**Electronic Supplementary information (ESI)**

# Osteoinductive Superparamagnetic Fe nanocrystal/Calcium Phosphate Heterostructured Microspheres

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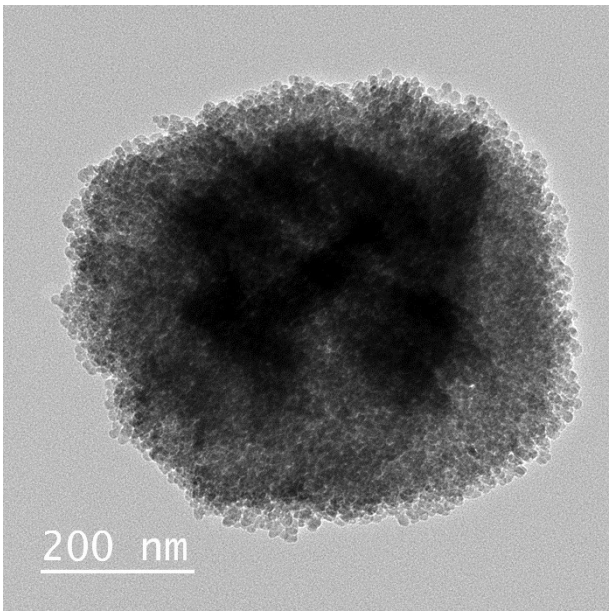


**Fig. S1** TEM image of $FeCaP_{30}$ samples. Note that the FeCaP microspheres are made of dense agglomeration of the primary nanoparticles.

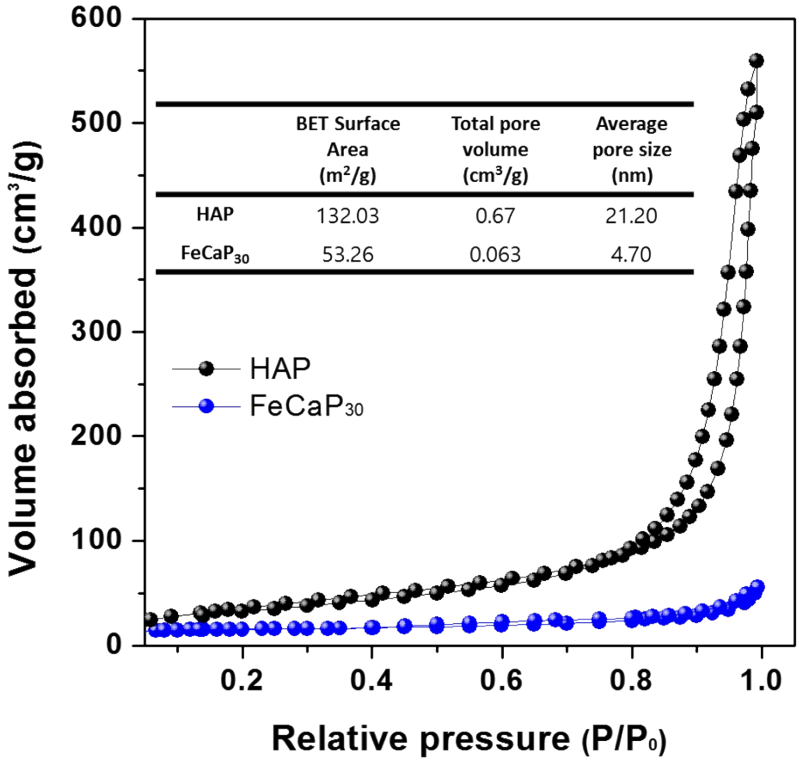


**Fig. S2** $N_2$ adsorption−desorption isotherms of the synthetic samples of $FeCaP_0$(HAP) and $FeCaP_{30}$ and the BET surface area, total volume and average pore size of samples are summarized in inset table.

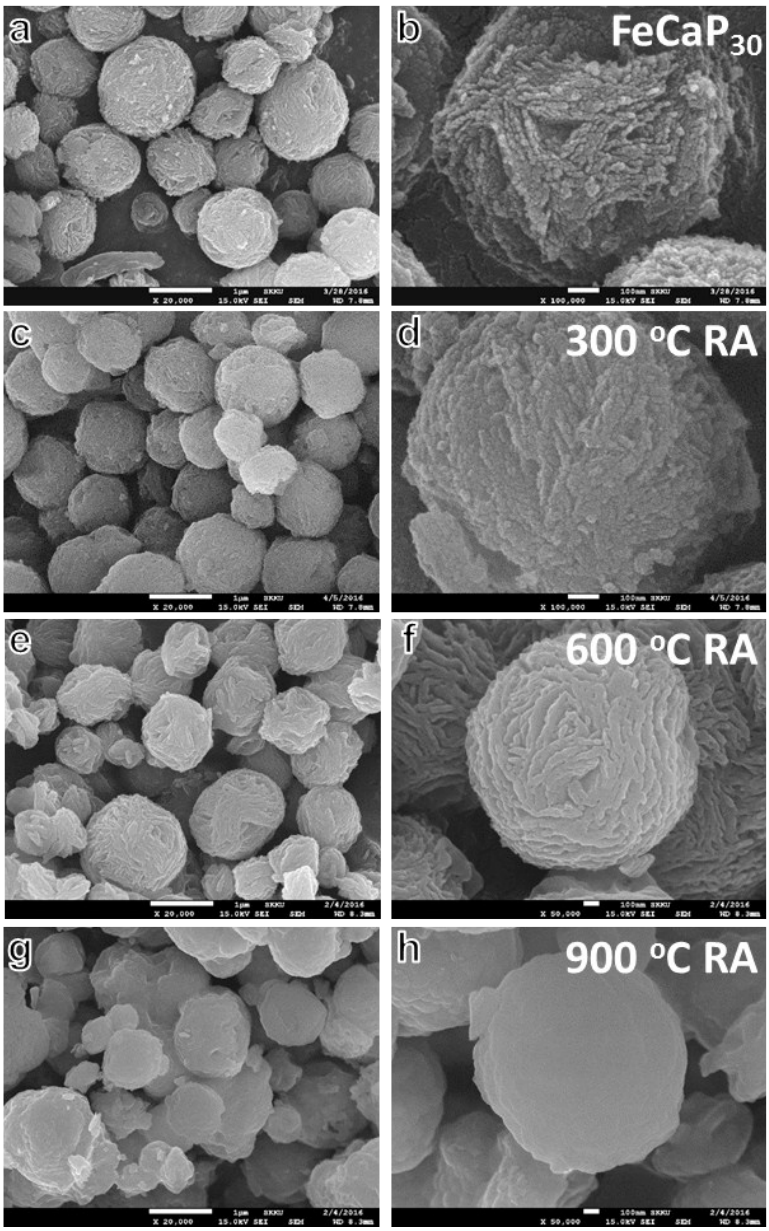


**Fig. S3** Low- and high-magnification SEM images of reduction-annealed FeCaP samples (Before treatment (a, b), 300 °C (c, d), 600 °C (e, f) and 900 °C (g, h)) as a function of annealing temperature.

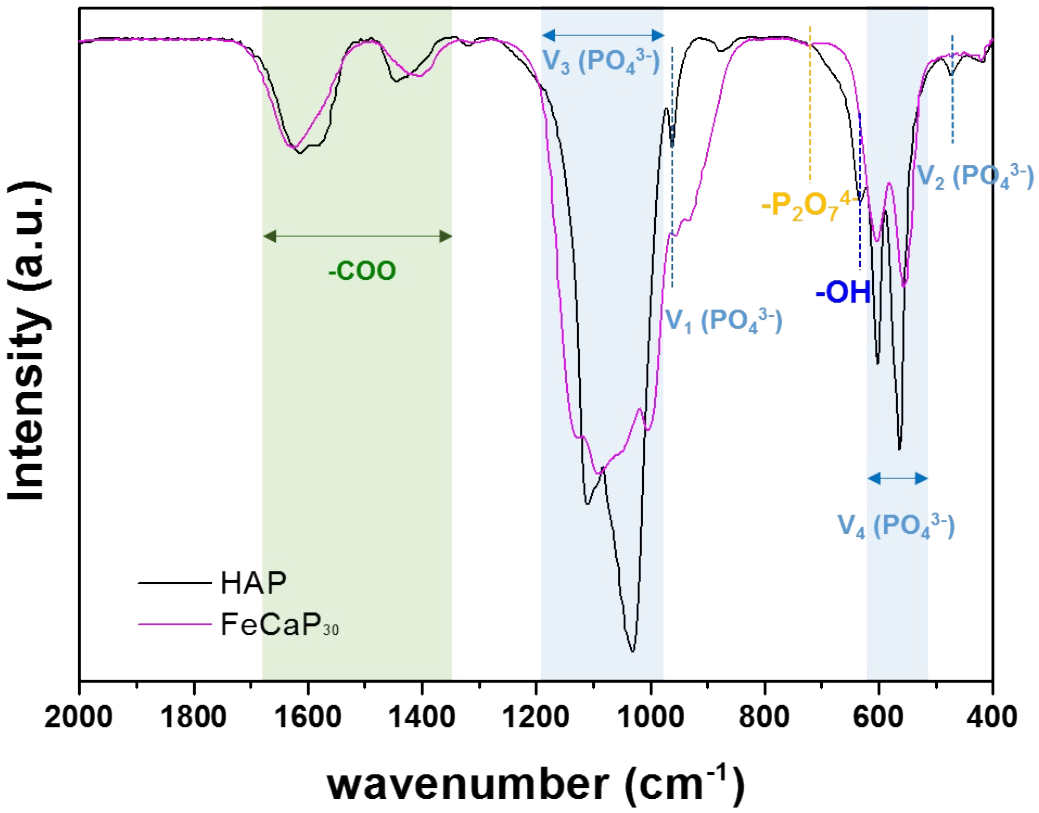


**Fig. S4** FT-IR analysis results of $FeCaP_0$ and $FeCaP_{0.3}$ samples

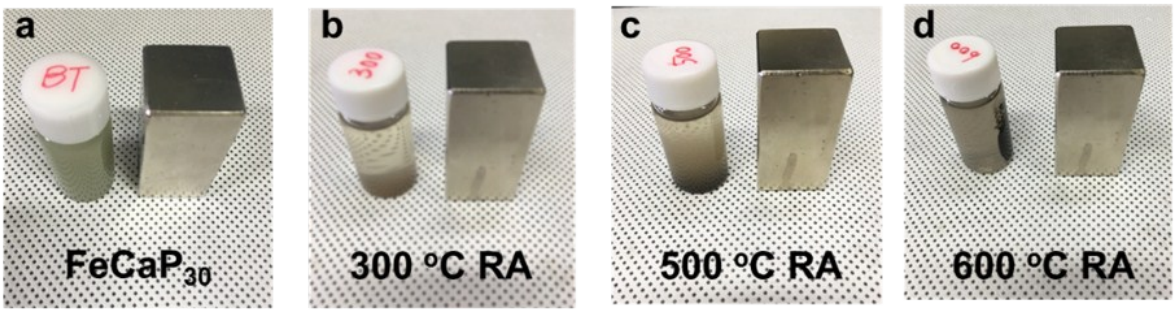


**Figure S5.** Fe/FeCaP microspheres dispersed in water exhibited magnetic property on a permanent Nd magnet.

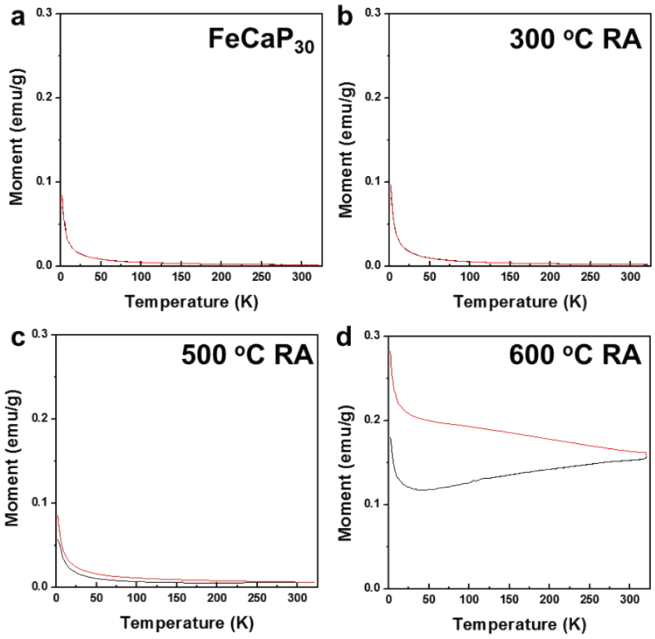


**Figure S6.** The zero-field-cooled and field-cooled magnetization of samples at 100 Oe for a) FeCaP30 before and after reduction annealing at b) 300 °C, c) 500 °C, and d) 600 °C.

**Table S1.** Element content in solution and synthetic particles

| Sample | Fe/(Ca+Fe) molar ratio in solution | (Ca+Fe)/P molar ratio in solution | Fe/(Ca+Fe) molar ratio in the synthetic particles | (Ca+Fe)/P molar ratio in the synthetic particles |
|---|---|---|---|---|
| $FeCaP_0$ | 0 | 1.67 | 0 | 1.632 |
| $FeCaP_5$ | 0.05 | 1.67 | 0.048 | 1.6 |
| $FeCaP_{10}$ | 0.1 | 1.67 | 0.1134 | 1.456 |
| $FeCaP_{30}$ | 0.3 | 1.67 | 0.2714 | 1.582 |
| $FeCaP_{50}$ | 0.5 | 1.67 | 0.5913 | 1.603 |

**Table S2.** The magnetism, saturation magnetization value (Ms), and paramagnetic susceptibility of the samples

| Sample | Magnetism | Ms[a] (eum $g^{-1}$) | paramagnetic susceptibility (m3 $g^{-1}$) |
|---|---|---|---|
| **$FeCaP_0$** | Dimagnetism | - | -0.113 E-7 |
| **$FeCaP_{30}$** | Paramagnetism | - | 0.248 E-6 |
| **300 °C RA[b]** | Paramagnetism | - | 0.228 E-6 |
| **500 °C RA** | Paramagnetism & Superparamagnetism | 0.014 | 0.285 E-6 |
| **600 °C RA** | Paramagnetism & Superparamagnetism | 10.77 | 0.315 E-6 |

[a] the saturation magnetization value (Ms) of FeCaP samples are expected from the measured data the hysteresis loop of FeCaP samples was not saturated when the external magnetic field is applied at 5000 Oe

[a] RA: reduction annealing