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1 Supporting information

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3 A dynamic and self-crosslinked polysaccharide hydrogel with 4 autonomous self-healing ability

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Figure S1 Fabrication and characterization of the oxidized alginate. (A) Synthetic
process of oxidized alginate. (B) FT-IR spectra of original alginate and oxidized
alginate with a degree of oxidation of 50%. (C) ¹H-NMR spectrum of oxidized
alginate with a degree of oxidation of 50%.

The synthetic process of oxidized alginate was shown in Figure S1 (A). Figure 7 S1 (B) shows the Fourier transform infrared spectroscopy (FT-IR) of the alginate and 8 ADA50. In the spectrum of alginate, the peaks at 1606 cm⁻¹ and 1416 cm⁻¹ were 9 assigned to antisymmetric stretch and symmetric stretch of carboxylate. Compared to 10 the spectrum of alginate, a new peak at 1151 cm⁻¹ appeared in the spectrum of 11 ADA50.1 In addition, the peaks at 820 cm⁻¹~890 cm⁻¹ (C-O-C) weakened or even 12 disappeared in the ADA50, which also demonstrated the successful preparation of the 13 ADA50.^{2, 3} The ADA50 was then characterized by ¹H NMR, as shown in Figure S1 14 (C). The peaks at 5.3 ppm and 5.55 ppm were assigned to the hemiacetalic proton 15 formed from aldehyde and neighbors hydroxyl groups, which further demonstrated 16 the formation of ADA50.⁴ 17



- 3 Figure S2 Hydrogel formed when incubating ADA50 and AMC7 at 7.4, while no gel
- 4 transition was observed at pH 5.0.





- 2 Figure S3 (a-d) Preparation of the self-healable hydrogel with mass ratio of AMC7 vs ADA50 as
- 1:0.1, 1:0.3 and 1:0.6.



2 Figure S4 Application of the hydrogel as a self-healing template to repair hydroxyapatite. (A) "I"

3 and "S" shaped freeze-dried hydrogel with 5 wt% hydroxyapatite. (B) "I" and "S" shaped

4 hydroxyapatite aerogel after annealing the freeze-dried hydrogel at 600 °C for 5 hours.

References

7	1.	E. F. Vieira, A. R. Cestari, C. Airoldi and W. Loh, Biomacromolecules, 2008, 9, 1195-1199.
8	2.	C. G. Gomez, M. Rinaudo and M. A. Villar, Carbohyd Polym, 2007, 67, 296-304.
9	3.	B. Balakrishnan, S. Lesieur, D. Labarre and A. Jayakrishnan, Carbohyd Res, 2005, 340, 1425-
10		1429.
11	4.	A. D. Rogalsky, H. J. Kwon and P. Lee-Sullivan, Journal of Biomedical Materials Research
12		<i>Part A</i> , 2011, 99A , 367-375.
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