Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B. This journal is © The Royal Society of Chemistry 2020

## **Supplementary Material**

Samples	GG (% w/v)	SA (% w/v)
S2510	2.5	1.0
S2020	2.0	2.0
S1530	1.5	3.0
S1040	1.0	4.0
S2040	2.0	4.0
\$3025	3.0	2.5

**Table S1.** Parameters of the organic components with varied proportions of sodium alginate (SA) and gellan gum (GG).



**Fig.S1.** Results of gelling and mechanical properties of the SA and GG hydrogel crosslinked with 0.1 M CaCl<sub>2</sub> solution. (a-c) Images of SA, GG and GG-SA crosslinked with Ca<sup>2+</sup> in a 34 mm diameter mold. After GG was gelled, its shape remained intact compared with the mold, while SA had serious volume shrinkage deformation. The volume deformation shape integrity was moderate after combining SA and GG. (d) The volume shrinkage of GG-SA hydrogels with different proportions was determined by drainage method after gelling. The volume shrinkage of 2.0% GG-4.0 % SA and 3.0% GG-2.5% SA was less than 25%. (e-f) Stress-strain curves and compressive stiffness of different SA/GG were measured by the compression test, which showed that the compressive stiffness of 2.0% GG-4.0% SA are  $433 \pm 79$  kPa and  $484 \pm 34$  kPa, respectively.



**Fig.S2.** The extrusion-based 3D printer applied in this study. The CAD model (a) and real 3D printer (b).



**Fig.S3.** The maximum compressive stress results of four hybrid bioinks during structural failure in the compression test.



**Fig .S4** The EDS scanning results of sections of I-A3025 (a) and I-B2040 hydrogels (b) at magnification of  $\times 1000$ . The elements C, O, Na, Mg, P and Ca were detected.



**Fig.S5.** The consistency and injectability measurements of different bioinks when using circular and cone nozzle. Injection speed 0.005 mL/s, nozzle diameter 410  $\mu$ m. Once the injection force exceeded 30 N, the experiment was stopped to ensure safety and protection of the equipment.



**Fig.S6.** The SEM micrograph of the SA-GG hydrogel after mineralization in SBF for 30 d (a), and the EDS results of dot 1 (b) and dot 2 (c) regions.



**Fig.S7.** Permeability test results of I-A3025 composite gel. (a) Standard curve for trypsin (24000 daltons) and BSA (Bovine serum albumin, 67000 daltons). (b) The change curves of protein absorbed by the I-A3025 composite gel after incubation in two different protein solutions for different times separately. (The initial concentration of the two proteins was 2.0 mg/mL).

Video.S1 was submitted online as an attachment.