

The following are available in the Supplementary Information: **Figure S1.** The cold atmospheric plasma (CAP) source and CAP application set-up. **Figure S2.** The FT-IR spectra of the samples at various process steps: (a) Full range ( $600\text{--}4000\text{ cm}^{-1}$ ), (b)  $1400\text{--}600\text{ cm}^{-1}$ , (c)  $1700\text{--}1400\text{ cm}^{-1}$ , and (d)  $4000\text{--}2700\text{ cm}^{-1}$ . Sample details are presented in Table 1. **Figure S3.** STEM micrographs of SPIONCFA-CUR. **Supplementary Table 1.** Observed FT-IR bands along with their assignments for SPIONCs after various process steps. For sample designations see Table 1S. **Supplementary Table 2.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of CAP in MCF-7 cells. **Supplementary Table 3.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of NCs in HME-1 cells. **Supplementary Table 4.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of NCs in MCF-7 cells. **Supplementary Table 5.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of CAP and NCs combined in HME-1 cells at 24h. **Supplementary Table 6.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of CAP and NCs combined in HME-1 cells at 48h. **Supplementary Table 7.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of CAP and NCs combined in MCF-7 cells at 24h. **Supplementary Table 8.**  $\text{IC}_{50}$  values (in  $\mu\text{g/mL}$ ) of CAP and NCs combined in MCF-7 cells at 48h. **Supplementary Table 9.** Combination Index (CI) values for the interaction of G7 ( $1\text{--}10\text{ }\mu\text{g/mL}$ ) with 10 s or 20 s CAP exposure in HME-1 cells after 24 h incubation. **Supplementary Table 10.** Combination Index (CI) values for the interaction of G7 ( $1\text{--}10\text{ }\mu\text{g/mL}$ ) with 10 s or 20 s CAP exposure in HME-1 cells after 48 h incubation. **Supplementary Table 11.** Combination Index (CI) values for the interaction of G7 ( $1\text{--}10\text{ }\mu\text{g/mL}$ ) with 10 s or 20 s CAP exposure in MCF-7 cells after 24 h incubation. **Supplementary Table 12.** Combination Index (CI) values for the interaction of G7 ( $1\text{--}10\text{ }\mu\text{g/mL}$ ) with 10 s or 20 s CAP exposure in MCF-7 cells after 48 h incubation. **Figure S4.** (a) Nitrogen adsorption-desorption isotherms, (b) Pore size/ diameter distribution of MPS-SPIONC, along with a table summarizing the important parameters obtained. **Figure S5.** Cytotoxicity effects of (a) CUR and (b) CAPE on MCF-7 cells after 24h and 48 h incubation, as determined by MTT assay. **Figure S6.** Apoptosis results of HME-1 cells. (a) Application of **G4** (FA-conjugated nanoclusters) and CAP, (b) **G5** (CUR-loaded nanoclusters) and CAP application, (c) **G6** (CAPE-loaded nanoclusters) and CAP application. (d) **G7** (CUR-CAPE loaded nanoclusters) and CAP application. **Figure S7.** Apoptosis results of MCF-7 cells. (a) Application of **G4** (FA-conjugated nanoclusters) and CAP, (b) **G5** (CUR-loaded nanoclusters) and CAP application, (c) **G6** (CAPE-loaded nanoclusters) and CAP application. (d) **G7** (CUR-CAPE loaded nanoclusters) and CAP application.