

# **Electronic Supplementary Material**

## **A mineralization strategy based on T-cell membrane coated CaCO<sub>3</sub> nanoparticles against breast cancer and metastasis**

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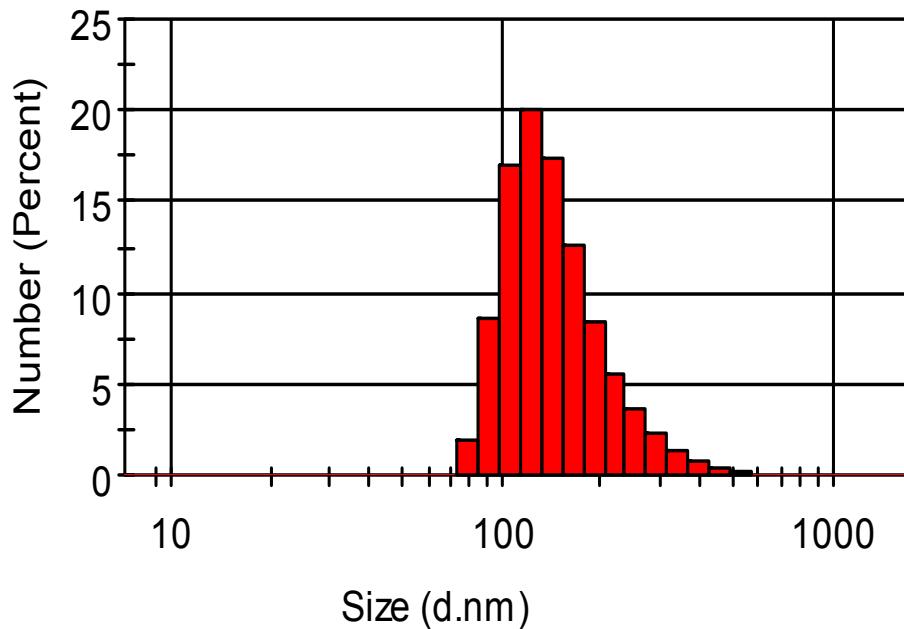
## Reagents and Materials

Calcium chloride dihydrate ( $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ ) and ammonia bicarbonate ( $\text{NH}_4\text{HCO}_3$ ) were purchased from China National Pharmaceutical Group Corporation. 1, 2-dioleoyl-sn-glycero-3-phosphate (sodium salt) (DOPA) and 1,2-distearoyl-sn-glycero-3-phosphoethanolamine-N-(methoxy(polyethylene glycol)-2000) DSPE-PEG2000 were purchased from Avanti. 1, 2-dihexadecanoyl-sn-glycero-3-phosphocholine (DPPC) was purchased from Corden Pharma Switzerland LLC. Cholesterol was purchased from Xi'an ruixi Biological Technology Co., Ltd. Fetal bovine serum (FBS) was purchased from Biological Industries. Trypsin-EDTA was purchased from Gibco. DMEM and RPMI 1640 medium was purchased from Key Gen Biotech. Co., Ltd. Folic acid (FA) was purchased from J&K China Chemical Ltd. The protein bicinchoninic acid (BCA) Kit, Mouse IL-12 Mini ELISA Kit and Mouse IL-6 ELISA Kit were purchased from Boster Biological Technology Co., Ltd. Flow cytometric antibodies were purchased from BioLegend, Inc. D-luciferin was purchased from EFEBIO Co., Ltd. 4T1-Luc cells were purchased from Shanghai AOLU Biological Technology Co., Ltd. Folic acid, Thiazolylbluetetrazoliumbromide (MTT), Hoechst 33342 and puromycin was purchased from Beijing Solarbio Science & Technology Co., Ltd. Glass Bottom dishes were purchased from Cellvis, Mountain View, CA. 96-well plates were purchased from Hangzhou Xinyou Biotechnology Co., Ltd, China. Plastic centrifuge tubes were purchased from GeneBrick Bioscience LLC. Red blood cell lysis buffer was purchased from Sangon Biotech Co., Ltd. All the aqueous solutions used in experiments were prepared using deionized water ( $18.2 \text{ M}\Omega \text{ cm}$ ) obtained from a Milli-Q water purification system. All chemicals were of analytical grade and were used without further purification. Transmission electron microscopy (TEM) was carried out on a HT7700 electron microscope (Hitachi, Japan). The *in vivo* imaging study was performed with a Caliper IVIS Lumina III imaging system (Caliper Co., USA).

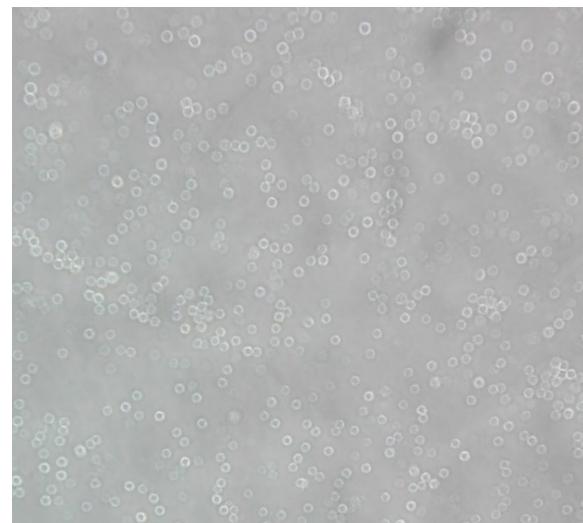
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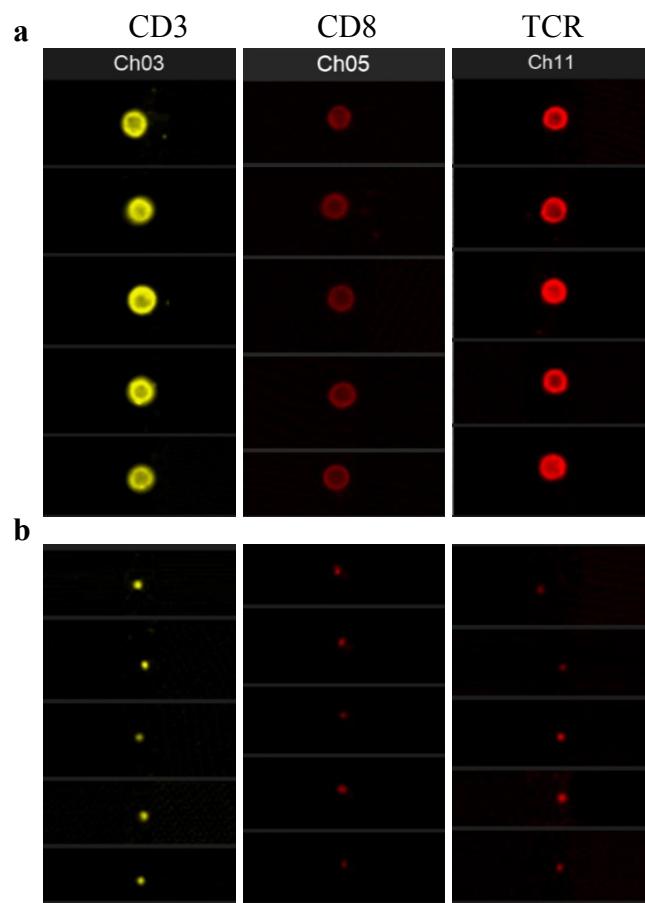
**Figure S1** The  $N_2$  adsorption-desorption isotherms of  $\text{CaCO}_3$  with an inset showing the pore size distribution obtained by the BJH method (a). Images of  $\text{CaCO}_3$  and  $\text{CaCO}_3@\text{FA}$  (b);  $^1\text{H}$  NMR spectrum of FA in the supernate of  $\text{CaCO}_3@\text{FA}$  (c).



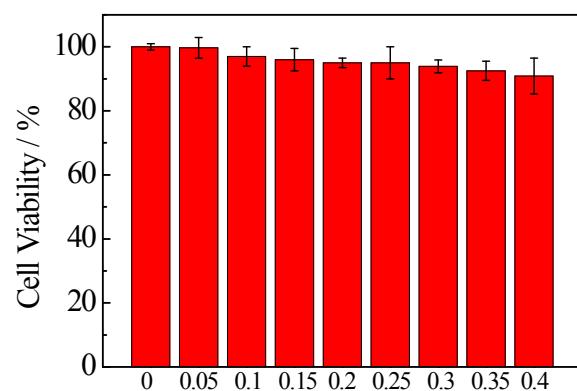
**Figure S2** Dynamic light scattering (DLS) of CaFAM.



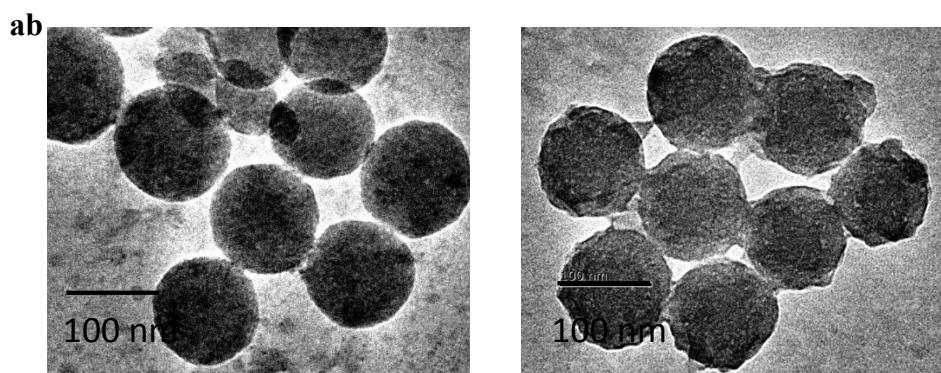
**Figure S3** T cells were harvested from spleens of mice by using nylon column.



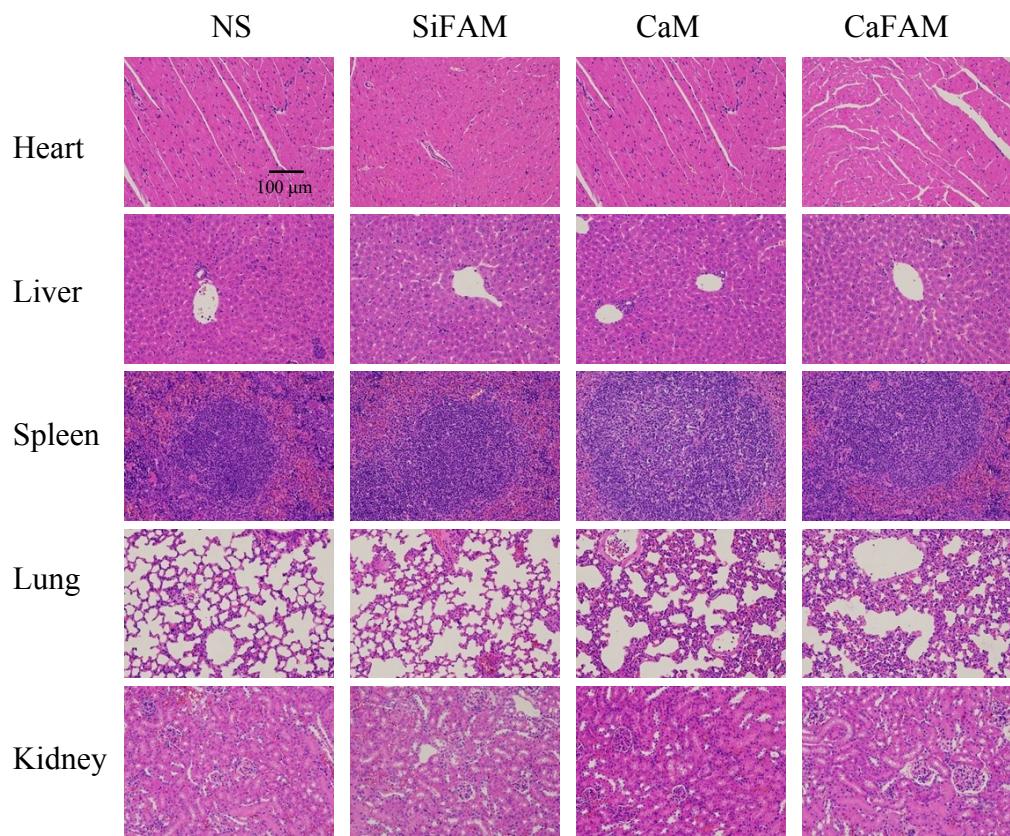
**Figure S4** Flow cytometer of T cells (magnified 40 times) (a) and CaFAM (magnified 60 times) (b) stained with anti-CD3, anti-CD8 and anti-TCR.



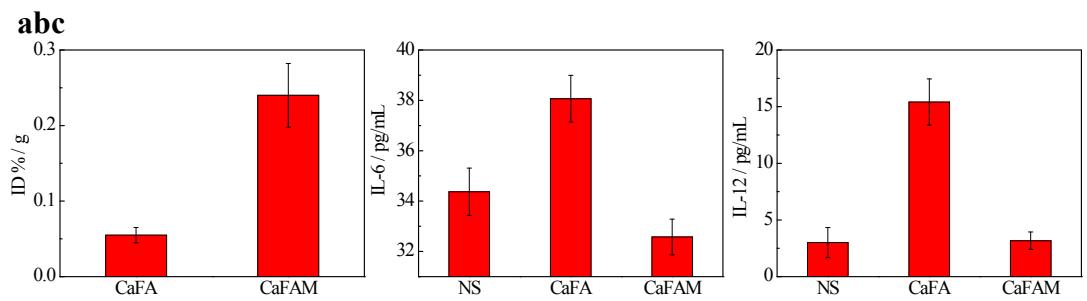
**Figure S5** Cell viability of the cancer cells treated with 0, 0.05, 0.1, 0.2 or 0.4 mg/mL CaFAM for 24 h.



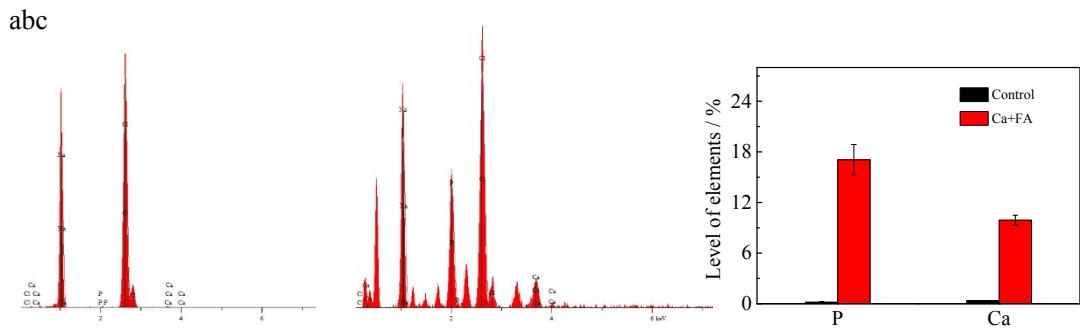
**Figure S6** TEM images of  $\text{SiO}_2\text{-NH}_2@\text{FA}$  (a) and  $\text{SiO}_2\text{-NH}_2@\text{FA}@\text{membrane}$  (SiFAM) (b). Scale bars are 100 nm.



**Figure S7** H&E staining of the five major organs (heart, liver, spleen, lung and kidney). The mice were treated as follows: I, NS; II, SiFAM; III, CaM; IV, CaFAM. Scale bar = 100  $\mu$ m.



**Figure S8** Mn content in tumors after the mice were injected with CaFA or CaFAM via ICP-AES analysis (a). Enzyme-linked immunosorbent assay (ELISA) analysis of IL-6 (b) and IL-12 (c) after the mice were injected with CaFA or CaFAM.



**Figure S9** Energy Dispersive Spectra (EDS) of the cancer cells treated with NS (a): Control and Ca+FA (b). The level of P and Ca element (c).