

An *in vitro* and *in vivo* comparison of Mg(OH)₂-, MgF₂- and HA-coated Mg on degradation and osteointegration

Shi Cheng^{a,b,†}, Wanshun Wang^{c,†}, Donghui Wang^{d,e}, Binglin Li^c, Jielong Zhou^a,
Dongdong Zhang^d, Lidan Liu^d, Feng Peng^{a,*}, Xuanyong Liu^{d,*}, Yu Zhang^{a,*}

^a*Department of Orthopedics, Guangdong Provincial People's Hospital, Guangdong Academy of Medical Sciences, Guangzhou, Guangdong, 510080, China.*

^b*The Second School of Clinical Medicine, Southern Medical University, Guangzhou 510515, China*

^c*Department of Graduate School, Guangzhou University of Chinese Medicine, 12 Airport Road, Guangzhou, Guangdong, 510405, China.*

^d*State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China.*

^e*School of Materials Science and Engineering, Hebei University of Technology, Tianjin 300130, China.*

***Corresponding Author:**

E-mail addresses: peng_feng7@163.com (F Peng), xyliu@mail.sic.ac.cn (X Liu), luck_2001@126.com (Y Zhang).

[†]The authors contributed equally to this work.

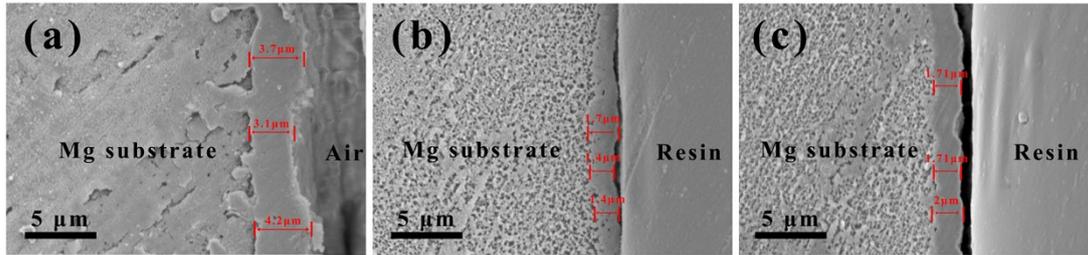


Figure S1. Cross section morphology of Mg@Mg(OH)₂ (a), Mg@MgF₂ (b) and Mg@HA (c) samples.

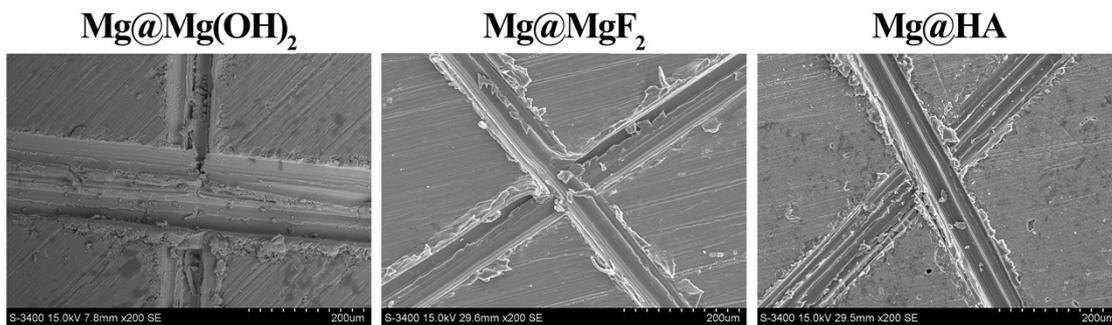


Figure S2. SEM images of Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA coatings after cross-cut tape test.

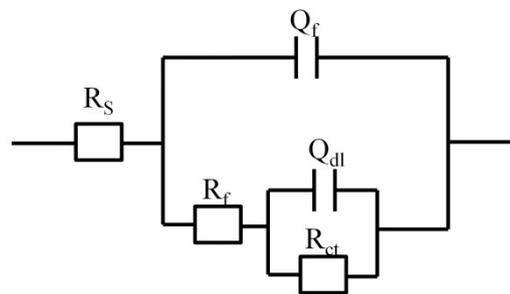


Figure S3.Equivalent circuit of EIS fitting for Mg, Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA samples. R_s is the solution resistance. Q_f and R_f are the capacitance and resistance of the corrosion production or coating on Mg, respectively. R_{ct} and Q_{dl} are the charge transfer resistance and the constant phase element of the electrical double layer, respectively.

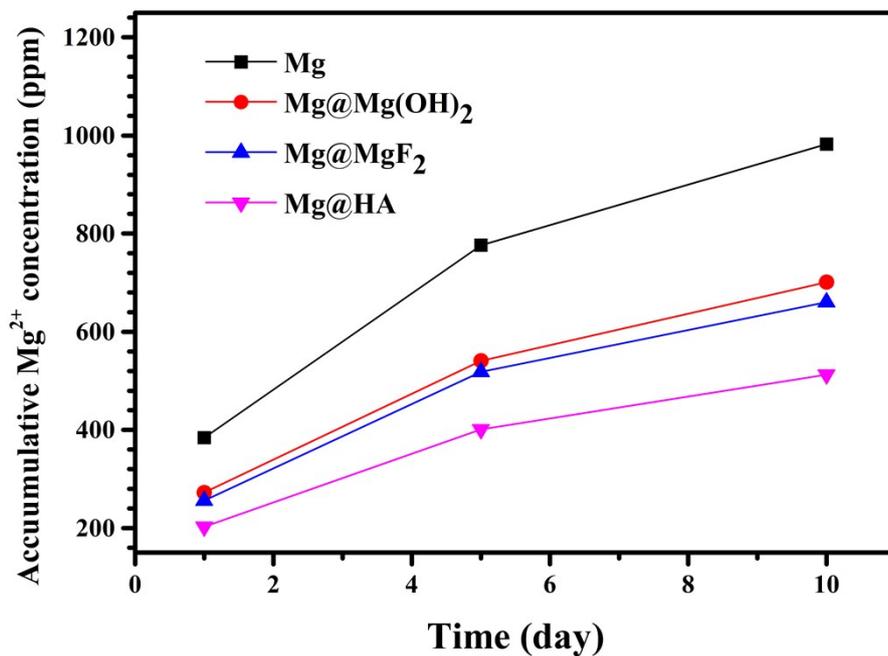


Figure S4. Accumulative release of Mg²⁺ ions after the samples immersed in 10 mL PBS.

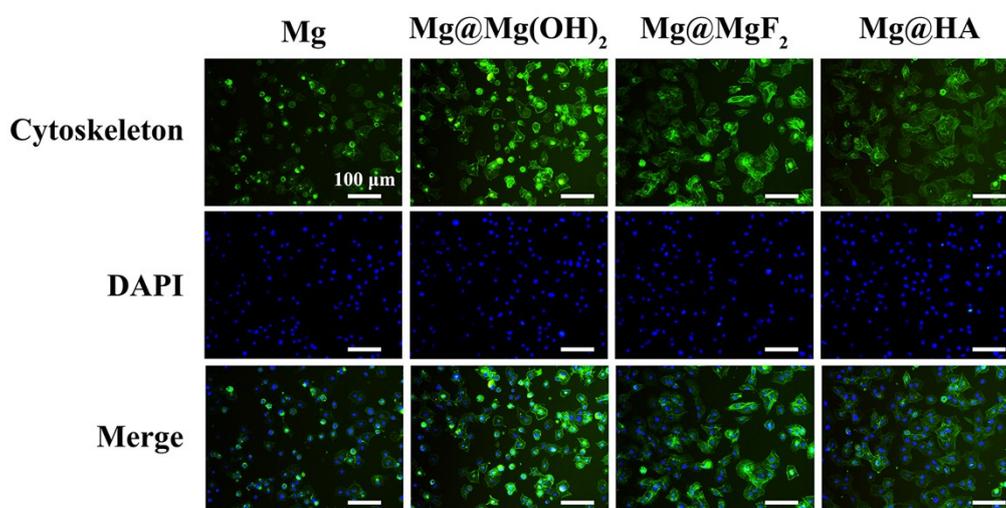


Figure S5. CLSM images of MC3T3-E1 cells cultured on the extract of Mg, Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA with actin stained with FITC (green) and the nucleus stained with DAPI (blue).

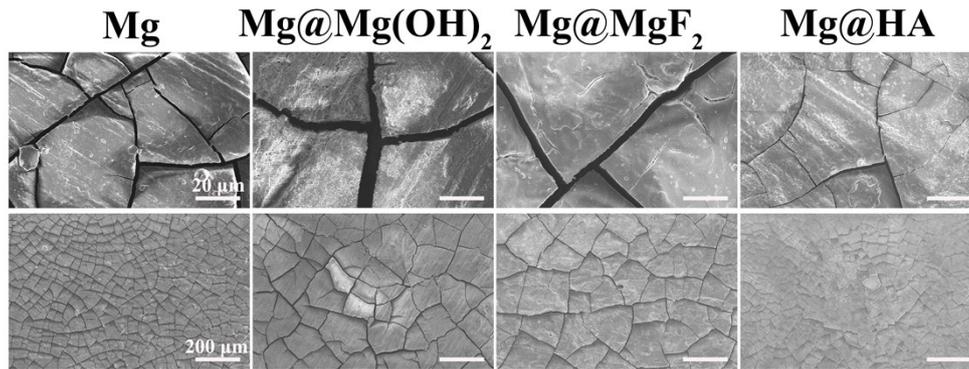


Figure S6. Surface morphology of Mg, Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA after subcutaneous implantation for 8 weeks.

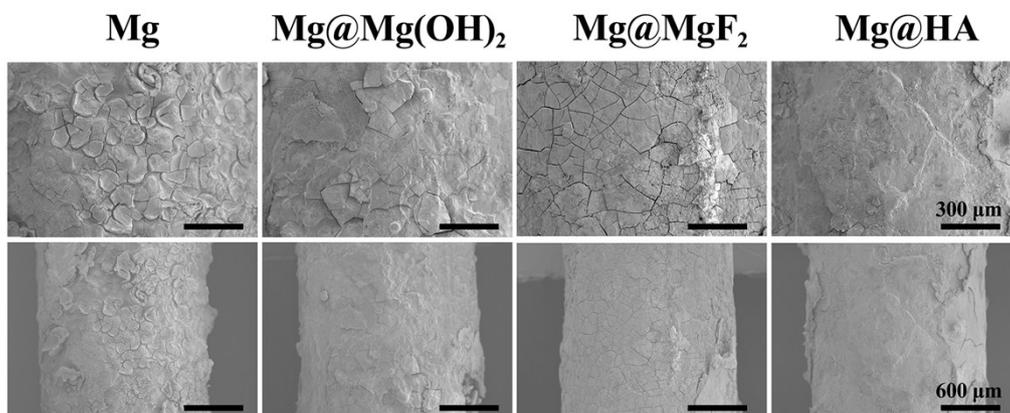


Figure S7. Surface morphology of Mg, Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA after femur implantation for 4 weeks.

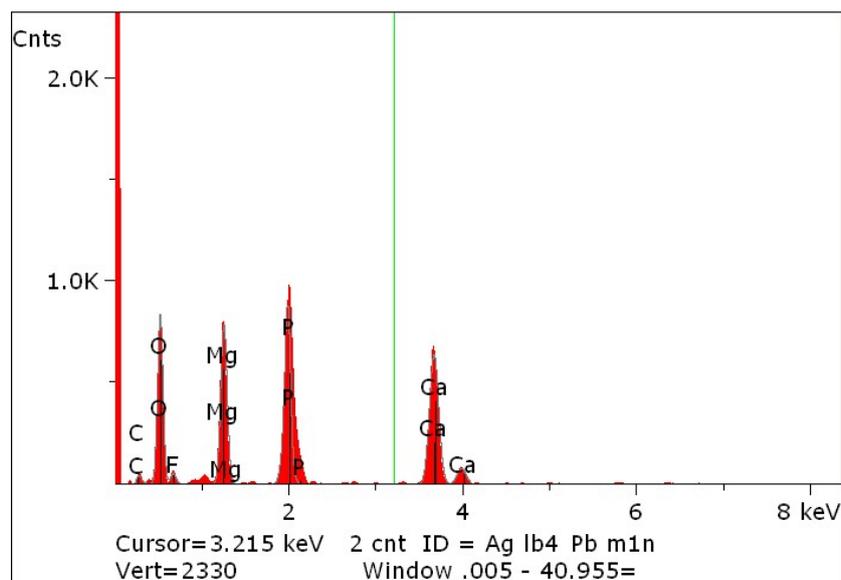


Figure S8. Energy spectrum of Mg@MgF₂ sample after femur implanted for 4 weeks, detected by EDS.

Table S1. Element composition of Mg@MgF₂ sample after femur implanted for 4 weeks, detected by EDS.

Elt.	Line	Intensity (c/s)	Atomic %	Atomic Ratio	Conc	Units	Error 2-sig	MDL 3-sig	
C	Ka	7.87	13.753	1.0000	8.902	wt. %	.789	1.593	
O	Ka	165.22	59.787	4.3472	51.547	wt. %	.661	.491	
F	Ka	11.86	5.519	.4013	5.650	wt. %	.405	.773	
Mg	Ka	183.97	9.779	.7110	12.811	wt. %	.161	.137	
P	Ka	204.78	6.155	.4476	10.274	wt. %	.119	.090	
Ca	Ka	214.74	5.008	.3641	10.816	wt. %	.117	.077	
			100.000		100.000	wt. %			Total
									1

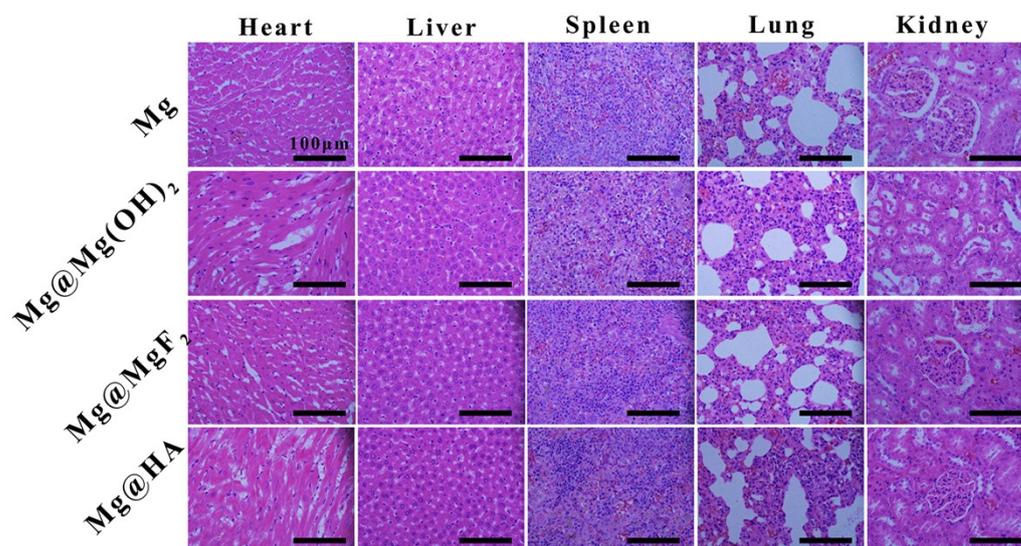


Figure S9. Typical histological morphology of important organic tissues in H&E sections of Mg, Mg@Mg(OH)₂, Mg@MgF₂ and Mg@HA samples after femur implantation for 4 weeks.