Table S1 The qPCR primer sequences.

Name	Forward 5'-3'	Reverse 5'-3'
Runx2	CCGACAGTCCCAACTTCCTG	GCTCGGCGGAGTAGTTCTCA
Sp7	GGCTGAGGAAGAAGCCCATT	AAGCGCTTGGAACAGAGCAG
Col1a1	GGAGAGAGCATGACCGATGG	GAGCAGGGCCTTCTTGAGGT
Bglap2	TCCAAGCAGGAGGGCAATAA	TGCGTTTGTAGGCGGTCTTC
Spp1	CTGTTTGGCATTGCCTCCTC	CCATGTGGTCATGGCTTTCA
Dmp1	CGCTGGTATCAGGTCGGAAG	TTTCCCTGCTGTTGCTGTCA
Fgf23	ACGGCAACATTTTTGGATCG	AGCCAGGAACTGGGAGAAGG
Sost	CCGTGCCTCATCTGCCTACT	TAGGGATGGTGGGGAGGTCT
β-actin	AGGGTGTGATGGTGGGAATG	GGTTGGCCTTAGGGTTCAGG

Table S2 Physical properties of commercial HAP/β-TCP, $(CMS)_{1.5}(CS)_{1.5}$ composite bone graft with submicron pores, and $(CMS)_{1.5}(CS)_{1.5}$ composite bone graft with hybrid pores.

	$(CMS)_{1.5}(CS)_{1.5}$ (submicron-pore)	**$(CMS)_{1.5}(CS)_{1.5}$ (hybrid-pore)**	**HAP/β-TCP (nano-pore)**
Porosity (%)	~71.38	~82.85	~65.4
Pore area (m^2/g)	2.672	2.588	2.812
Compressive strength (MPa)	~13.17 ± 1.7	~5.21 ± 1.2	N/A

**The porosity and pore area were measured by a mercury intrusion analyzer (Autopore 9520).

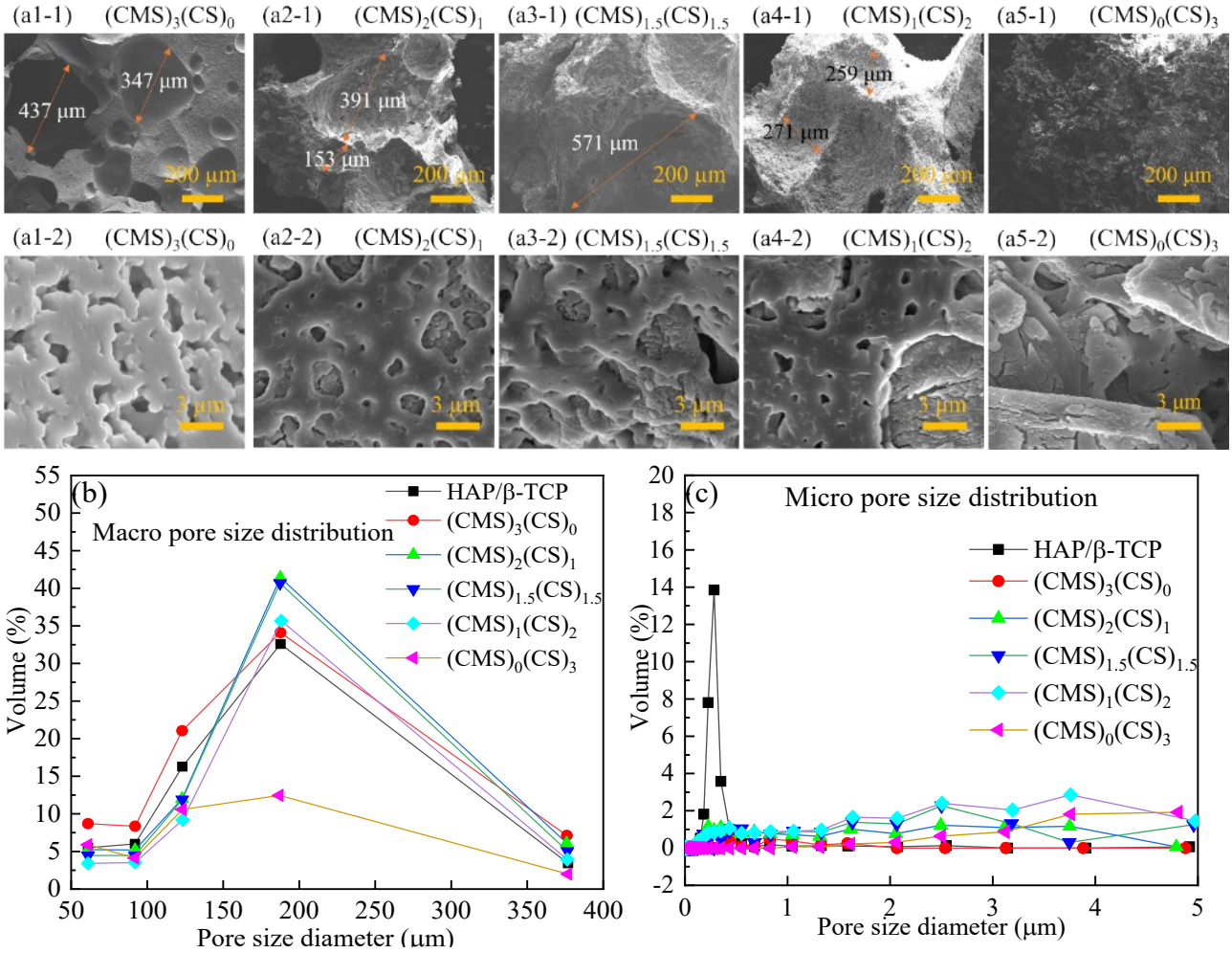

Figure S1 SEM micrographs of the porous $(CMS)_{3-x}(CS)_x$ (x = 0, 1, 1.5, 2, and 3) composite bone grafts sintered at 900 °C. (a1-1) to (a5-1) Milli-scaled microstructures and (a1-2) to (a5-2) micro-scaled pores of the microstructure. Pore size distribution in $(CMS)_{3-x}(CS)_x$ (x = 0, 1, 1.5, 2, and 3) bone grafts with (b) macro pore size of 50-350 μm and (c) micro pore size of 0-5 μm.

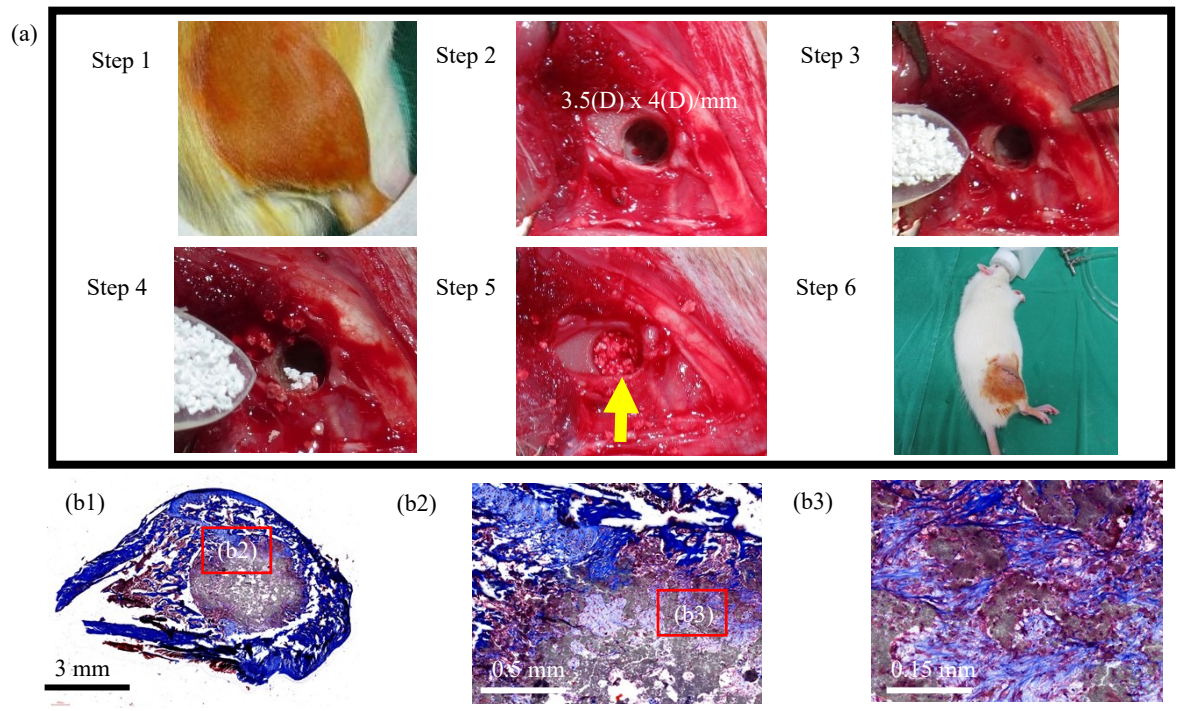

Figure S2 *In vivo* result of hybrid-pore $(CMS)_{1.5}(CS)_{1.5}$ composite bone graft implanted in rat femur after 2 weeks. (a) Experimental procedure and (b) Masson trichrome staining (collagen fibers are stained as blue, nuclei are stained as dark brown or black, and cytoplasm are stained as red).

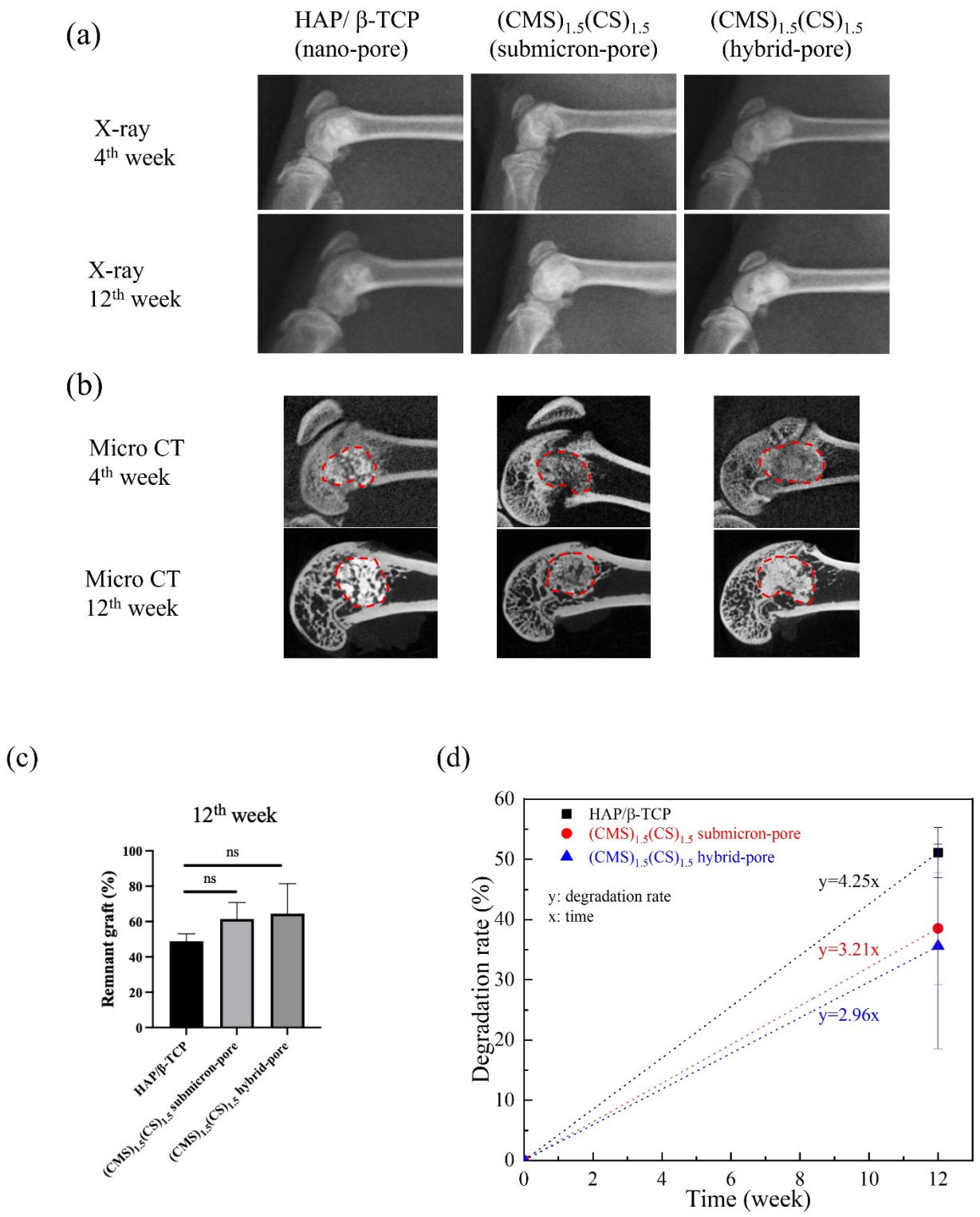

Figure S3 (a) X-ray and (b) micro-CT images of the rat femur with defect at 4 and 12 weeks after surgery. The region enclosed by the red dotted line indicates the bone defect region implanted with bone graft. (c) The volume percentages of the material remaining in the bone defects at 12 weeks. (d) Linear regressions applied to the degradation of the bone graft ratios.