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Supplementary Materials for

Antibacterial infection and immune-evasive coating for orthopedic implants

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The PDF file includes:

Figs. S1 to S10
Legend for movie S1

Other Supplementary Material for this manuscript includes the following:

(available at advances.sciencemag.org/cgi/content/full/6/44/eabb0025/DC1)

Movie S1

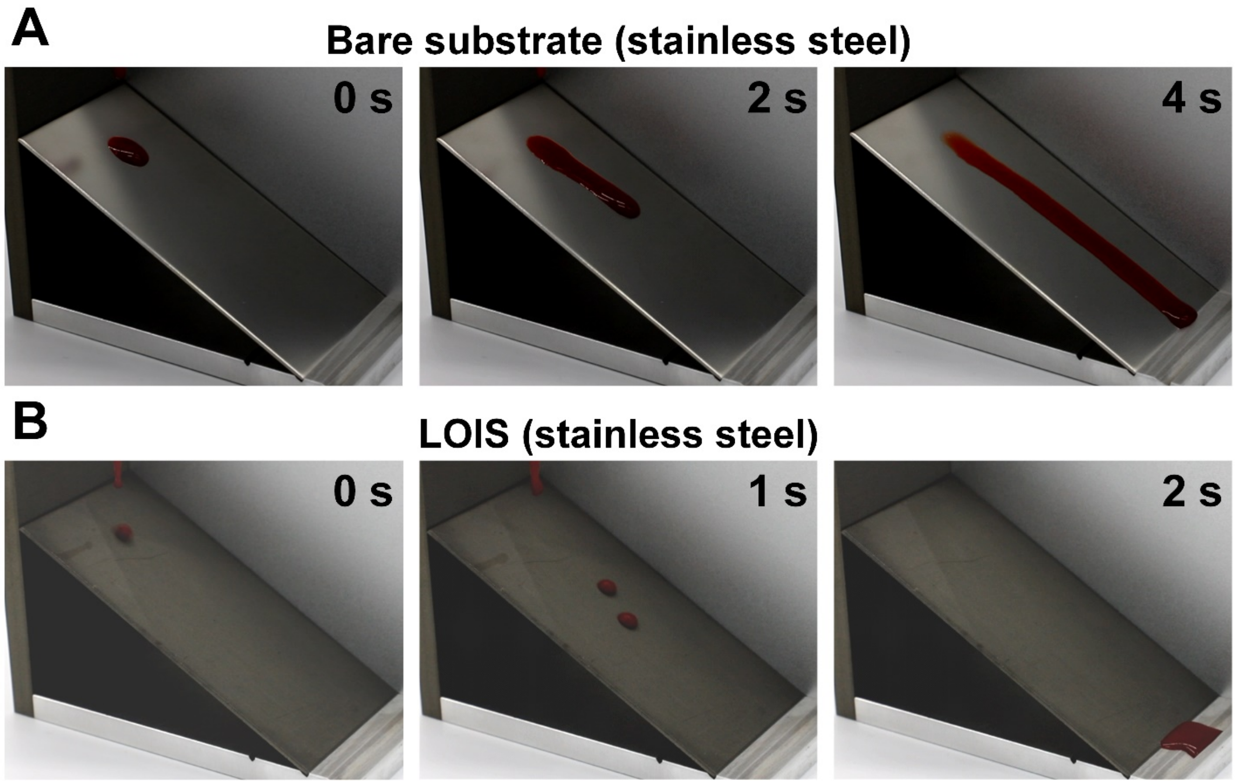

Fig. S1. Time-lapse images demonstrating ability to repel blood by LOIS, as compared to bare substrate without any surface treatment. (A) The blood droplets rolling off on bare substrate with tilting angle of 30° taking 4 s while leaving residue. (B) On the LOIS, the blood droplets are immediately repelled without any residue left on the surface and slides down within 2 s. Photo credit: Kyomin Chae, Yonsei University.

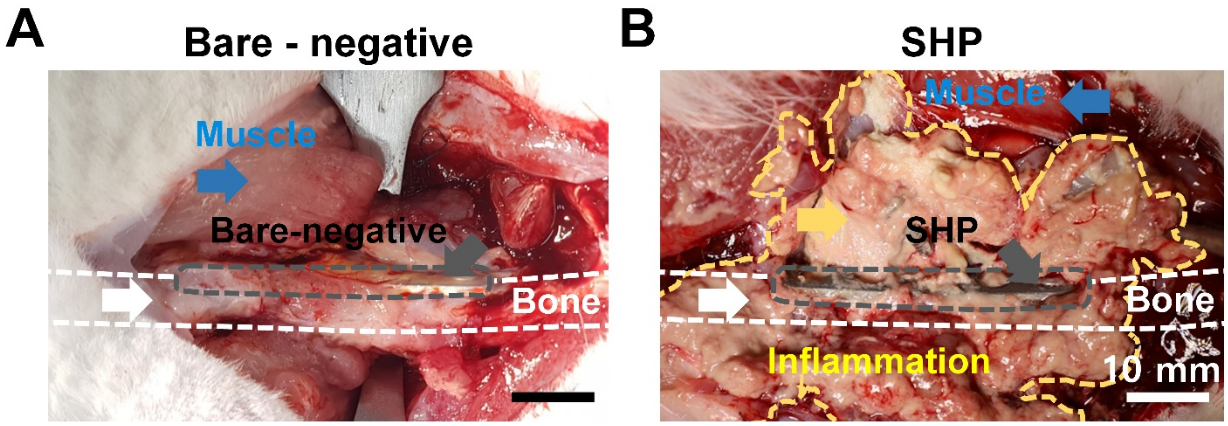

Fig. S2. Photograph images of the fracture site after four weeks of implantations. The rabbits implanted with (A) sterilized bare-negative substrate showing no signs of infection. (B) SHP showing serious inflammation due to bacterial infection. Photo credit: Kyomin Chae & Kijun Park, Yonsei University.

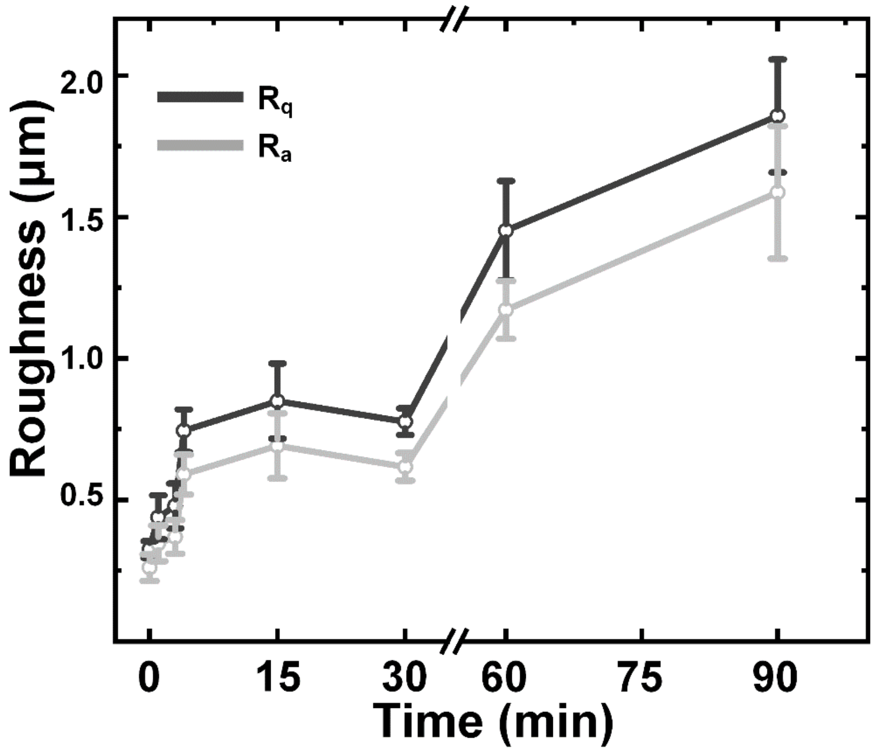

Fig. S3. Time-dependent AFM roughness R_q, R_a changes in stainless steel surface formed via HF solution etching. Etching time of 0, 1, 3, 5, 15, 30, 60, and 90 min, respectively. Etching time in which micro/nano structure both exists is between 5 and 30 min, and 15 min etched substrate resulted in the highest roughness among them.

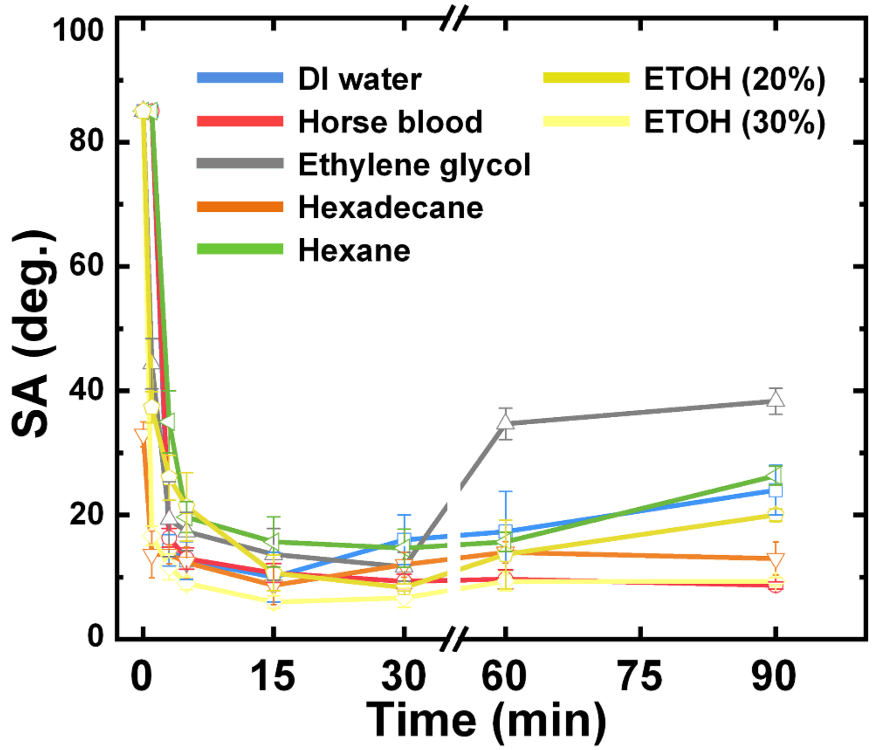

Fig. S4. Sliding angle measurement of the substrate as a function of etching time. To confirm the performance of LOIS with different etching time, SA of etched substrates were examined with liquids with varying surface energy.

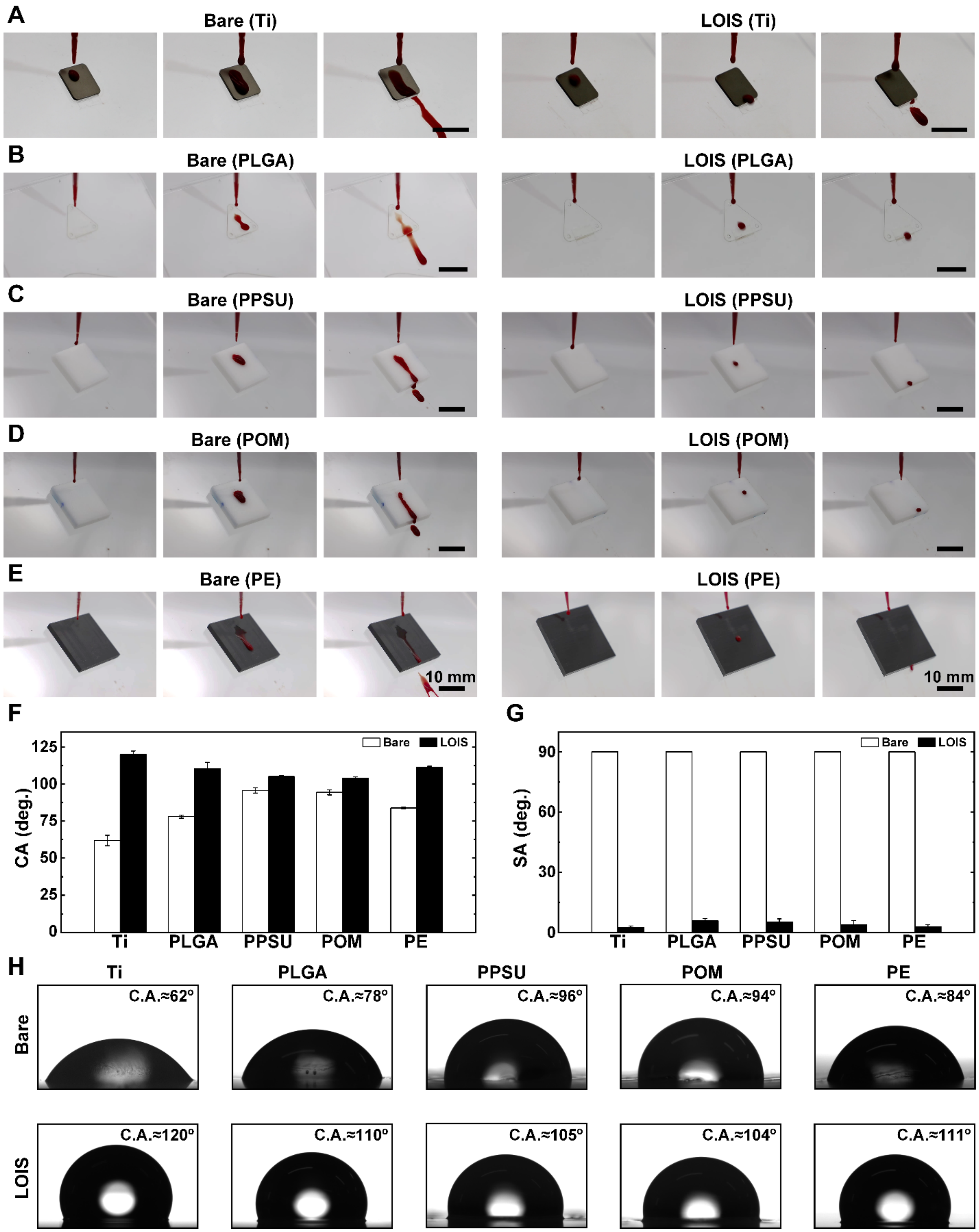

Fig. S5. Compatibility of LOIS coating for various biomaterials. Sequential images of a blood droplet sliding-off on (A) Ti, (B) PLGA, (C) PPSU, (D) POM, (E) PE. (F) CA measurement of DI water on bare and LOIS-treated biomaterials. (G) SA measurement of DI water on bare and LOIS-treated biomaterials. (H) Representative photograph images of CA for each material. Photo credit: Yeontaek Lee, Yonsei University.

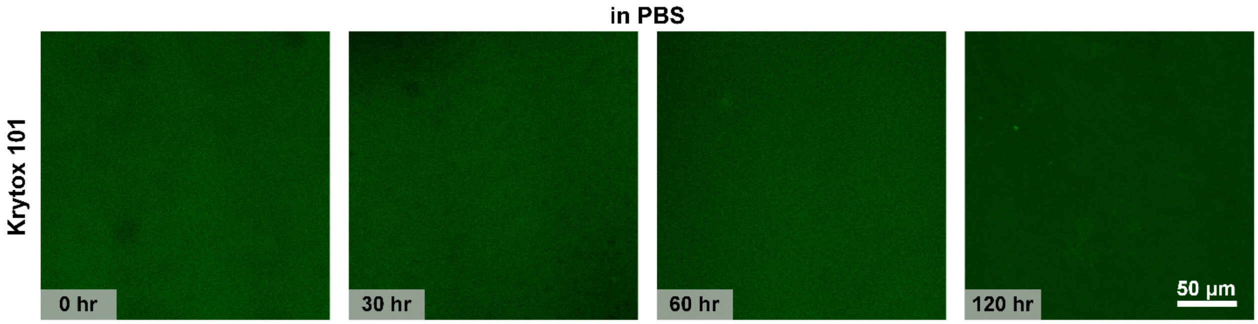

Fig. S6. Confocal microscopy images in reflection mode for lubricant-infused surface submerged in PBS. In order to investigate the long-term reliability of LOIS, the lubricant-infused substrate was submerged in PBS and mildly shook at 120 rpm.

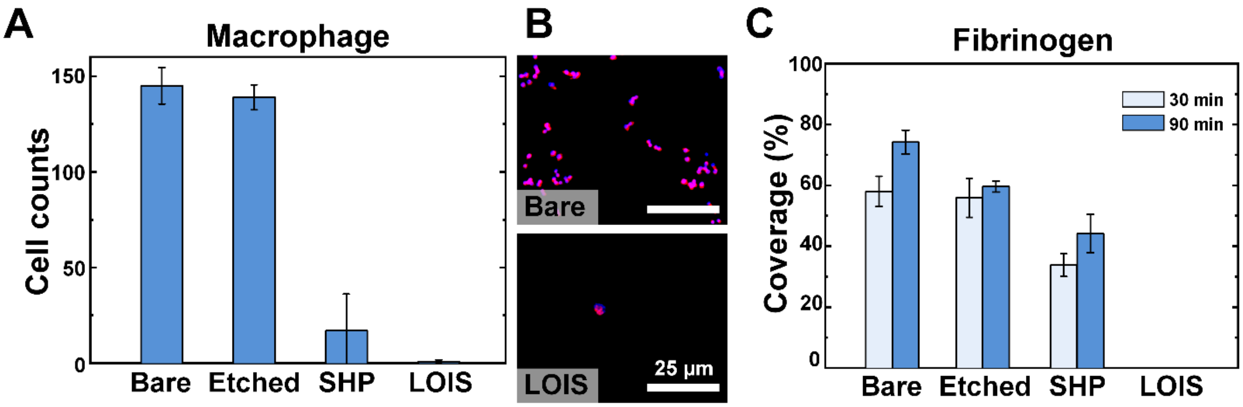

Fig. S7. Demonstration of the anti-biofouling property against the biosubstances. (A) Number of macrophages adhered on each substrate and (B) fluorescence microscopy images of the cells adhered on the bare and LOIS. (C) Calculated area coverage of immune-related protein, fibrinogen for each substrate.

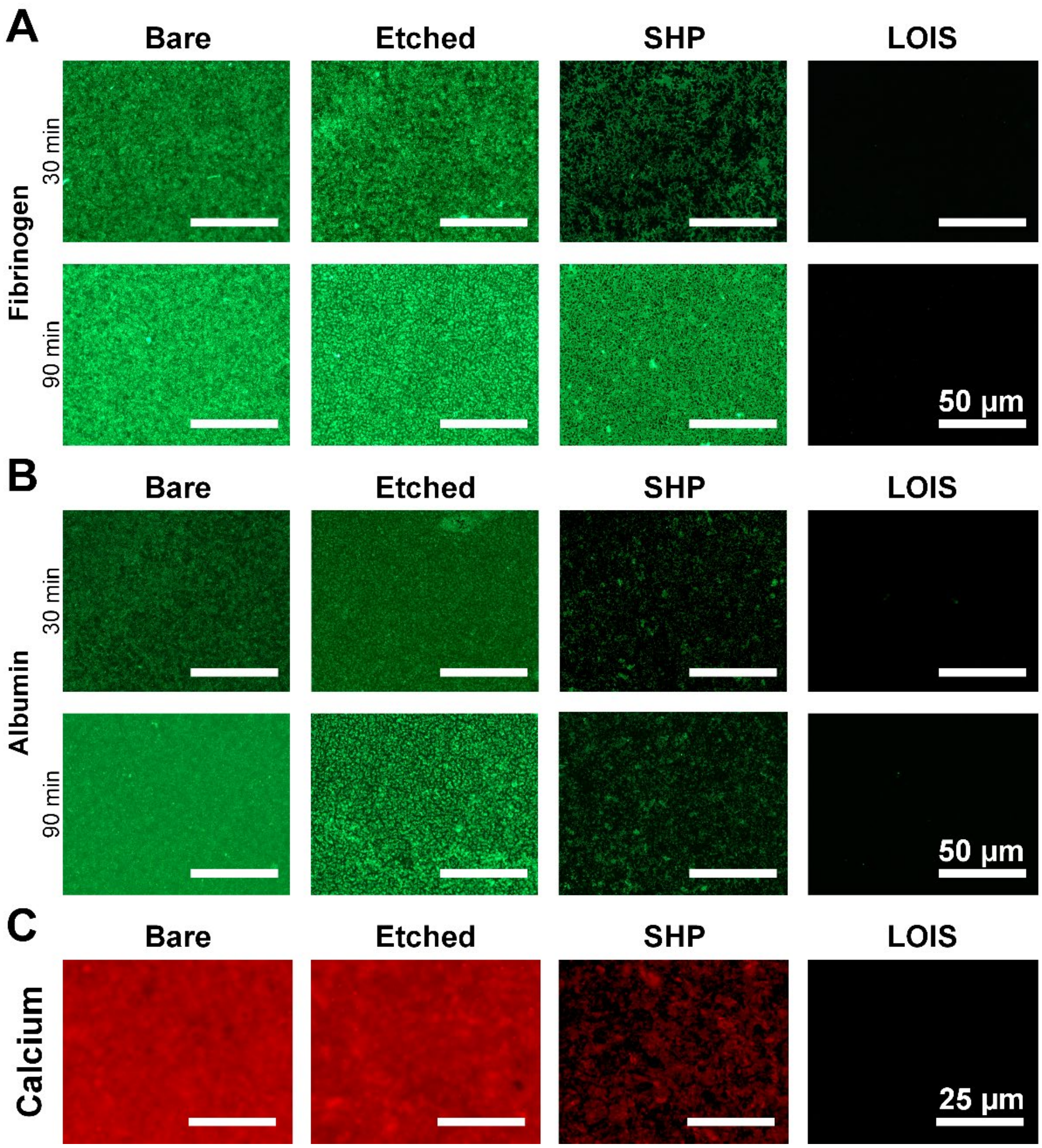

Fig. S8. Fluorescence microscopy images of bare, etched, SHP, and LOIS incubated in immune-related proteins. (A) Fibrinogen and (B) albumin for 30 min and 90 min. (C) Adhesion test for calcium, which is involved in bone healing after incubation for 90 min.

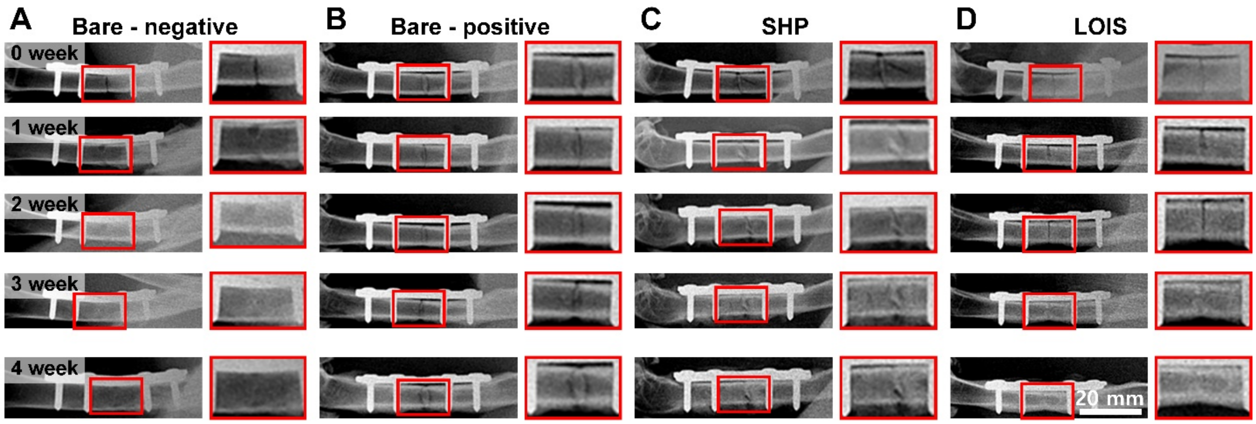

Fig. S9. Representative X-ray images of the femur at 0, 1, 2, 3, and 4 weeks. To demonstrate differences in degrees of bone fracture healing processes between (A) bare-negative, (B) bare-positive, (C) SHP and (D) LOIS. Bone fracture fully regenerated in the bare-negative and LOIS groups, while bone still undergoes healing process in the bare-positive and SHP groups. The fractured area highlighted with red dashed circle.

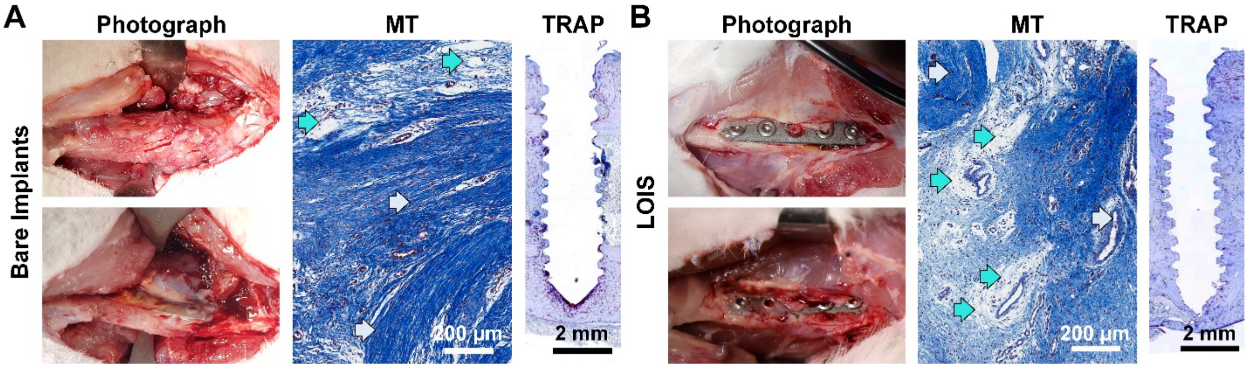

Fig. S10. Optical images of the surgical site, MT staining results of tissues collected near the screws, and TRAP staining results highlighting screw-bone interface of (A) Bare implants and (B) LOIS-treated implants. Photo credit: Kyomin Chae, Yonsei University.

Legend for movie S1

Movie S1. The movie is divided in two parts: first, the blood droplet was dropped on the bare substrate, remaining blood trails along the substrate surface. In the second part, the dropped blood droplet rolled off the LOIS without any blood remaining on the surface demonstrating superior antibiofouling properties. All the substrates are filmed at a tilting angle of 30°.