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

Supporting Information:

Wet-chemical synthesis of Mg-doped hydroxyapatite nanoparticles by step reaction and ion exchange processes

Xiaoya Yuan,[a] Bangshang Zhu,*[a] Gangsheng Tong,[a] Yue Su[b] and Xinyuan Zhu[b]

[a] *Instrumental Analysis Center, Shanghai Jiao Tong University, 800 Dongchuan Road, Shanghai 200240, People's Republic of China.* *Correspondence: E-mail: bshzhu@sjtu.edu.cn

[b] *School of Chemistry and Chemical Engineering, State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University,800 Dongchuan Road, Shanghai 200240, People 's Republic of China.*

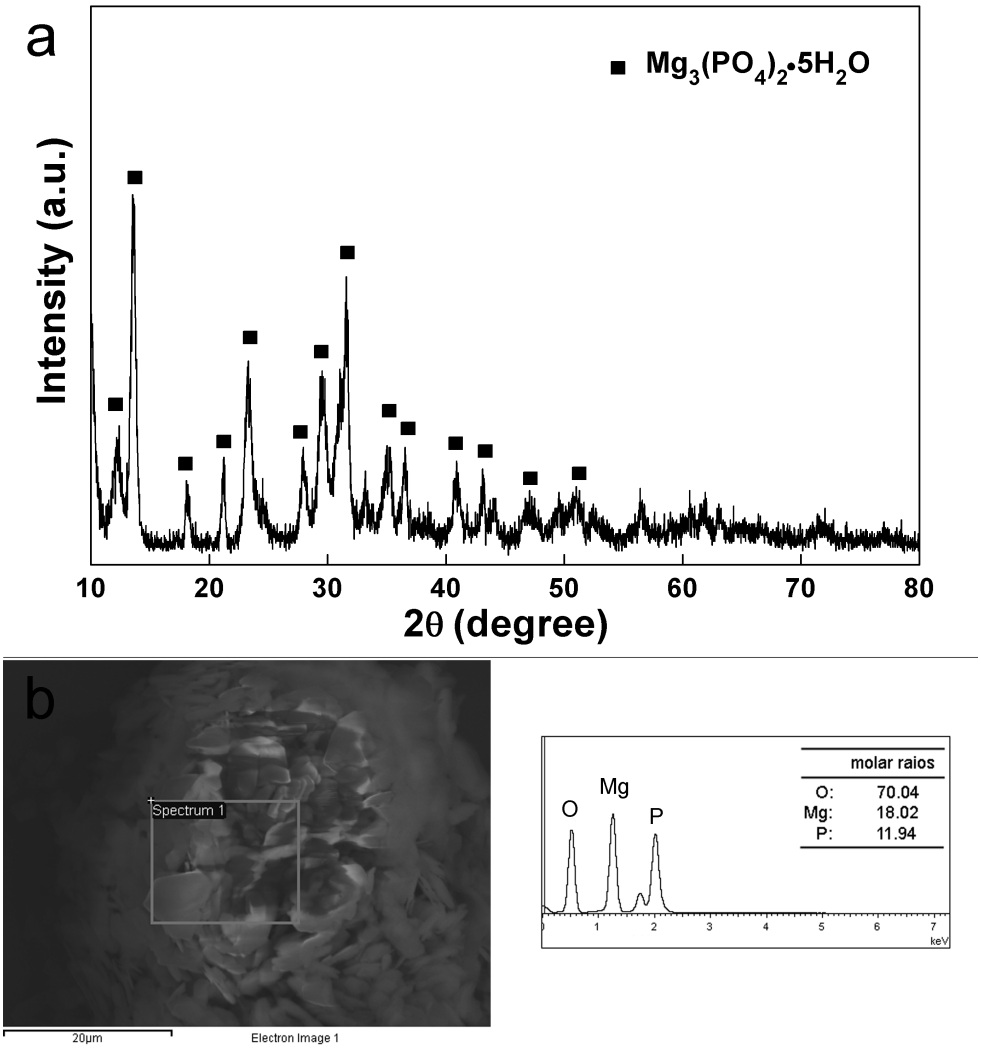

Fig. S1 The XRD, SEM and EDX analysis of magnesium precursor particles. (a) The XRD pattern of magnesium precursor material. The detectable peaks in the picture match well with $Mg_3(PO_3)_2 \cdot 5H_2O$-derived peaks (PDF: 35-0329). (b) SEM accompanied by energy dispersive spectrometry (EDX) analysis of the elements in the magnesium precursor material, and O, Mg and P elements were found and their contents in the material were shown.

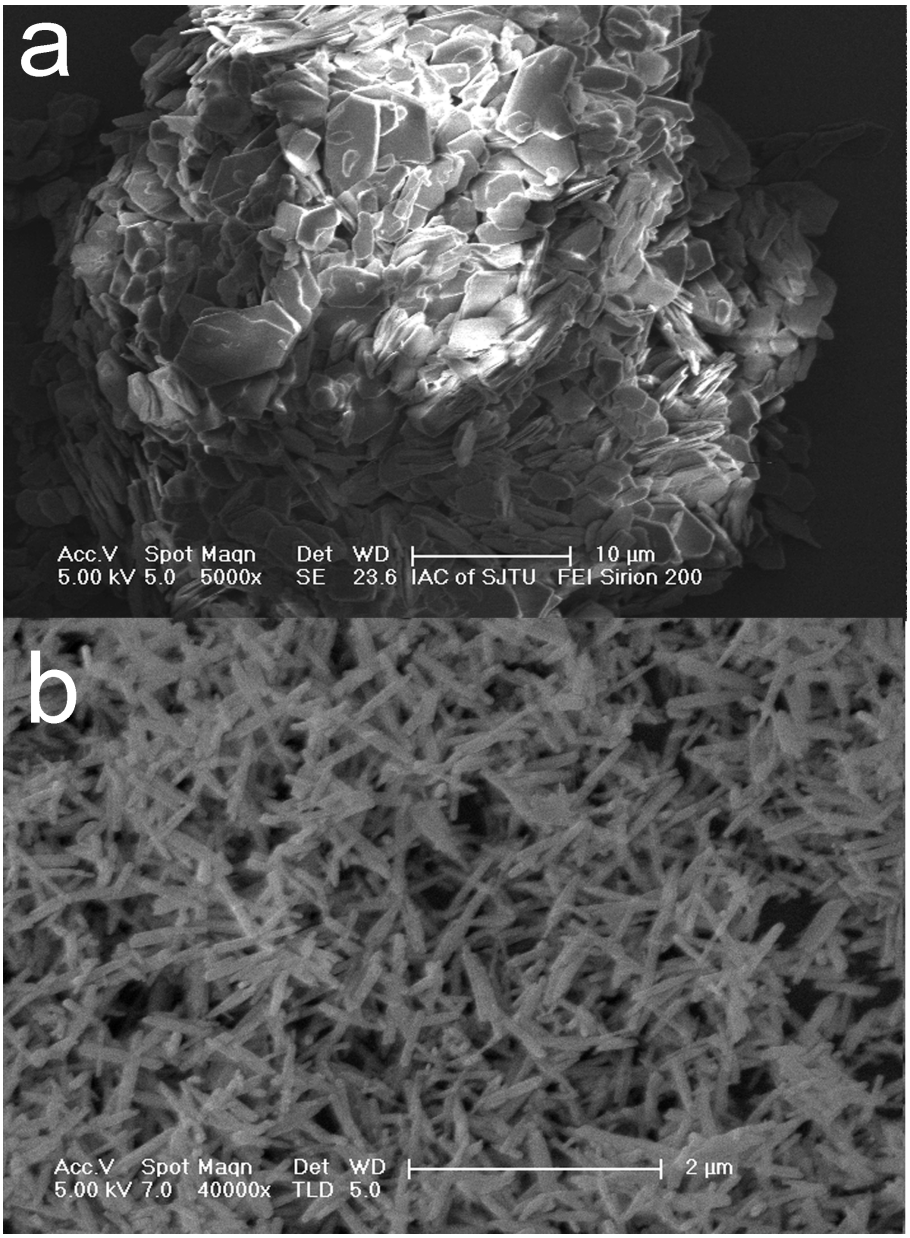

Fig. S2 The SEM observation of the size and morphology of (a) magnesium phosphate and (b) hydroxyapatite particles.

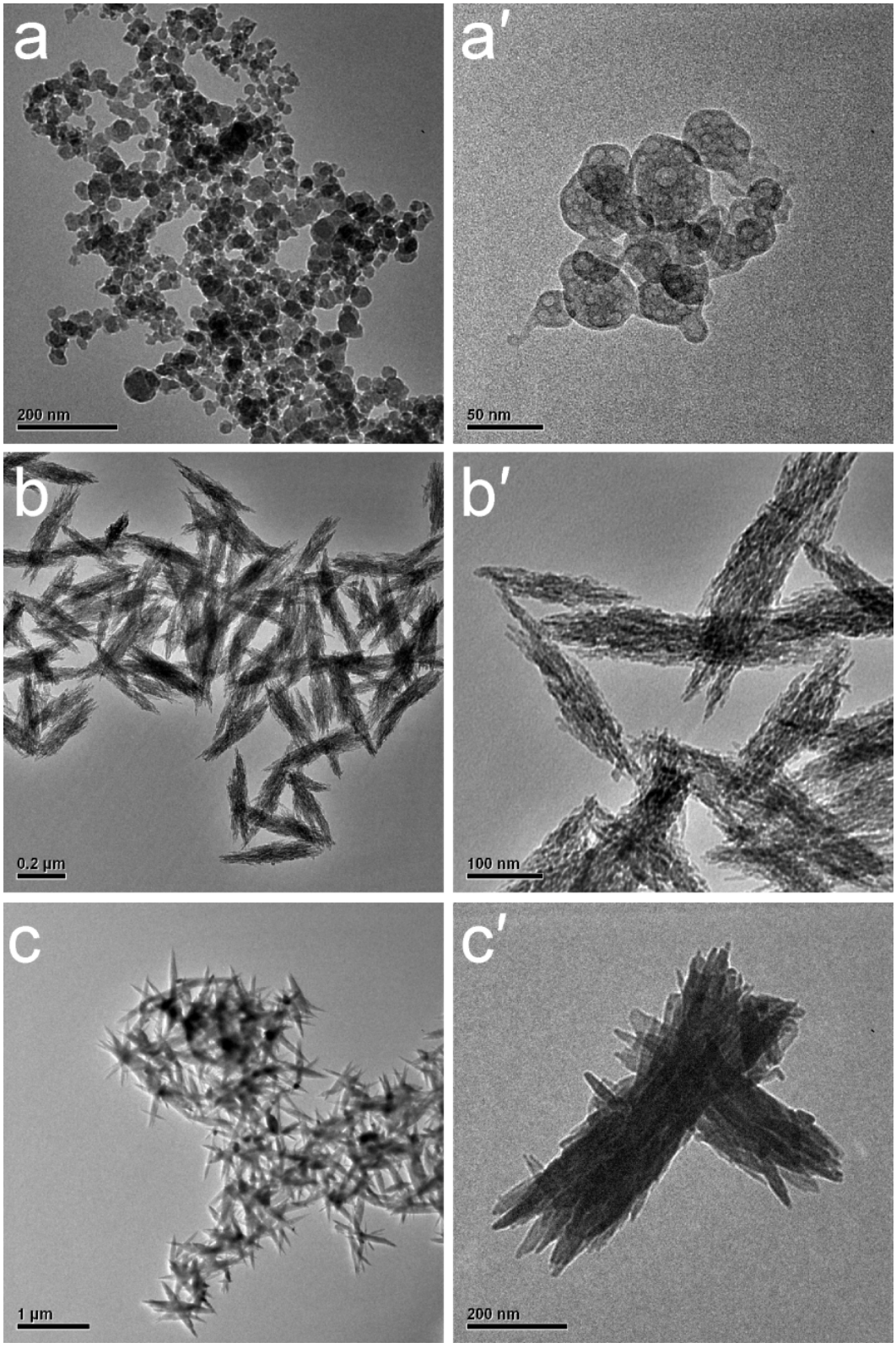

Fig. S3 The TEM observation of the Mg-HA particles synthesized by Ca^{2+} and Mg^{2+} co-precipitation method at feeding ratios with (a) 2.5:1, (b) 7.5:1 and (c) 12.5:1. (a′)-(c′) demonstrate the detailed morphology at a high magnification corresponding to (a)-(c).

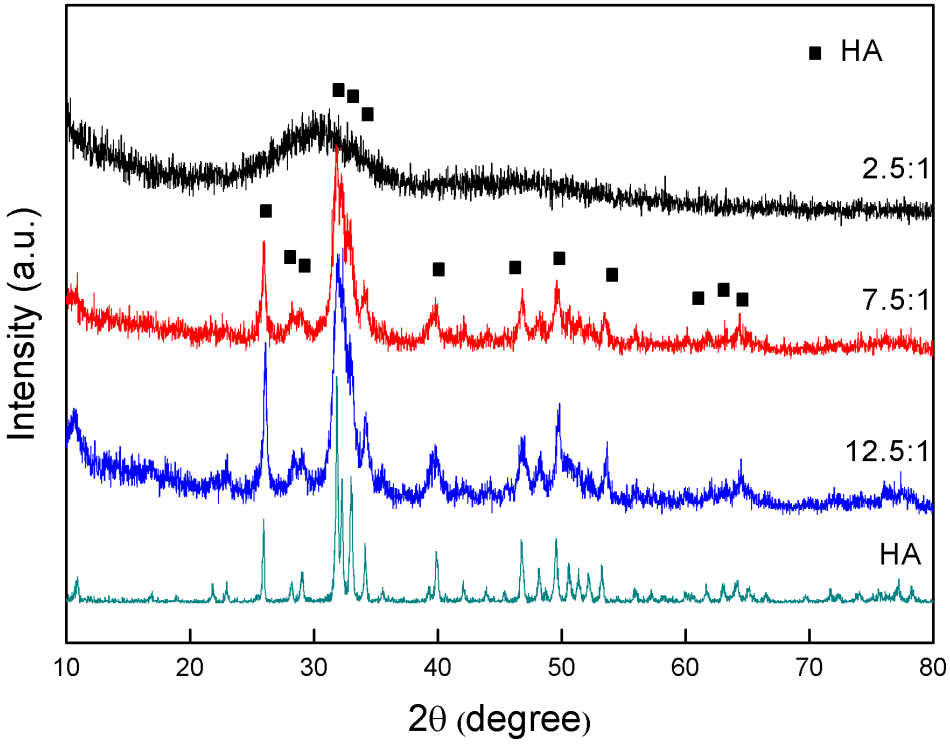

Fig. S4 The XRD analysis of the Mg-HA nanoparticles synthesized by Ca^{2+} and Mg^{2+} co-precipitation method at feeding ratios with 2.5:1, 7.5:1 and 12.5:1 in comparison with HA.

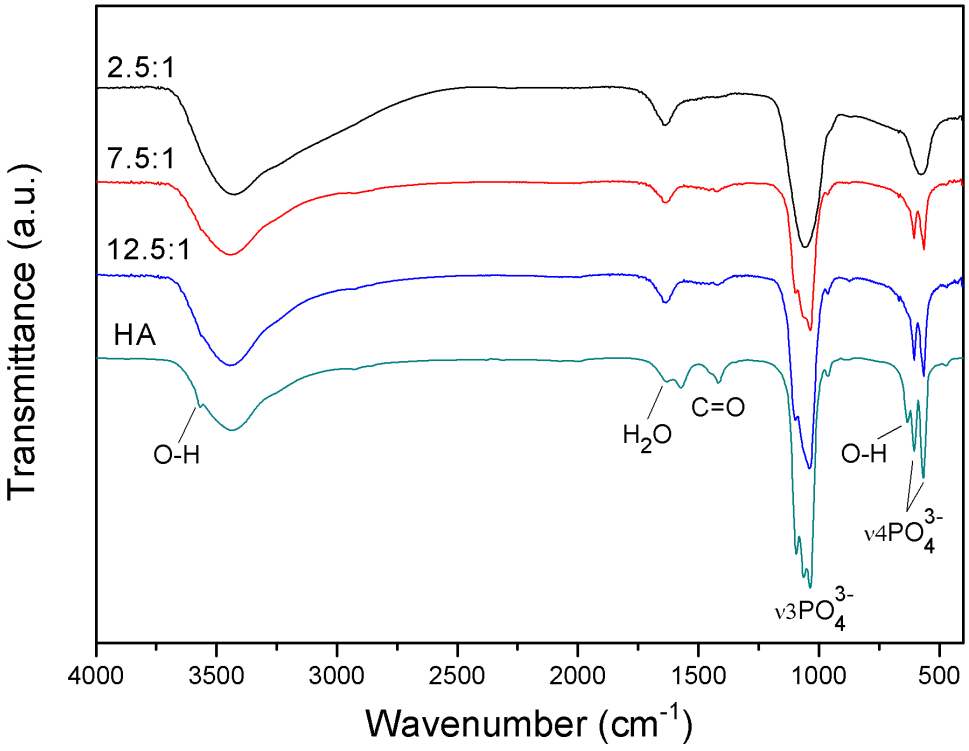

Fig. S5 The FTIR patterns of the Mg-HA nanoparticles synthesized by Ca^{2+} and Mg^{2+} co-precipitation method at feeding ratios with 2.5:1, 7.5:1 and 12.5:1 in comparison

with HA.

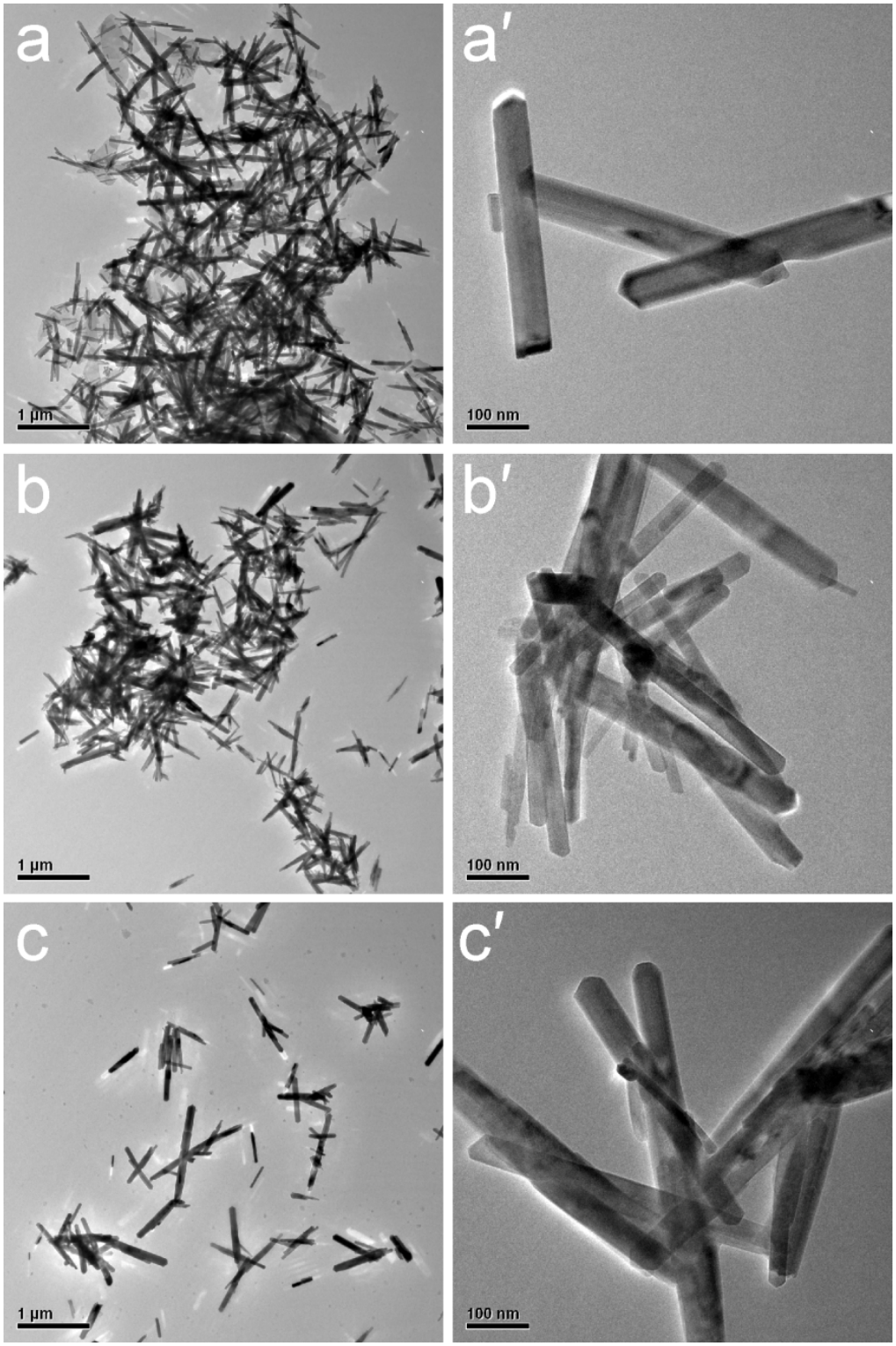

Fig. S6 The TEM characterization of the Mg-HA particles synthesized at feeding ratios with (a) 2.5:1, (b) 7.5:1 and (c) 12.5:1 by Mg^{2+}-substituted Ca^{2+} ion exchange process. (a′)-(c′) show the detailed morphology at a high magnification corresponding to (a)-(c). All the samples indicate a rod-like appearance with relatively smooth surface. Both the size and

morphology are similar to that of HA particles.

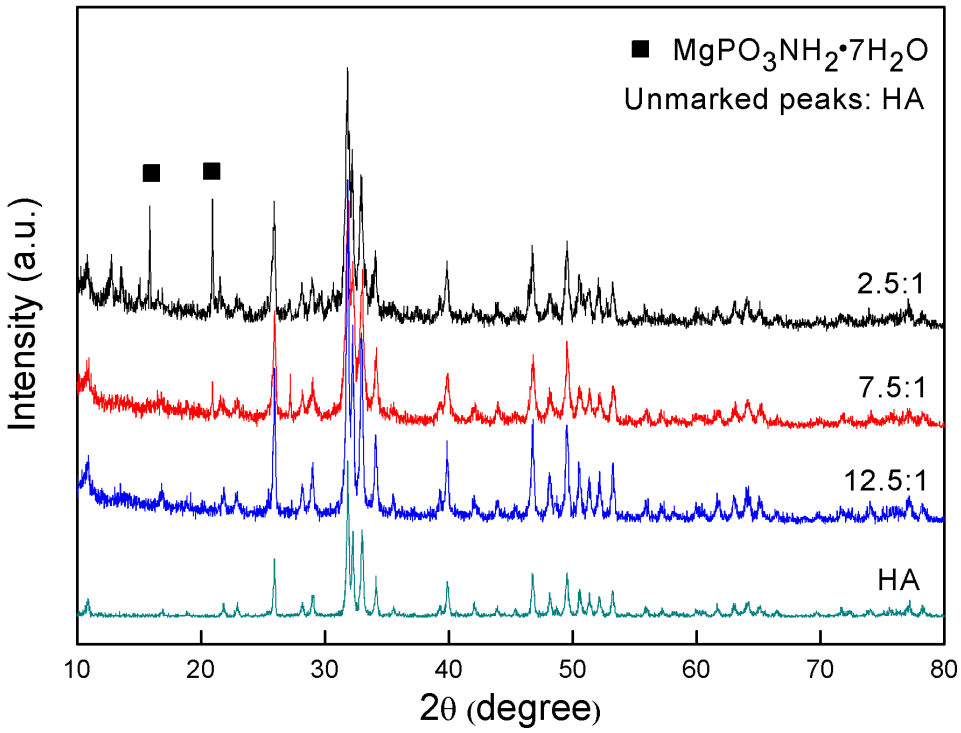

Fig. S7 The XRD analysis of the Mg-HA nanoparticles synthesized by Mg^{2+}-substituted Ca^{2+} in HA by step reaction and ion exchange process with Ca/Mg feeding ratio of 2.5:1, 7.5:1 and 12.5:1 in comparison with HA.

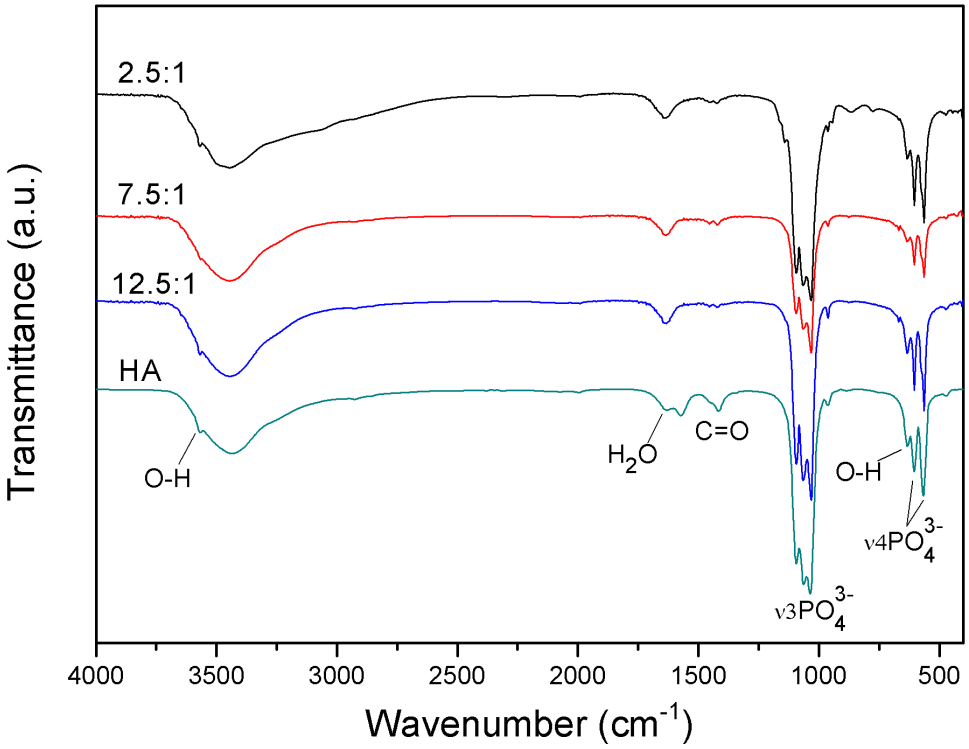

Fig. S8 The FTIR analysis of the Mg-HA nanoparticles synthesized by Mg^{2+}-substituted Ca^{2+} in HA by step reaction and ion exchange process at Ca/Mg feeding ratio with 2.5:1, 7.5:1 and 12.5:1 in comparison with HA.

Table S1 The ICP results of Ca, Mg and P content in the Mg-HA synthesized by *Method B and Method C. The molar ratio of magnesium precursor is also shown.**

Sample (Ca/Mg feeding ratio)		Measured wt%			(Ca+Mg)/P molar ratio
		Ca	Mg	P	
Method B	2.5:1	25.58	4.27	16.19	1.55
	7.5:1	36.10	2.09	17.94	1.70
	12.5:1	36.51	1.75	18.25	1.67
Method C	2.5:1	28.59	4.39	17.90	1.55
	7.5:1	35.65	0.83	17.89	1.60
	12.5:1	36.01	0.25	17.43	1.61
magnesium phosphate		--	17.99	15.35	1.49

* ***Method B***: Ca^{2+} and Mg^{2+} co-precipitation method;

Method C: Mg^{2+}-substituted Ca^{2+} in HA by step reaction and ion exchange process.

The content of the Ca, Mg and P in the Mg-HAs with Ca/Mg feeding molar ratio ranged from 2.5:1 to 12.5:1 were examined by ICP analysis, and the results are listed in Table S1. For the Mg-HA synthesized at feeding ratio of 2.5:1, the (Ca + Mg)/P molar ratios in the final materials are significantly lower than initial feeding ratio (1.67), regardless of the difference in synthesis. The (Ca+Mg)/P molar ratio of all the materials by ***Method C*** is lower than stoichiometry value (1.67) of HA.