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Electronic Supplementary Information

Mussel-Inspired Capsules toward Reaction-Triggered Cargo Release

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KEYWORDS: Capsules; Mussel-Inspired Chemistry; Controlled Release; Enzyme Immobilization; Stimuli-Response Property

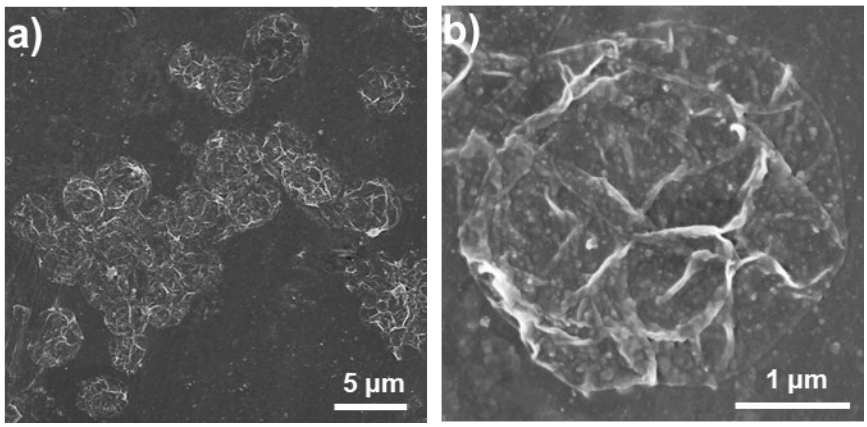

Figure S1. SEM images of (a) TP capsules in large view and (b) magnification of a single TP capsule.

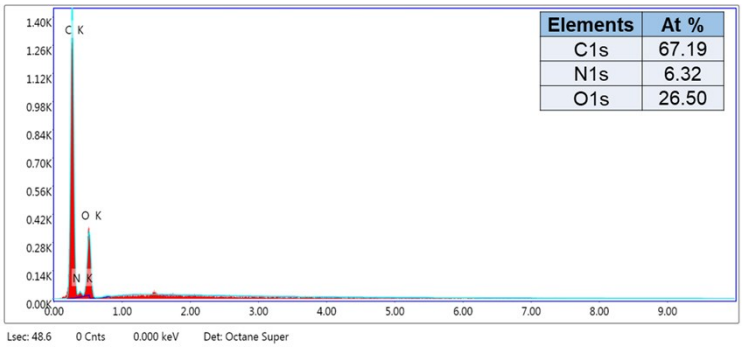

Figure S2. EDS spectrum of TP capsules.

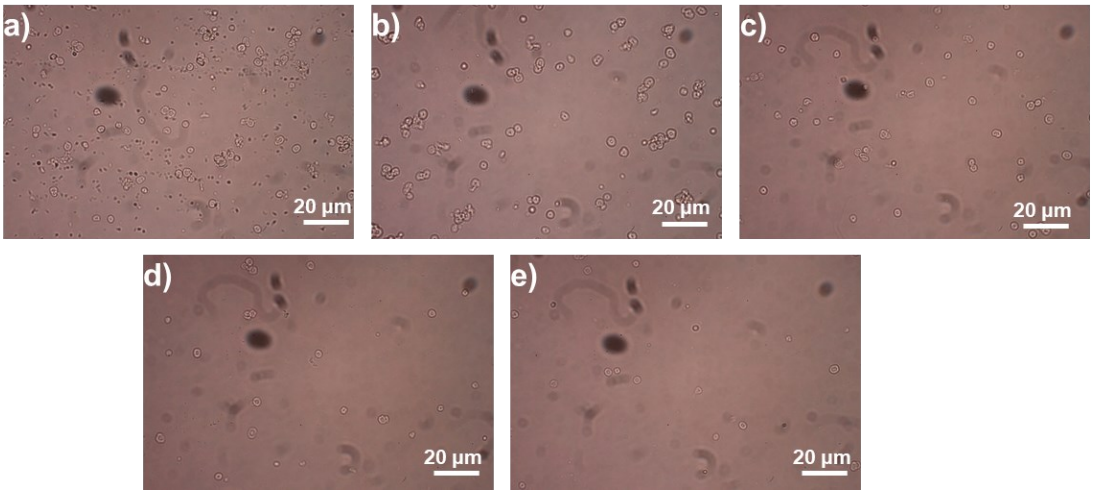

Figure S3. OM images of GOD&INS@TP capsules treated with different concentrations of glucose for 3 h: (a) 0 mM, (b) 5 mM, (c) 10 mM, (d) 20 mM, and (e) 50 mM.

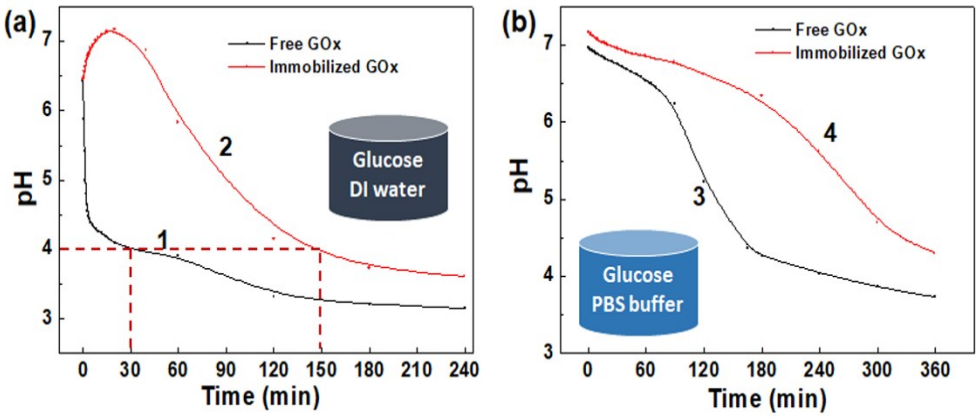

Figure S4. Changes of pH value of free GOD and GOD@TP capsules solution as a function of reaction time treated with 20 mM glucose in (a) water and (b) PBS buffer.

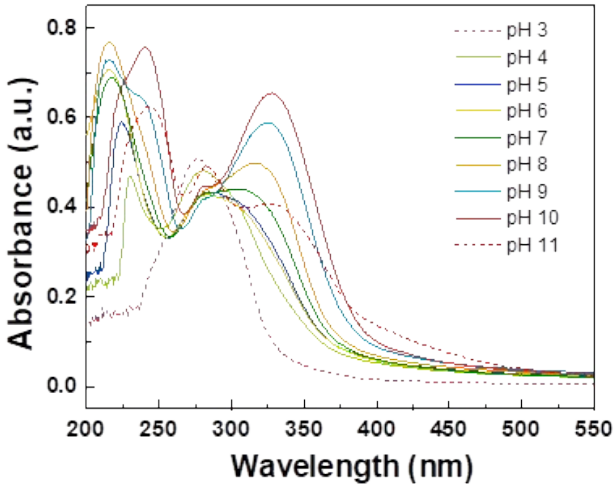

Figure S5. UV-vis spectra of GOD&INS@TP capsules solution at different pH values.

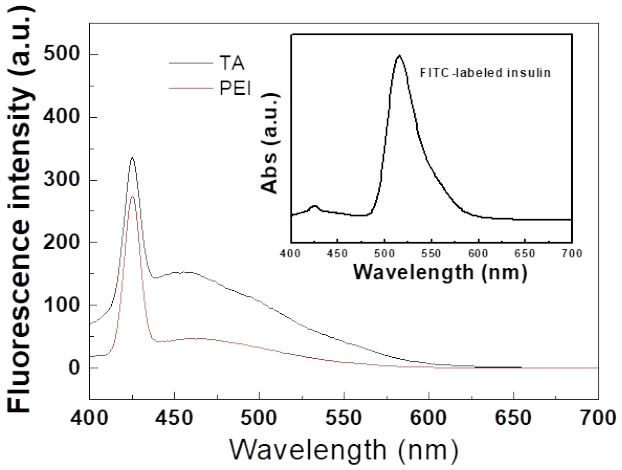

Figure S6. Fluorescence spectra of TA, PEI and FITC-labeled INS.

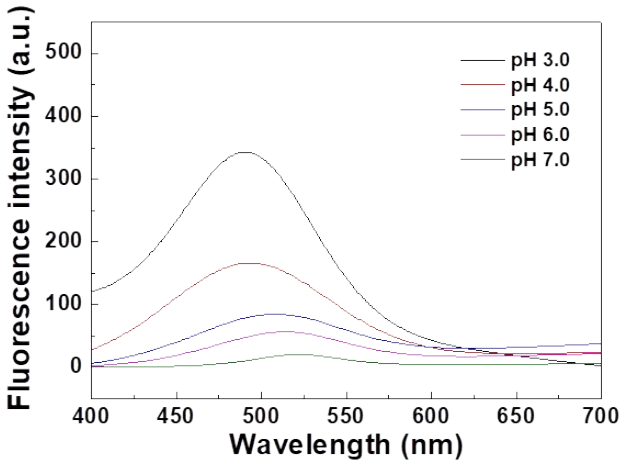

Figure S7. Fluorescence spectra corresponding to the released FITC-labeled INS from GOD& INS@TP capsules treated at different pH values.

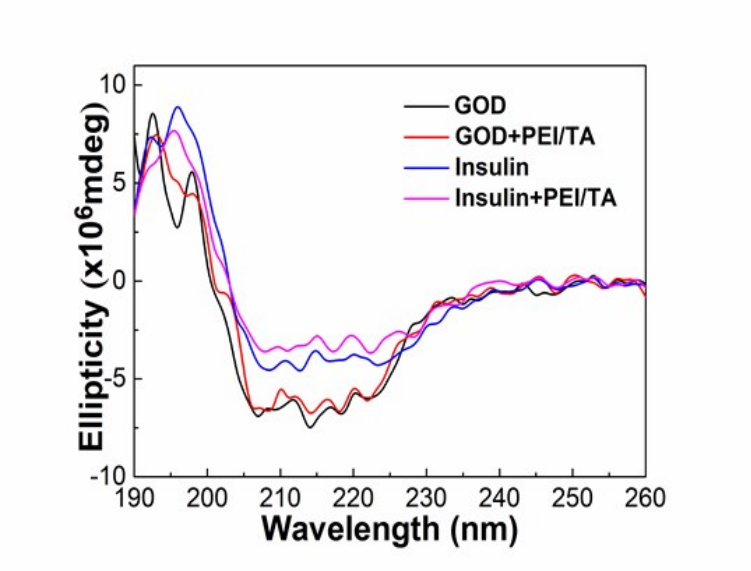

Figure S8. CD spectra of free GOD, free INS, GOD treated by TP capsules for 3 h and INS treated by TP capsules for 3 h.

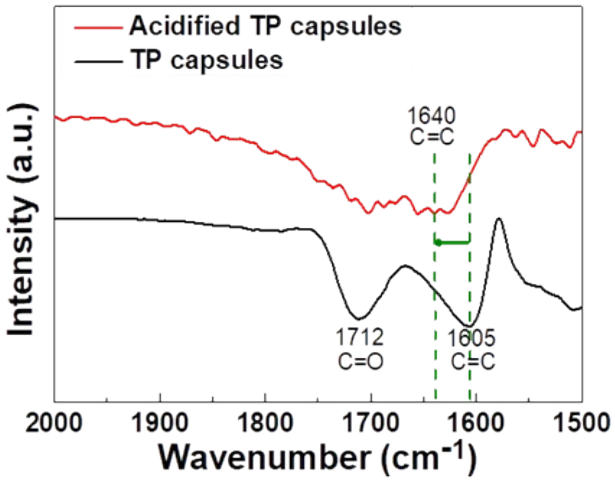

Figure S9. FTIR spectra of TP capsules and acidified TP capsules (treated at pH 3).

Under acidic conditions, GOD&INS@TP capsules were degraded, and the solution became clear and solid-free (**Figure 3b**). Then, we added acidified TP capsules solution to KBr powders to conduct FTIR analysis. From the FTIR spectra, the red shift of C=C bond (1640 cm^{-1}) in acidified TP capsules, compared with 1605 cm^{-1} of TP capsules, may be as a result of the cleavage of C=N bond. The absorption band of C=N was not detected probably due to the overlap of the absorption bands of C=C and C=N. FTIR was conducted through adding acidified TP capsules solution to KBr powders.

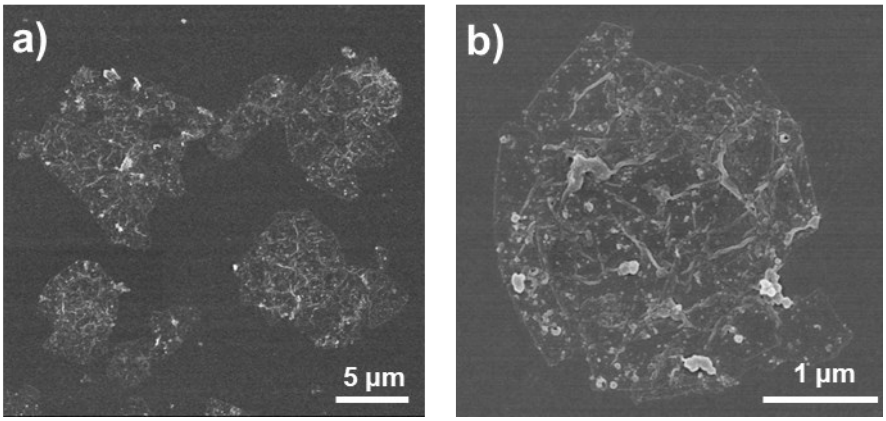

Figure S10. SEM images of (a) TP capsules (prepared at pH 6.0) in large view and (b) magnification of a single TP capsule (prepared at pH 6.0).

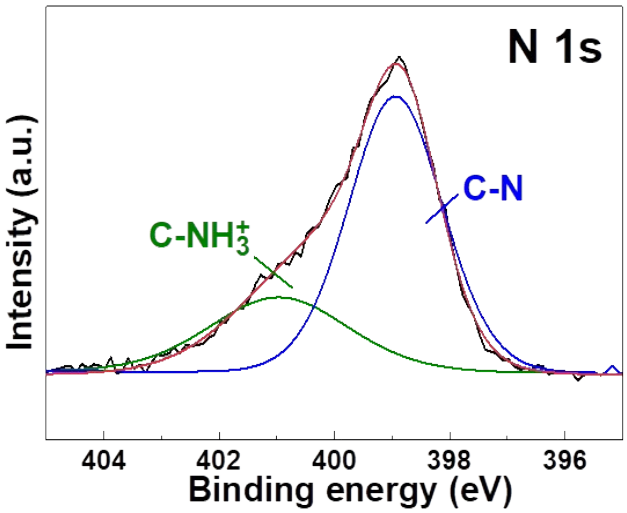

Figure S11. N 1s XPS high-resolution spectrum of acidified TP capsules (treated at pH 3).

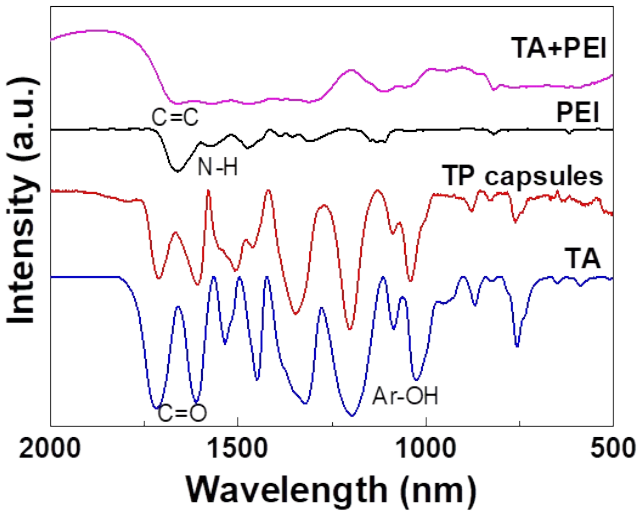

Figure S12. FTIR spectra of TP capsules, pure TA, pure PEI and the mixture of TA and PEI.

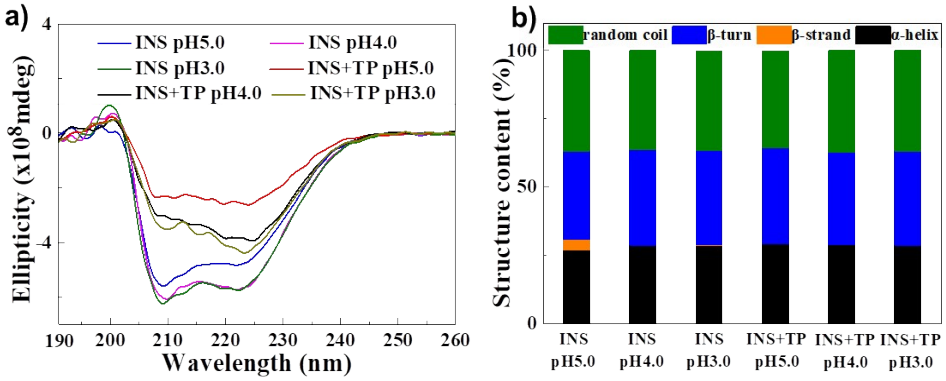

Figure S13. a) CD spectra and b) secondary structure analysis of free INS and INS treated by TP capsules at different pH values for 1 h.

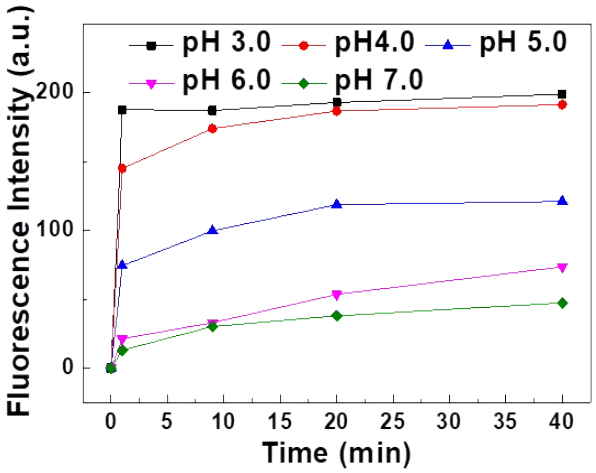

Figure S14. Time-dependent fluorescence spectra corresponding to the released FITC-labelled INS from GOD&INS@TP capsules treated at different pH values.

Table S1. Encapsulation efficiency and amount of INS and GOD in TP capsules

Enzyme	Encapsulation efficiency%	Encapsulation amount/mg
INS	91.97	11.50
GOD	93.86	11.73

The supernatants of the INS@$CaCO_3$ and GOD@$CaCO_3$ preparation solution and the three times washed water were collected and mixed, which were measured by Coomassie blue staining to test the absorbance to get the INS and GOD encapsulation efficiency. The INS and GOD encapsulation efficiency was calculated based on the following equation:

$$Encapsulation\ efficiency\ (\%)=(m-CV)/m\ *100 \quad (1)$$

where m was the mass of INS and GOD initially introduced into the solution for encapsulation (mg); C (mg mL^{-1}) and V (mL) were the enzyme concentration, which could be derived from the UV-vis absorbance, and the volume of the supernatant after encapsulation.