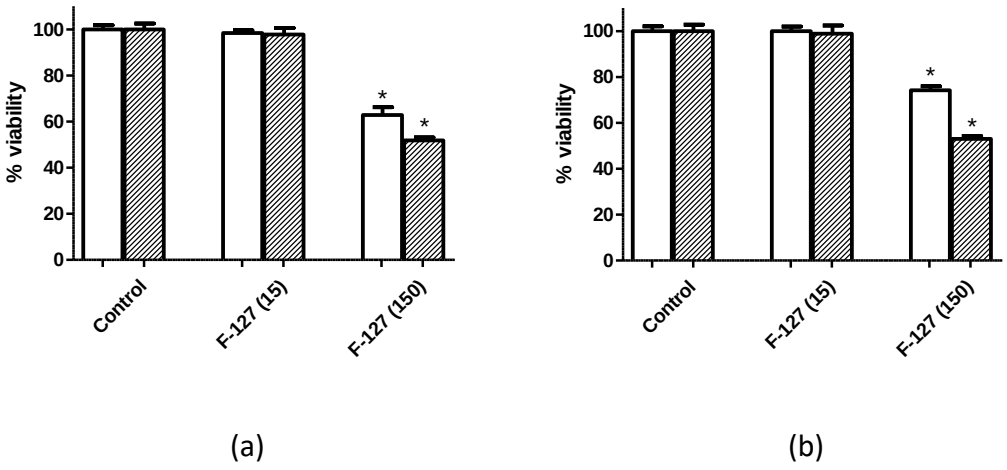
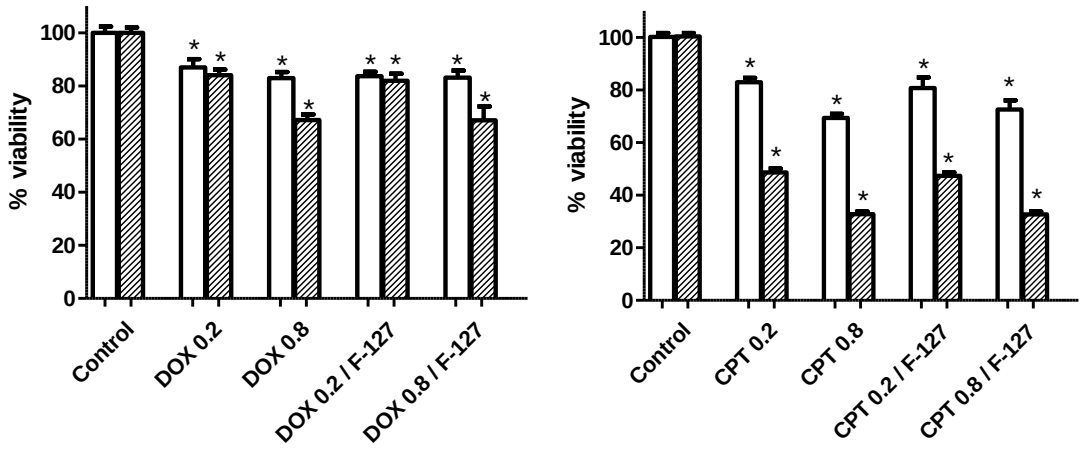


Figure S2. Cell viability assays after treatment with F-127 at 15 μg·mL^{-1} and 150 μg·mL^{-1} for 24 h (white) and 72 h (striped), on (a) Caco-2 and (b) MCF-7 cells. (*represents significance at $p < 0.05$ when compared to untreated control cells).

(a)



(b)

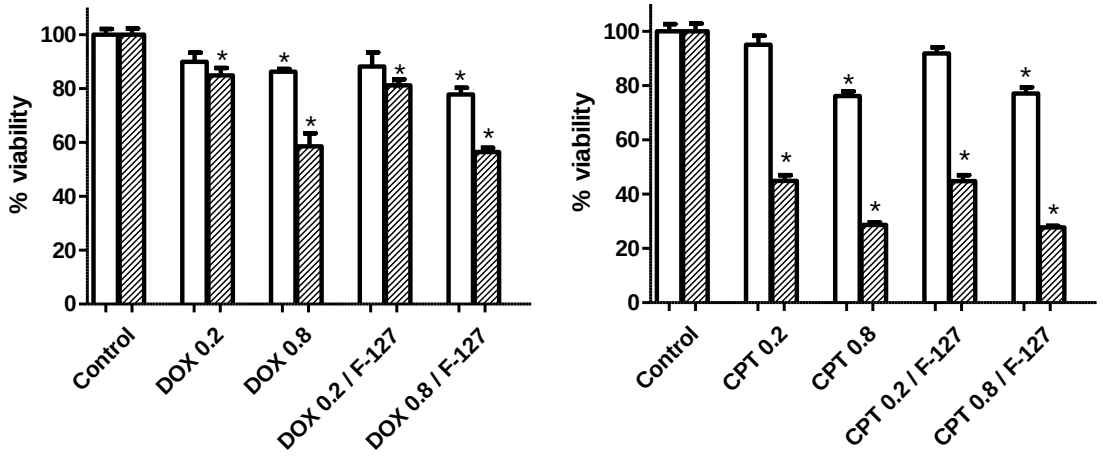


Figure S3. Cell viability assays after treatment with DOX and CPT at 0.2 μg·mL^{-1} and 0.8 μg·mL^{-1} for 24 h (white) and 72 h (striped), on (a) Caco-2 and (b) MCF-7 cells, showing no significant differences in the absence or in the presence of F-127 at 15 μg·mL^{-1}. (*represents significance at $p < 0.05$ when compared to untreated control cells).

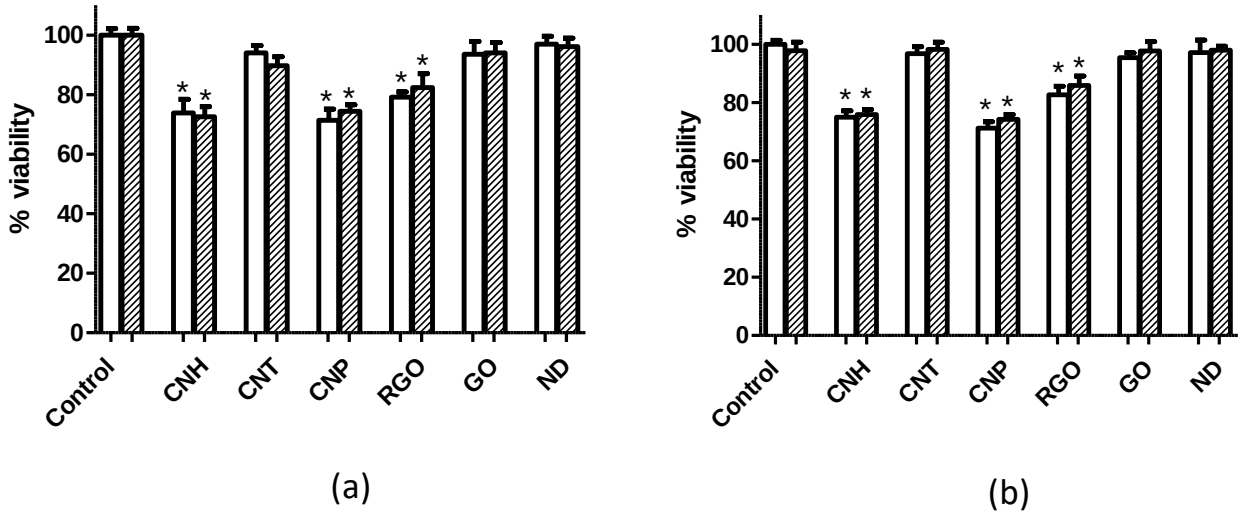


Figure S4. Cell viability assays after 24 h (white) and 72 h (striped) of incubation with various carbon nanomaterials at 0.6 μg·mL^{-1} showing differential effects on (a) Caco-2 and (b) MCF-7 cells. Values that are significantly different from the control ($p < 0.05$) are denoted with asterisk (*). Untreated cells were used as control.

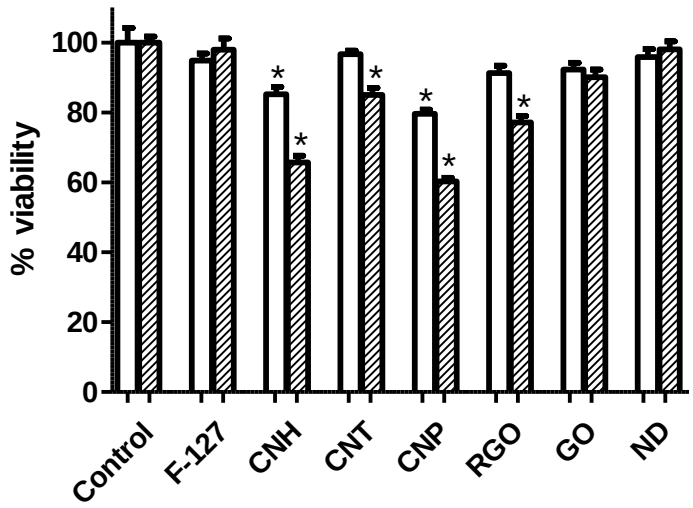


Figure S5. Cell viability assays after 24 h (white) and 72 h (striped) of incubation with various carbon nanomaterials at 3.0 μg·mL^{-1}, and also F-127 at 15 μg·mL^{-1}, showing differential effects on human dermal fibroblasts. Values that are significantly different from the control ($p < 0.05$) are denoted with asterisk (*). Untreated cells were used as control.

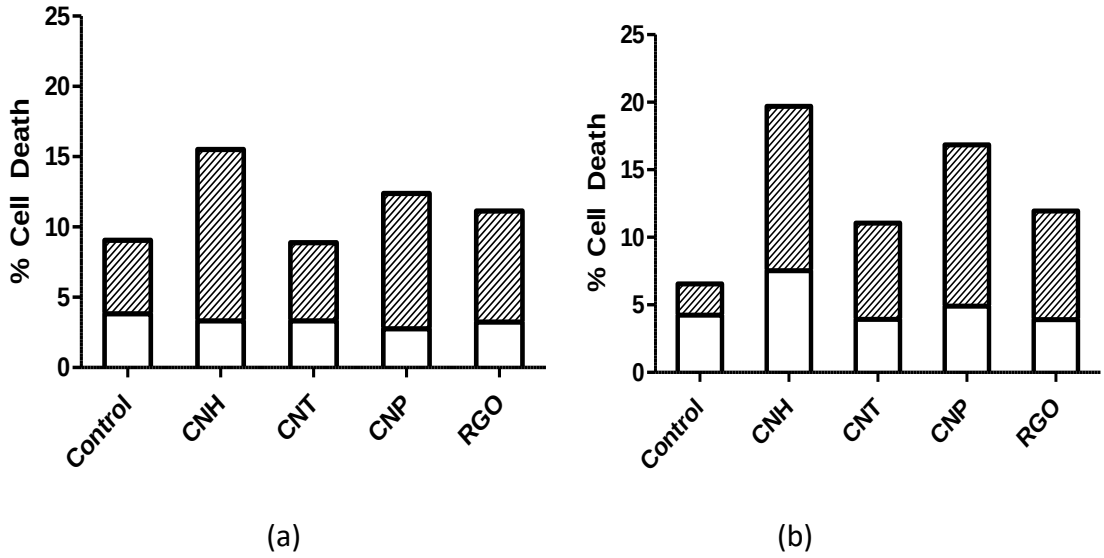


Figure S6. Bar graphs corresponding to flow cytometry analysis, quantifying the percentage of early-stage apoptotic (white), and late-stage apoptotic/necrotic (striped) cells in response to exposure for 72 h to different carbon nanomaterials at 3 $\mu g \cdot mL^{-1}$ for (a) Caco-2 and (b) MCF-7 cells. Control represents untreated cells.

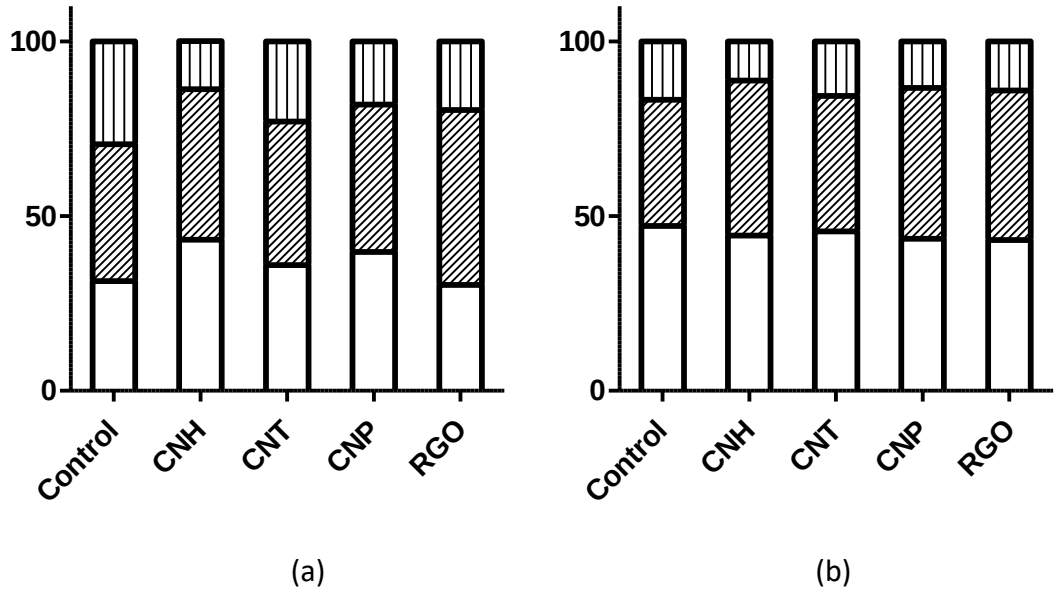
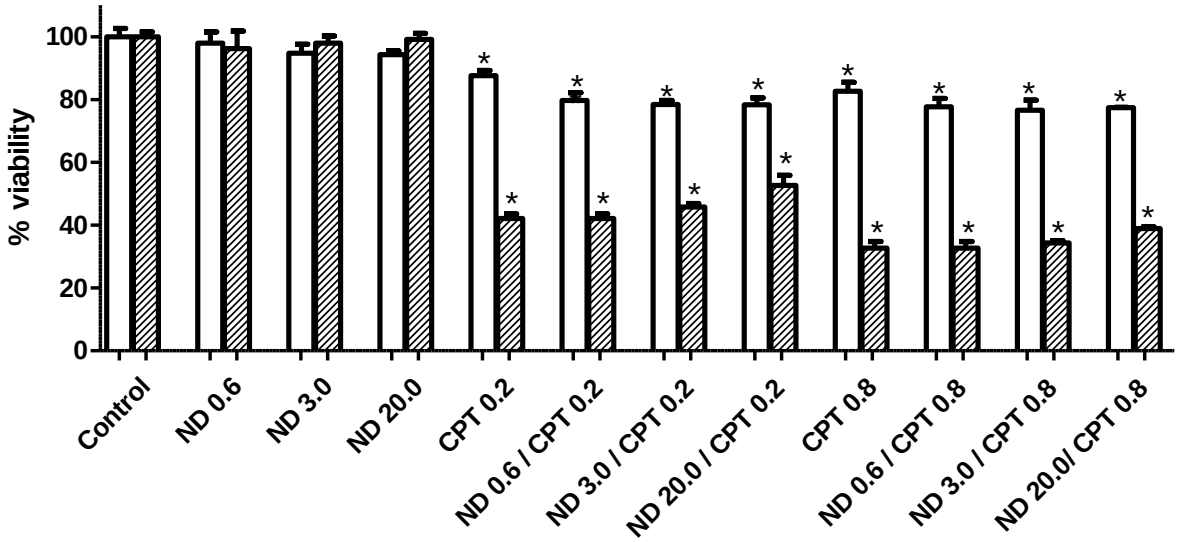


Figure S7. Quantitative distribution percentages of cell cycle phases for (a) Caco-2 and (b) MCF-7, after treatment with carbon nanomaterials at 3 μg·mL^{-1} for 72 h. Control represents untreated cells. (☐ G1, ▨ S, ▥ G2).

(a)



(b)

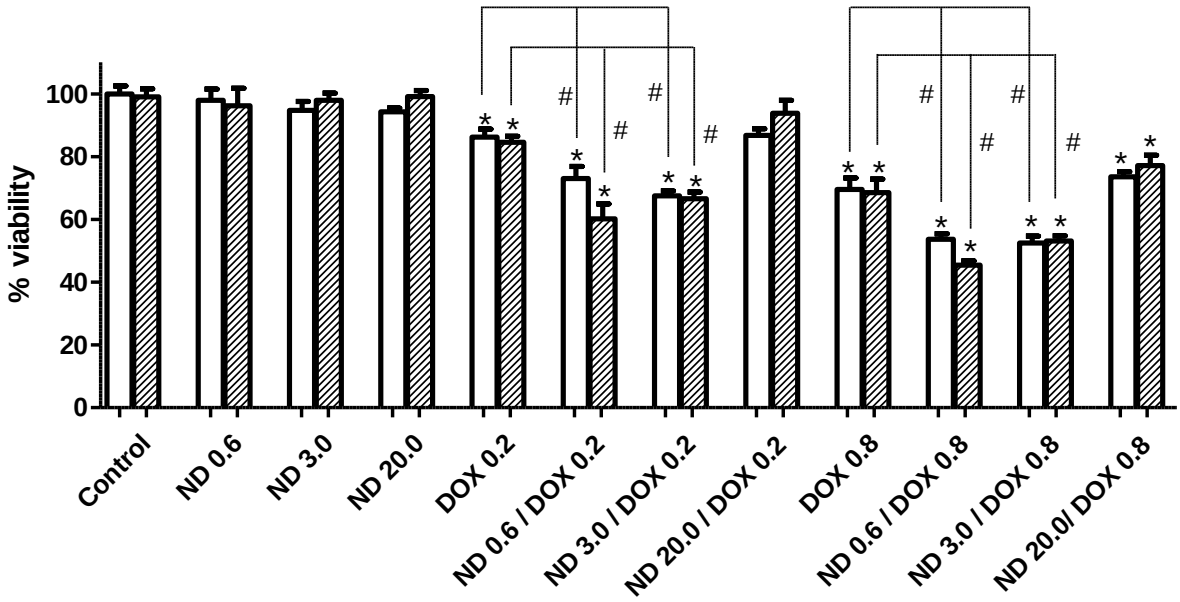


Figure S8. Cell viability assays for Caco-2 cells after 24 h (white) and 72 h (striped) of incubation with ND at 0.6, 3.0 and 20.0 μg·mL^{-1}, free drugs (a) CPT and (b) DOX, at 0.2 and 0.8 μg·mL^{-1}, and (a) CPT- and (b) DOX- loaded carbon nanomaterials. (* and # represent significance at $p < 0.05$ when compared to untreated control cells and free drug-treated cells, respectively).