Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

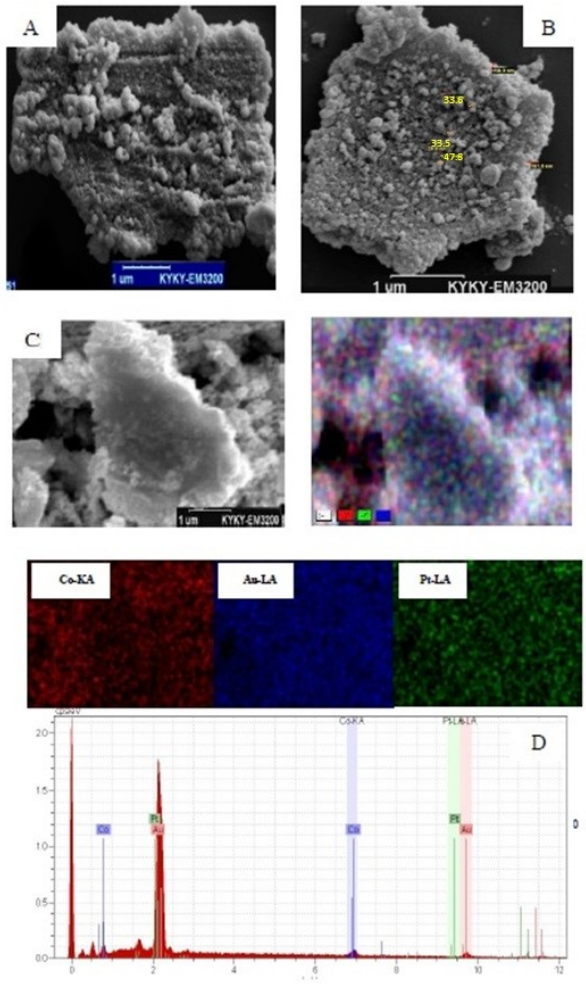

Figure S1: (A,B) FE-SEM, (C) SEM/EDX images and (D) EDX spectra obtained for NSMs.

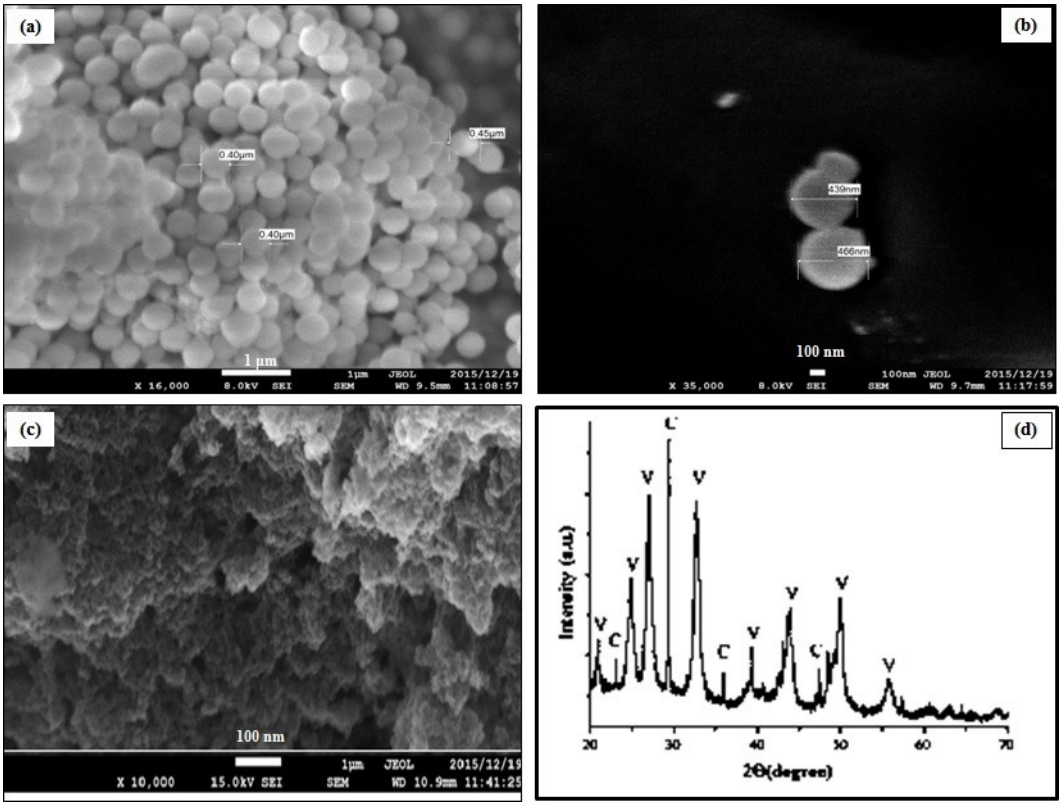

Figure S2: (a, b and c) SEM images of $CaCO_3$ (CMC) microparticles with different magnifications and (d) XRD pattern of $CaCO_3$ (CMC) microparticles (V and C denote vaterite and calcite, respectively).

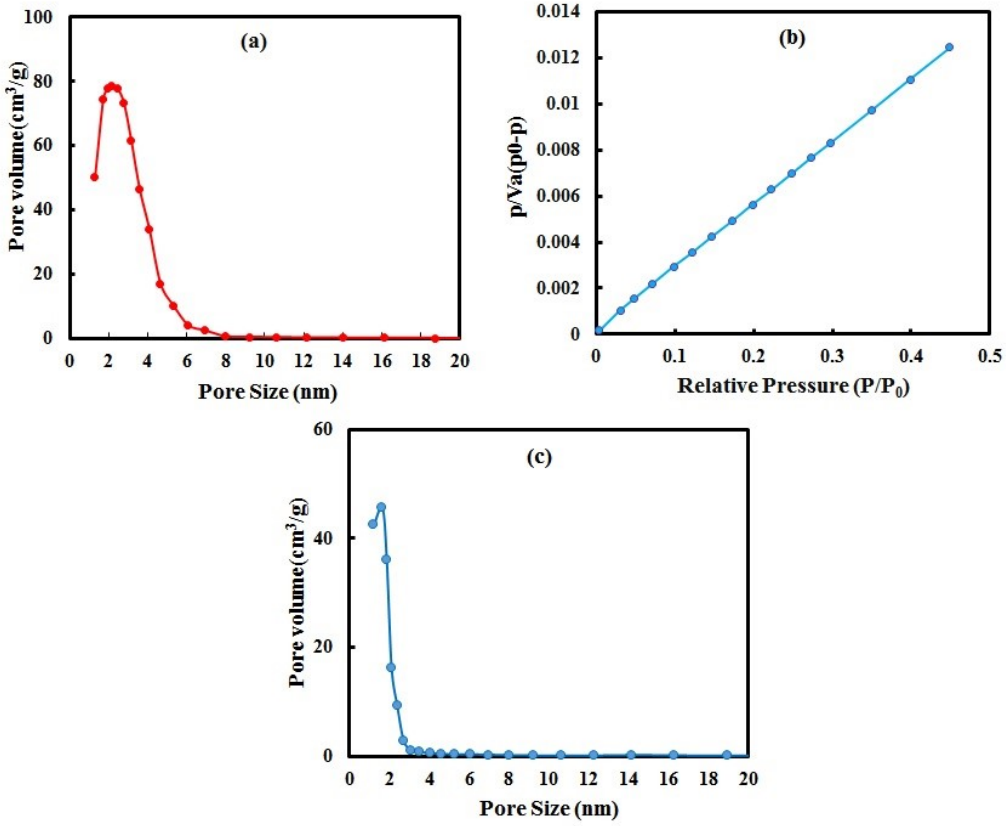

Figure S3: (a) Pore size distribution and (b) plot of the adsorption versus partial pressure of $CaCO_3$ (CMC) microparticles and (c) pore size distribution of hollow multilayer magnetic microcapsule.

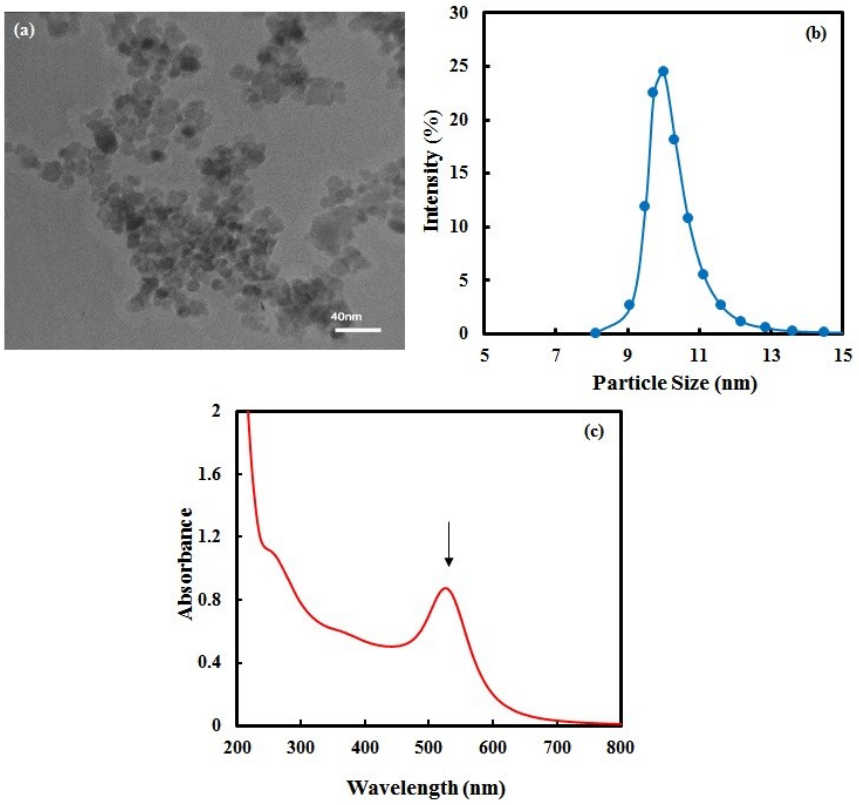

Figure S4: (a) TEM image, (b) size distribution and (c) UV-Vis absorption spectrum of Au NPs**.**

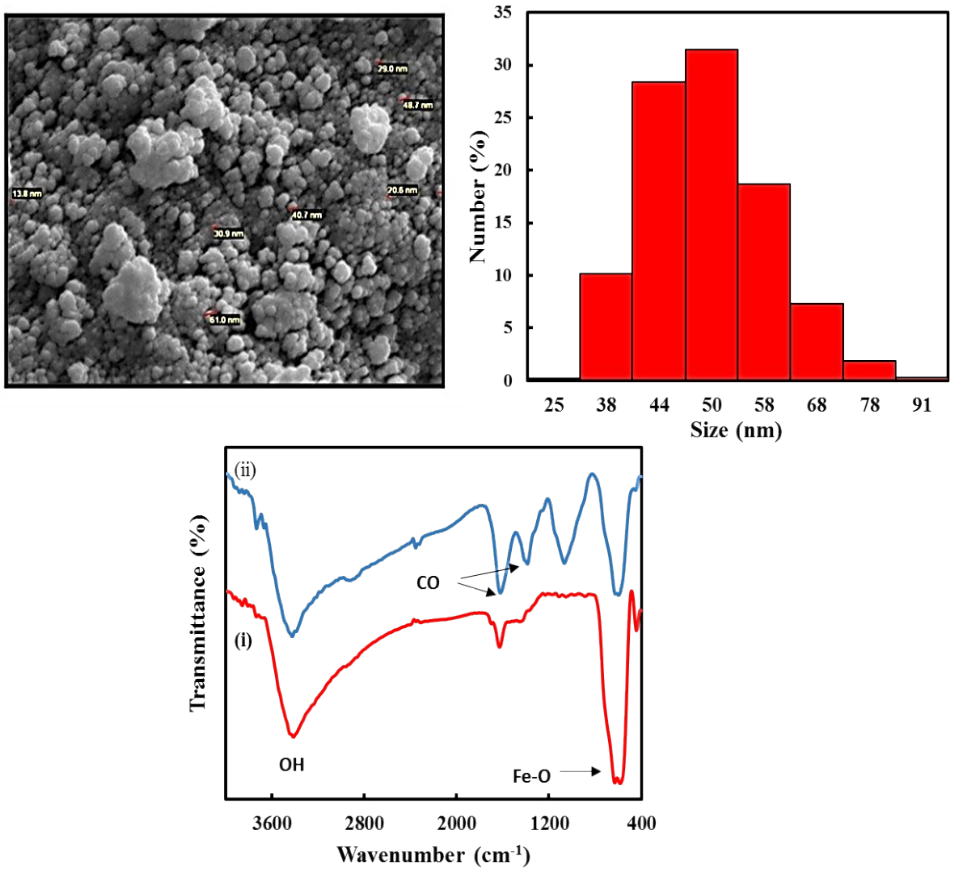

Figure S5: (a) SEM image, (b) size distribution and (c) FTIR spectra of the (i) Fe_3O_4 and (ii) citrate coated Fe_3O_4 NPs**.**

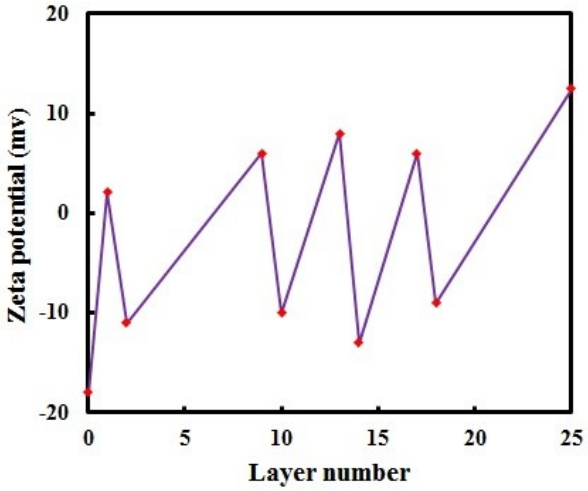

Figure S6: Zeta potential measurement as a function of layer numbers of coated calcium carbonate microparticles (number 0 represents bare microparticles).

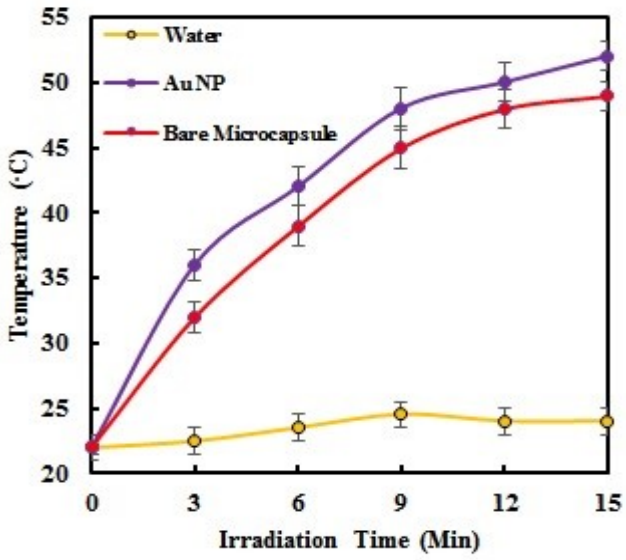

Figure S7: The photothermal effects of water, Au NPs and an aqueous dispersion of magnetic multilayer microcapsule (1mg) under NIR irradiation at a power density of 200mW cm^{-2}.

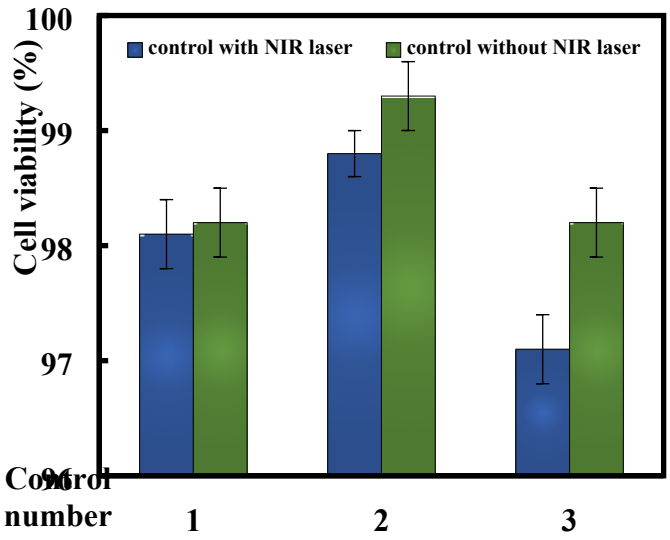

Figure S8: *In vitro* cell viability in the control culture medium without/with 200 mw NIR irradiation for 15 min.

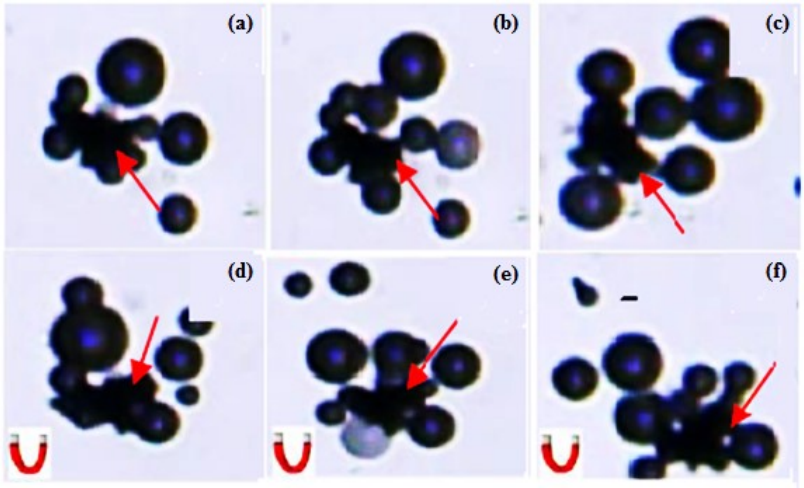

Figure S9: Remote magnetic guidance of oxygen-propelled NSM in PBS solution with 1% H_2O_2 at 37°C. The arrows show the movement of NSM in the absence (a, b, c) and the presence (d, e, f) of magnetic field (0.5 Tesla). The magnification of images is 640 times.

SI Video 1. Autonomous motion of NSMs in 1% H_2O_2 solution in PBS (pH 7.4) at 37 °C.

SI Video 2. Pick-up of DOX loaded magnetic multilayer microcapsule using NSM in 1% H_2O_2 in PBS (pH 7.4) under a magnetic field of about 0.5 Tesla.

SI Video 3. Transport of DOX loaded magnetic multilayer microcapsule using NSM in 1% H_2O_2 in PBS (pH 7.4) under a magnetic field of about 0.5 Tesla.

SI Video 4. Attachment of NSMs to HeLa cells.