Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Materials

Optimization of magnetic hyperthermia effect for breast cancer stem cell therapy

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Figure S1 Characterization of the prepared MNCs. (a) The changes in the chemical functional groups of bare MNC and PAA-coated MNC were measured by FT-IR. The intensity of the peaks of C=O and O-H from the PAA polymer increased. (b) The percentage of mass weight of PAA-coated MNC and MNC alone determined by TGA analysis. From these data, the PVP coating onto the MNC was quantitatively measured ~ 8 % from the weight loss because the organic polymer was generally degraded at high temperature (~ 300 °C).

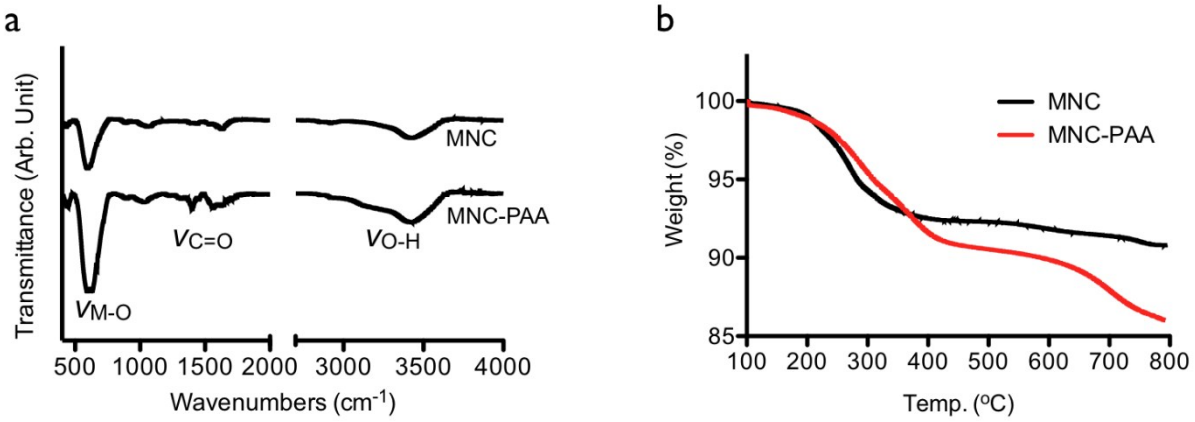
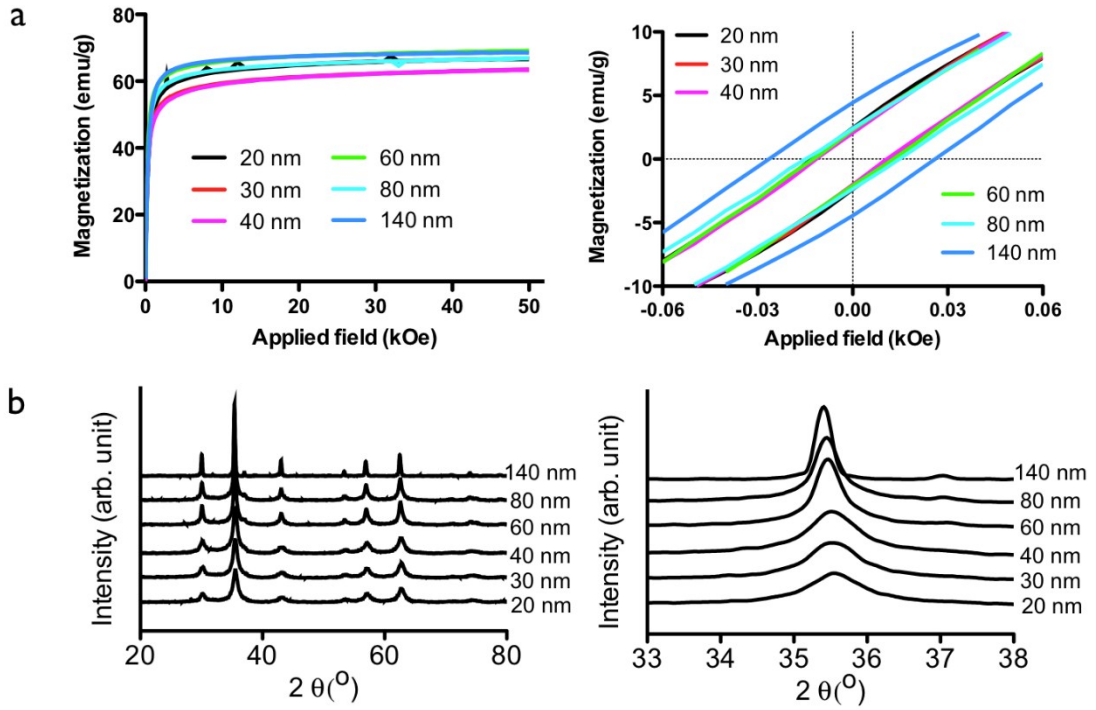


Figure S2 Magnetic and structural characterization of the MNCs of different sizes. (a) The MNCs exhibited almost super-paramagnetism with similar M_s and coercivity values. (b) The prepared MNCs showed typical magnetite spinel structures, as confirmed by XRD, and the crystal size was calculated. (c) The conditions such as different concentrations of the chemicals, MNC whole, and crystal sizes are summarized ([a] The average size was determined from the TEM image, [b] The crystal size was calculated from the XRD data).



c

sample	$FeCl_3 \cdot 6H_2O$ (g)	NaOAc (g)	Avg. size (nm)[a]	Crt. size (nm)[b]
1	15	150	20 ± 4.1	10
2	15	100	30 ± 4.1	9.9
3	18	100	40 ± 9.2	9.9
4	24	100	60 ± 8.3	19.8
5	27	150	80 ± 7.5	23.7
6	27	100	140 ± 14.5	46.2

Figure S3 HR-TEM images of the various sized MNC particles. From the image, all MNC particles were revealed high crystallinity and formed with aggregation of primary crystalline. The scale bar is indicated to the 5 nm and inset image is for the relatively low magnification of HR-TEM image.

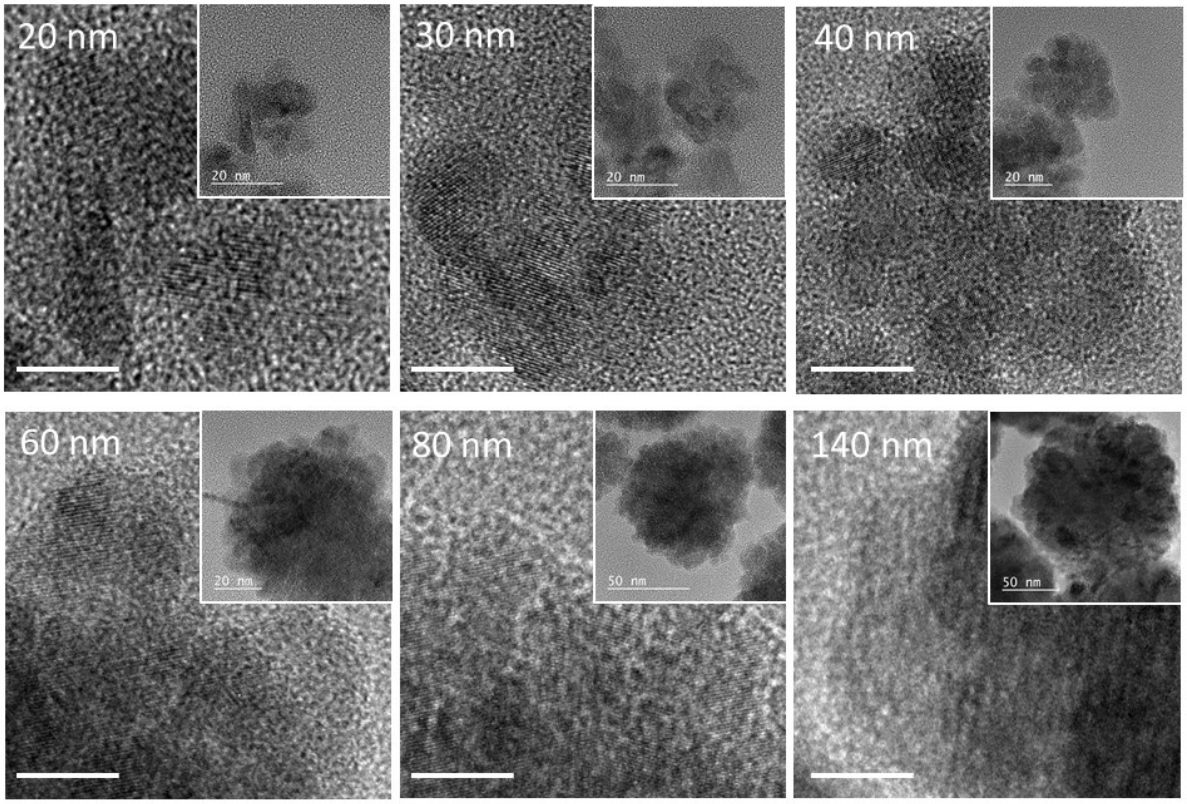


Figure S4 Characterization of mammosphere (MS) formation. (a) The morphology of MS was determined on different days and (b) serial passages of MS (P0~P3) were performed for MS formation (the scale bar: 200 μm). (c) The intensity of the biomarkers ALDH1 and CD44+/CD24- at different passages of MS was determined by flow cytometry.

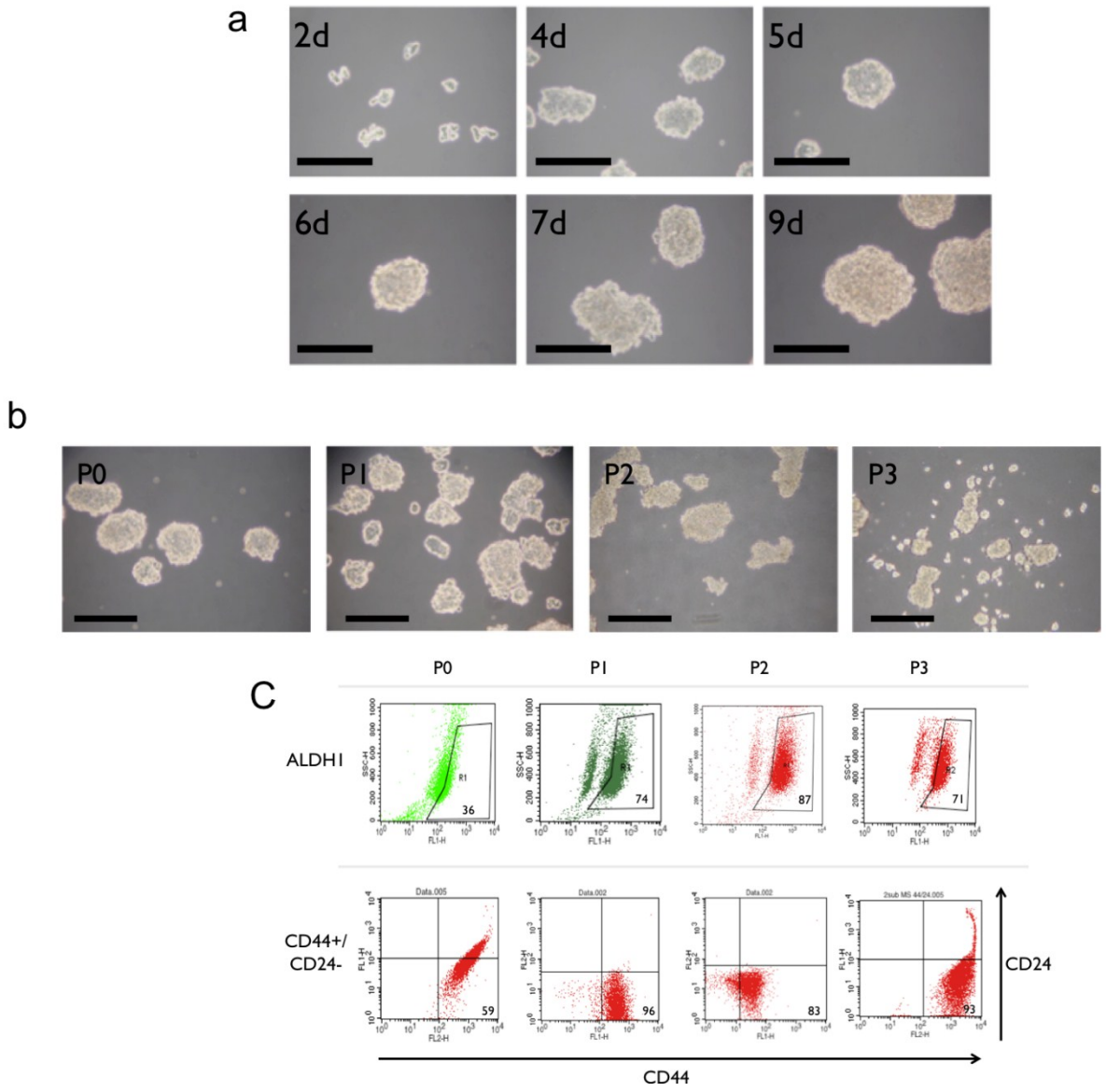


Figure S5 The effect of thermal therapy on mammosphere (MS) cells under the optimized magnetic hyperthermia conditions (60-nm sized MNC, 290 kHz, and 60 kA/m). (a) The changes in the expression level of the biomarkers with different factors such as time and size. (b) The treated cells were subjected to staining analysis with PI and annexin-V to establish the cell death process, and typical apoptosis mechanism was exhibited.