## Electronic Supplementary Information

**Figure S1:** HPLC standard curve of IBU concentration and corresponding Regression equations (insert).

**Figure S2:** HPLC.; Figure S2: The standard curves of IBU concentration in PBS at pH 7.4 (A) and pH 2.0 (B), corresponding their Regression equations (insert).

**Figure S3:** Emission spectra of NA in acetonitrile solution at different concentrations (A), (a) ACN, (b) $1.0\times10^{-4}$ M, (c) $2.5\times10^{-4}$ M, (d) $3.3\times10^{-3}$ M, (e) $5.0\times10^{-3}$ M, (f) $8.3\times10^{-3}$ M, (g) $1.0\times10^{-2}$ M, (h) $5.0\times10^{-2}$ M, (i) $1.0\times10^{-1}$ M, (j) NA solid. The relationships between their concentration values and wavelength values (B).

**Figure S4:** Emission spectra of P(NA-AA)-1-y (A) and P(NA-AA)-7-y (B) with various doped amount of NA, (a) P(NA-AA)-x-0.05, (b) P(NA-AA)-x-0.1, (c) P(NA-AA)-x-0.5, (d) P(NA-AA)-x-1, (e) P(NA-AA)-x-3, (f) P(NA-AA)-x-5, (g) P(NA-AA)-x-7, and (h) P(NA-AA)-x-10. The emission spectra of the NA-PAAs mixed by physical method (C), (a) NA-PAA-0.05, (b) NA-PAA-0.1, (c) NA-PAA-0.5, (d) NA-PAA-1, (e) NA-PAA-3, (f) NA-PAA-5, (g) NA-PAA-7, and (h) NA-PAA-10. The relationships between the wavelength values of the characteristic peak and the doped-NA amount in PAA (D), (a) P(NA-AA)-0-y, (b) P(NA-AA)-1-y, (c) P(NA-AA)-7-y, and (d) NA-PAA-y.

**Figure S5:** Kratky plots(A) of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-7, and (e) P(NA-AA)-0-10. Kratky plots (A) of (a) P(NA-AA)-0-0.1, (b) P(NA-AA)-1-0.1, (c) P(NA-AA)-3-0.1, and (d) P(NA-AA)-7-0.1.

**Figure S6:** TG (A) and DTG (B) plots of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-10 and (e) NA.

**Figure S7:** FT-IR spectra of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-10, and (e) NA.

**Figure S8:** SR profiles of P(NA-AA)-1-y (A) and P(NA-AA)-7-y (B) at 37.0 °C under pH 7.4 (y = 0.1 (a), 1.0 (b), 10.0 (c)) and 2.0 (y = 0.1 (d), 1.0 (e), and 10.0 (f)).

**Figure S9:** PL spectra of (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different swelling time under pH 7.4. Notes: S- represents the swollen solid and L- the filtrated solution obtained from the swelling system over time.

**Figure S10:** PL spectra of (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different shrinking time under pH 2.0.

**Figure S11:** PL spectra of P(NA-AA)-0-0.1 with different swelling/shrinking time under pH 10.0 (A) and pH 1.0 (B).

**Figure S12:** SAXS patterns (yellow lines were fitting curves based on the power low) of the swollen/shrunken (A and B) P(NA-AA)-1-0.1, and (C and D) P(NA-AA)-7-0.1 under pH 7.4 (A, and C) and 2.0 (B, and D) with the extended time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h. The vertical offset values were presented in the Y-axis.

**Figure S13:** PDDF profiles of the swollen/shrunken P(NA-AA)-1-0.1 (A and C), and P(NA-AA)-7-0.1 (B and D) under pH 7.4 (A, and B) and 2.0 (D, and E) with the extended time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

**Figure S14:** Kratky plots of the swollen P(NA-AA)-0-0.1 (A), P(NA-AA)-0-1 (B), P(NA-AA)-0-10 (C), P(NA-AA)-1-0.1 (D), and P(NA-AA)-7-0.1 (E) under pH 7.4 with the extension of the swelling time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

**Figure S15:** Kratky plots of the shrunken P(NA-AA)-0-0.1(A), P(NA-AA)-0-1 (B), P(NA-AA)-0-10 (C), P(NA-AA)-1-0.1 (D), and P(NA-AA)-7-0.1 (E) under pH 2.0 with the extension of the shrinking time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

**Figure S16:** Cumulative IBU-releasing profiles from drug-loaded P(NA-AA)-1-y (A) and P(NA-AA)-7-y (b) at 37.0 °C under pH 2.0 (y = 0.1 (a), 1.0 (b), 10.0 (c)) and 7.4 (y = 0.1 (d), 1.0 (e), and 10.0 (f)).

**Figure S17:** PL spectra of the drug-released (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different releasing time under pH 7.4. Notes: As described in experimental methods, the drug loaded samples were immersed in PBS system, 1.0 mL of releasing solution was withdrawn at a predetermined time. After filtered, the obtained solid was defined S, and corresponding filtrate liquid was defined L.

**Figure S18:** PL spectra of the drug-released (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different releasing time under pH 2.0.

**Figure S19:** Time-dependent CLSM images of HeLa cells incubated as controlled samples. The scale bars are 10 μm.

**Table S1**. Summary of P(NA-AA)-x-y drug loading rate and cumulative release rate under pH 7.4 and pH 2.0.

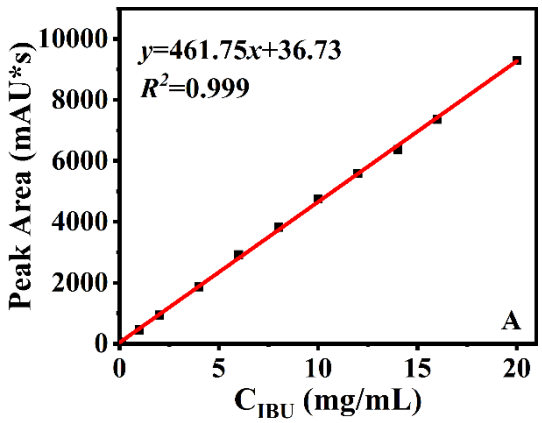



**Figure S1.** HPLC standard curve of IBU concentration and corresponding Regression

equations (insert).

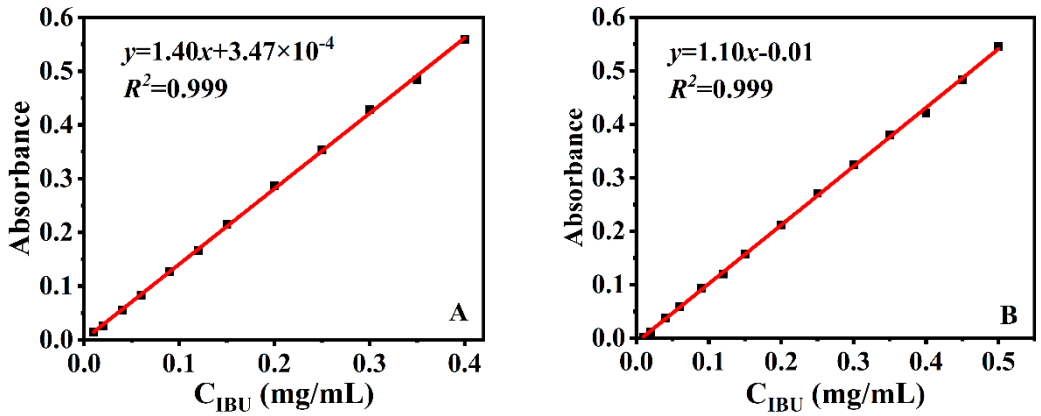



**Figure S2.** The standard curves of IBU concentration in PBS at pH 7.4 (A) and pH 2.0 (B), corresponding their Regression equations (insert).

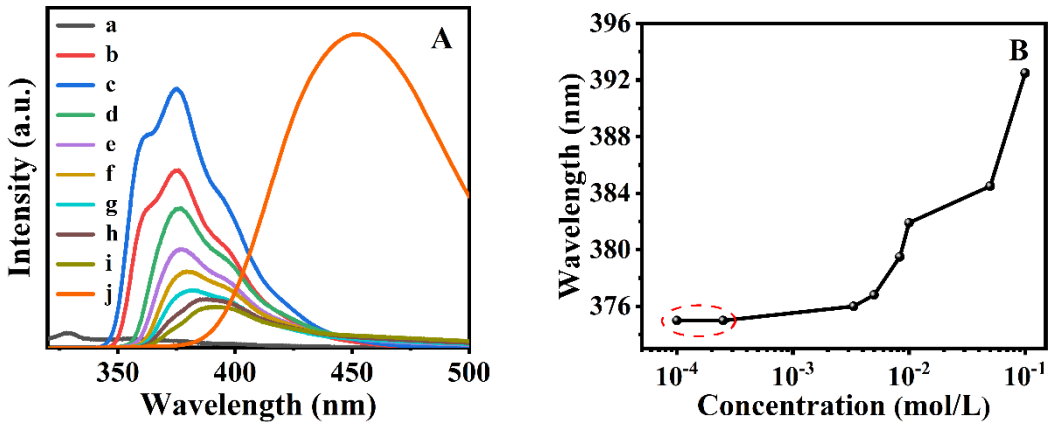



**Figure S3.** Emission spectra of NA in acetonitrile solution at different concentrations (A), (a) ACN, (b) $1.0\times10^{-4}$ M, (c) $2.5\times10^{-4}$ M, (d) $3.3\times10^{-3}$ M, (e) $5.0\times10^{-3}$ M, (f) $8.3\times10^{-3}$ M, (g) $1.0\times10^{-2}$ M, (h) $5.0\times10^{-2}$ M, (i) $1.0\times10^{-1}$ M, (j) NA solid. The relationships between their concentration values and wavelength values (B).

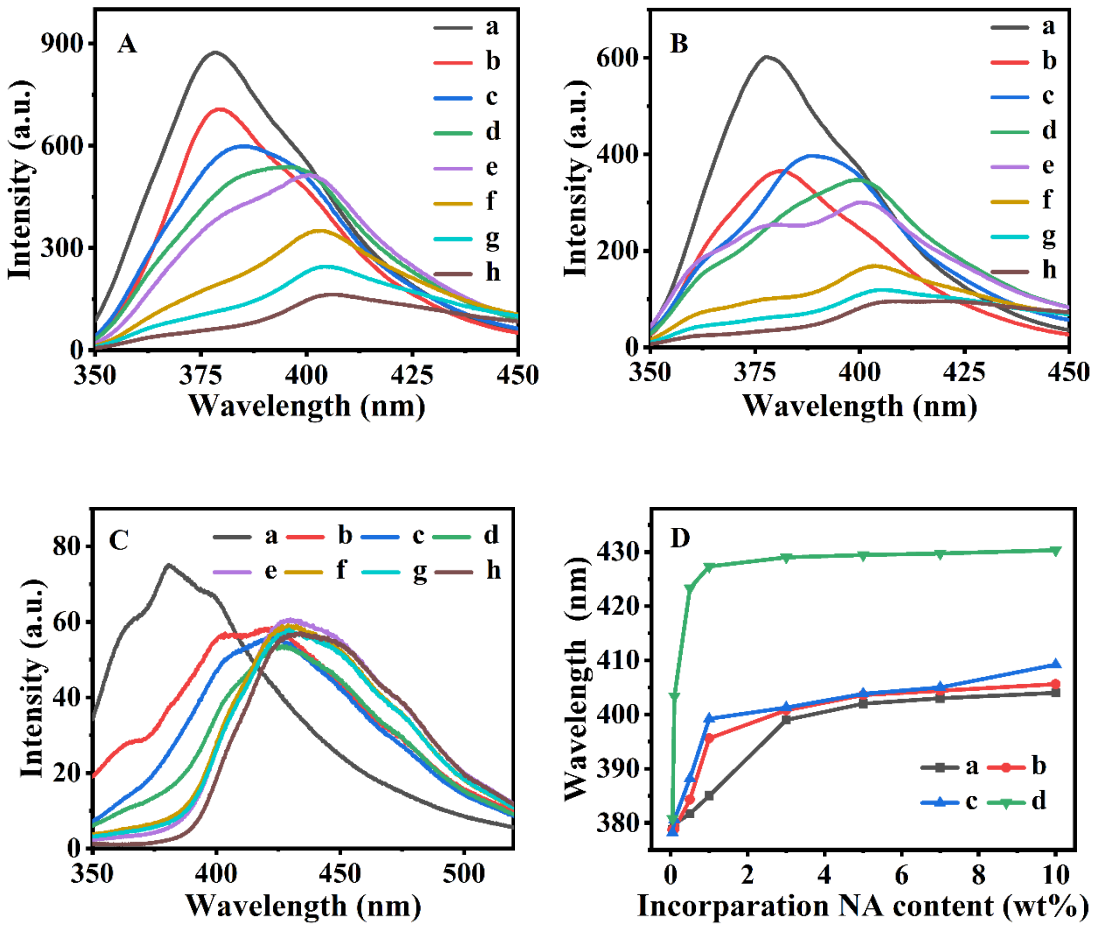



**Figure S4.** Emission spectra of P(NA-AA)-1-y (A) and P(NA-AA)-7-y (B) with various doped amount of NA, (a) P(NA-AA)-x-0.05, (b) P(NA-AA)-x-0.1, (c) P(NA-AA)-x-0.5, (d) P(NA-AA)-x-1, (e) P(NA-AA)-x-3, (f) P(NA-AA)-x-5, (g) P(NA-AA)-x-7, and (h) P(NA-AA)-x-10. The emission spectra of the NA-PAAs mixed by physical method (C), (a) NA-PAA-0.05, (b) NA-PAA-0.1, (c) NA-PAA-0.5, (d) NA-PAA-1, (e) NA-PAA-3, (f) NA-PAA-5, (g) NA-PAA-7, and (h) NA-PAA-10. The relationships between the wavelength values of the characteristic peak and the doped-NA amount in PAA (D), (a) P(NA-AA)-0-y, (b) P(NA-AA)-1-y, (c) P(NA-AA)-7-y, and (d) NA-PAA-y.

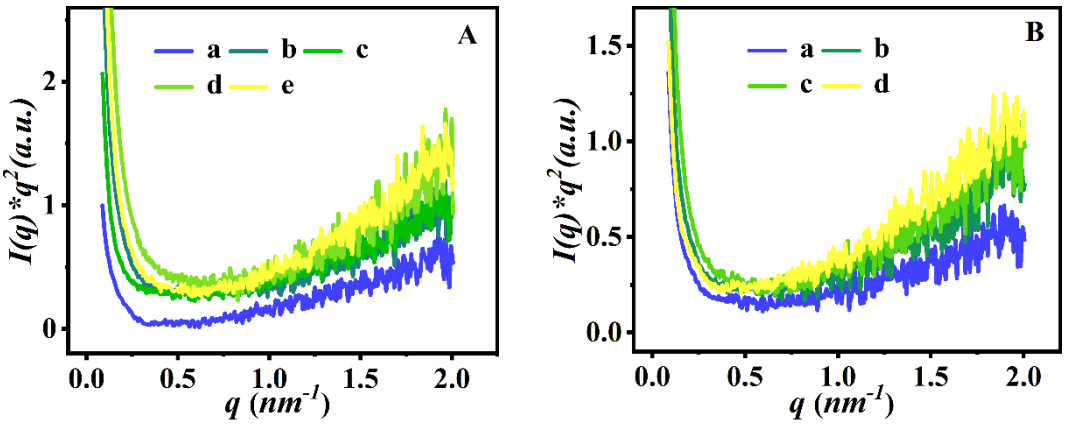



**Figure S5.** Kratky plots(A) of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-7, and (e) P(NA-AA)-0-10. Kratky plots (A) of (a) P(NA-AA)-0-0.1, (b) P(NA-AA)-1-0.1, (c) P(NA-AA)-3-0.1, and (d) P(NA-AA)-7-0.1.

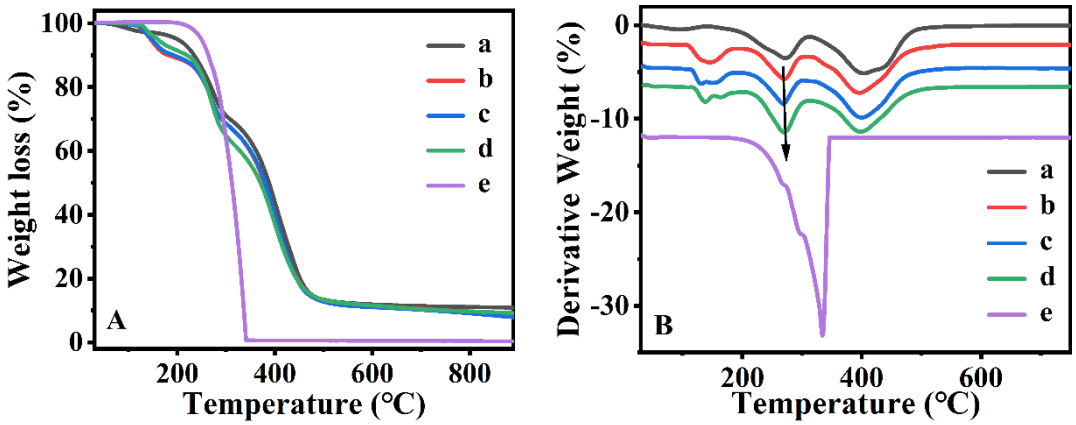



**Figure S6.** TG (A) and DTG (B) plots of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-10, and (e) NA.

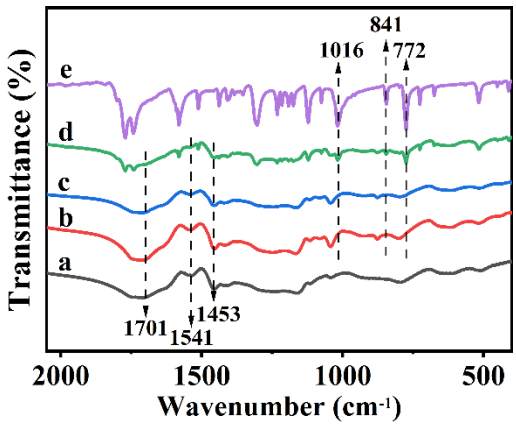



**Figure S7.** FT-IR spectra of (a) PAA, (b) P(NA-AA)-0-0.1, (c) P(NA-AA)-0-1, (d) P(NA-AA)-0-10, and (e) NA.

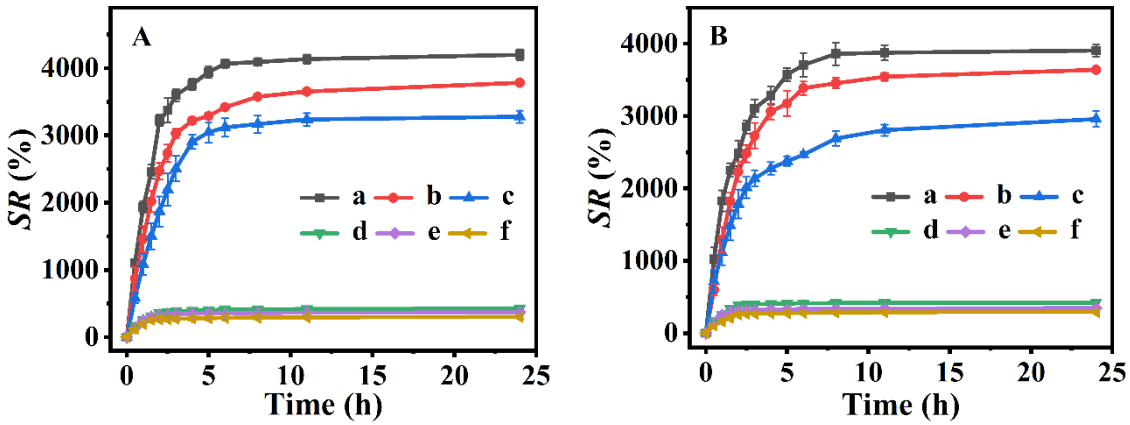



**Figure S8.** SR profiles of P(NA-AA)-1-y (A) and P(NA-AA)-7-y (B) at 37.0 °C under pH 7.4 (y = 0.1 (a), 1.0 (b), 10.0 (c)) and 2.0 (y = 0.1 (d), 1.0 (e), and 10.0 (f)).

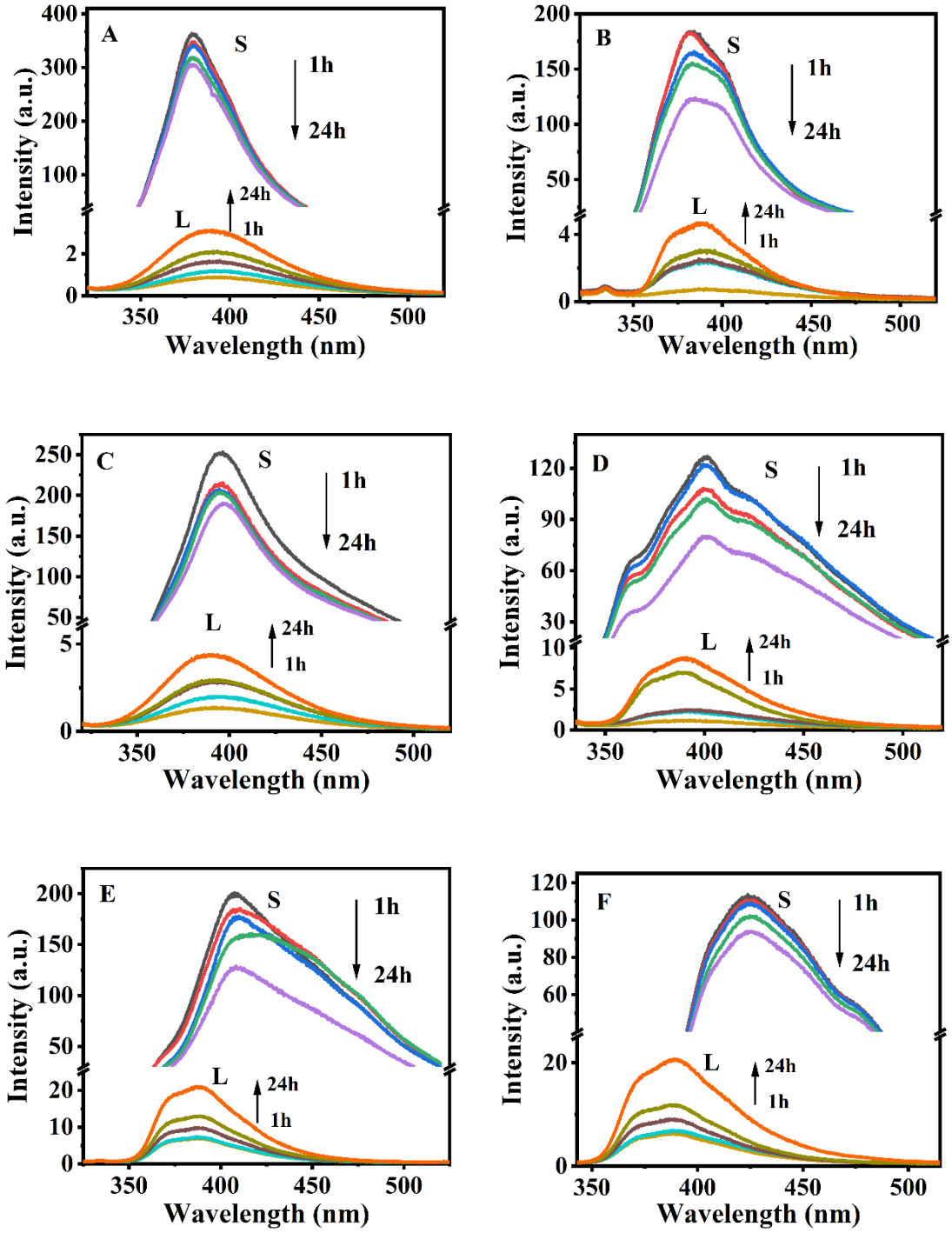



**Figure S9.** PL spectra of (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different swelling time under pH 7.4. Notes: S- represents the swollen solid and L- the filtrated solution obtained from the swelling system over time.

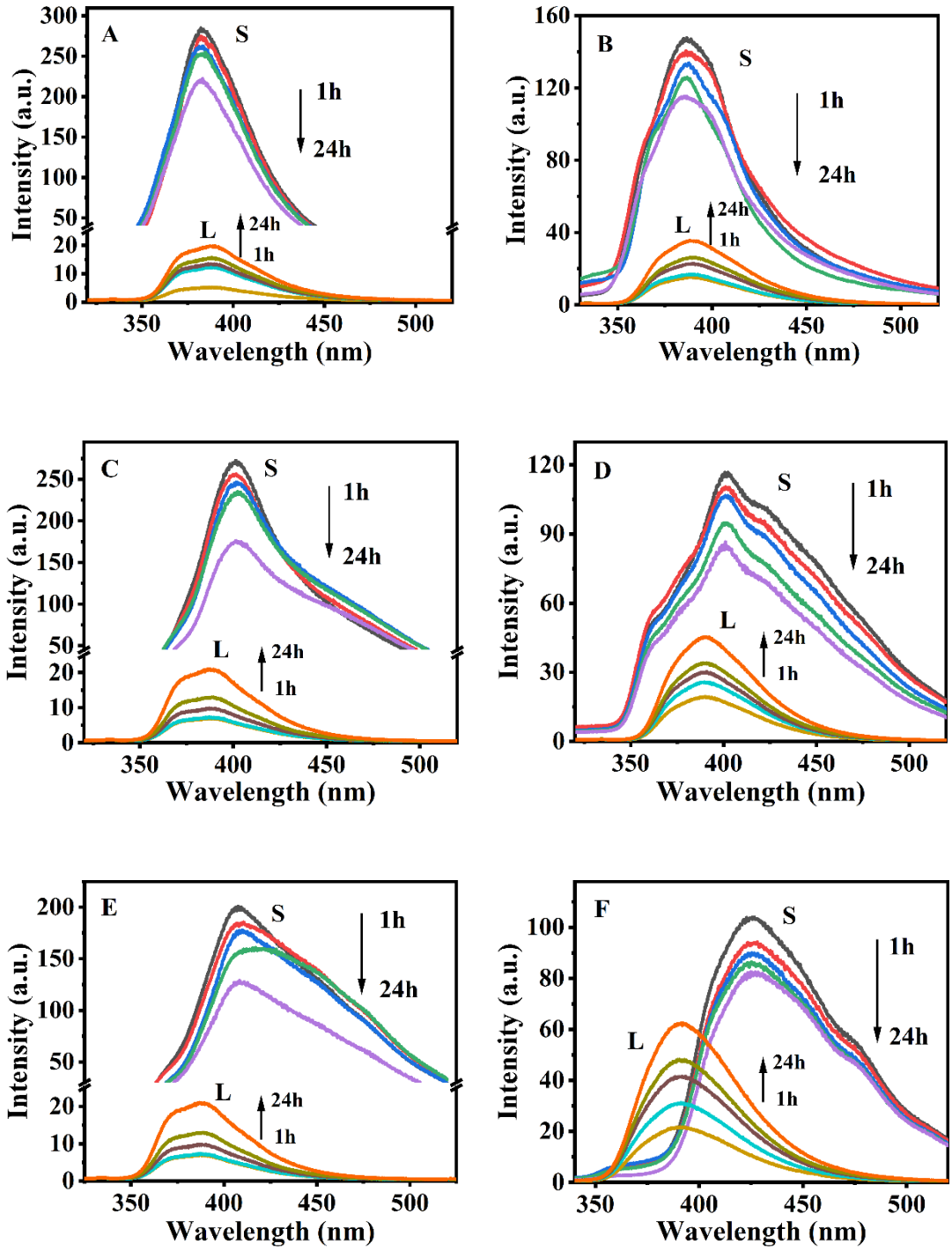



**Figure S10.** PL spectra of (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different shrinking time under pH 2.0.

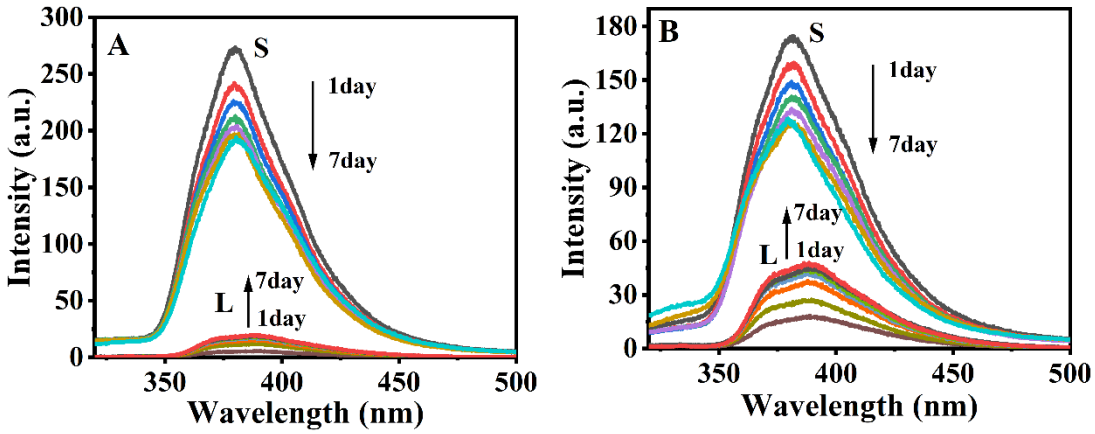



**Figure S11.** PL spectra of P(NA-AA)-0-0.1 with different swelling/shrinking time under pH 10.0 (A) and pH 1.0 (B).

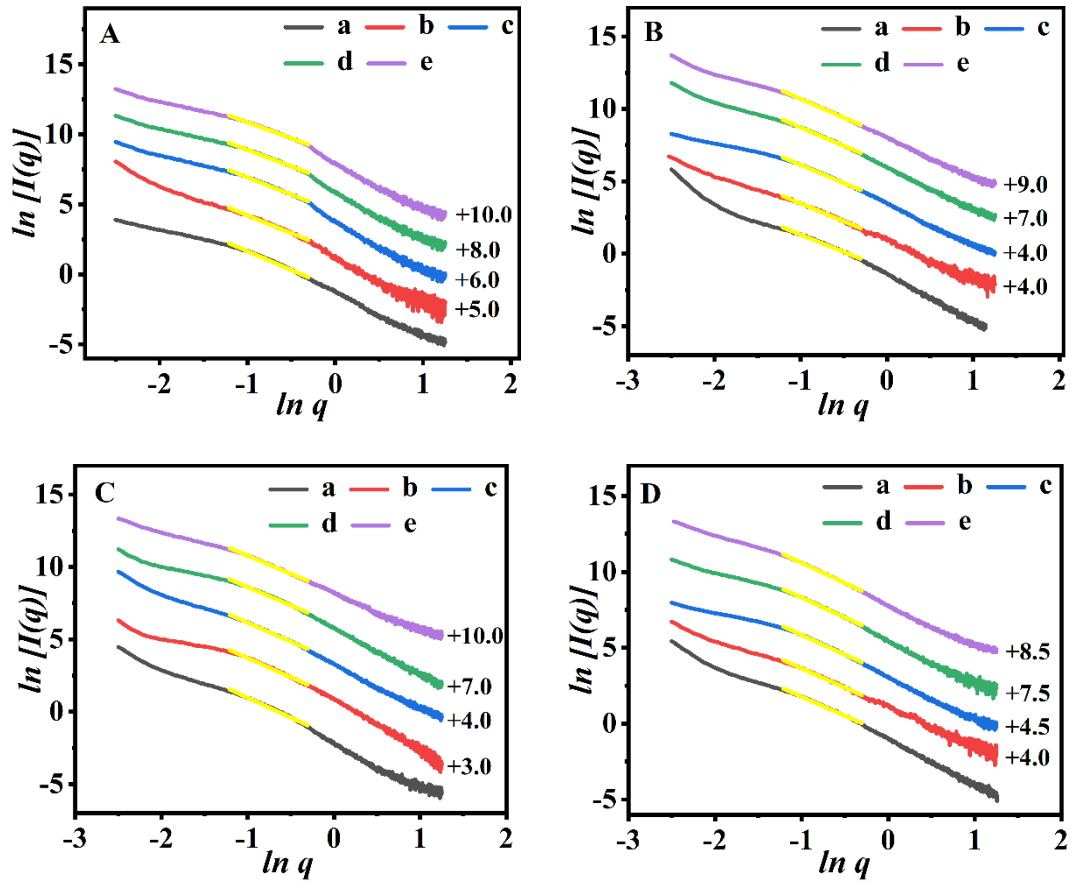



**Figure S12.** SAXS patterns (yellow lines were fitting curves based on the power low) of the swollen/shrunken (A and B) P(NA-AA)-1-0.1, and (C and D) P(NA-AA)-7-0.1 under pH 7.4 (A, and C) and 2.0 (B, and D) with the extended time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h. The vertical offset values were presented in the Y-axis.

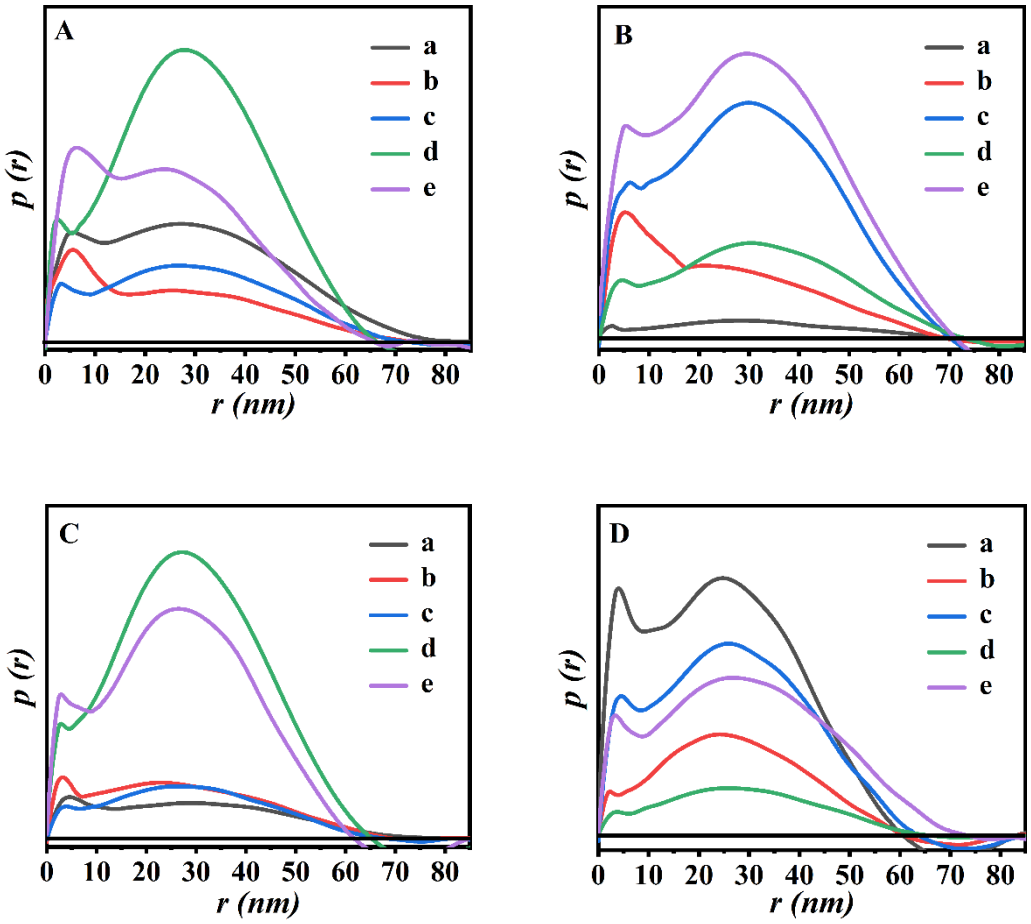



**Figure S13.** PDDF profiles of the swollen/shrunken P(NA-AA)-1-0.1 (A and C), and P(NA-AA)-7-0.1 (B and D) under pH 7.4 (A, and B) and 2.0 (D, and E) with the extended time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

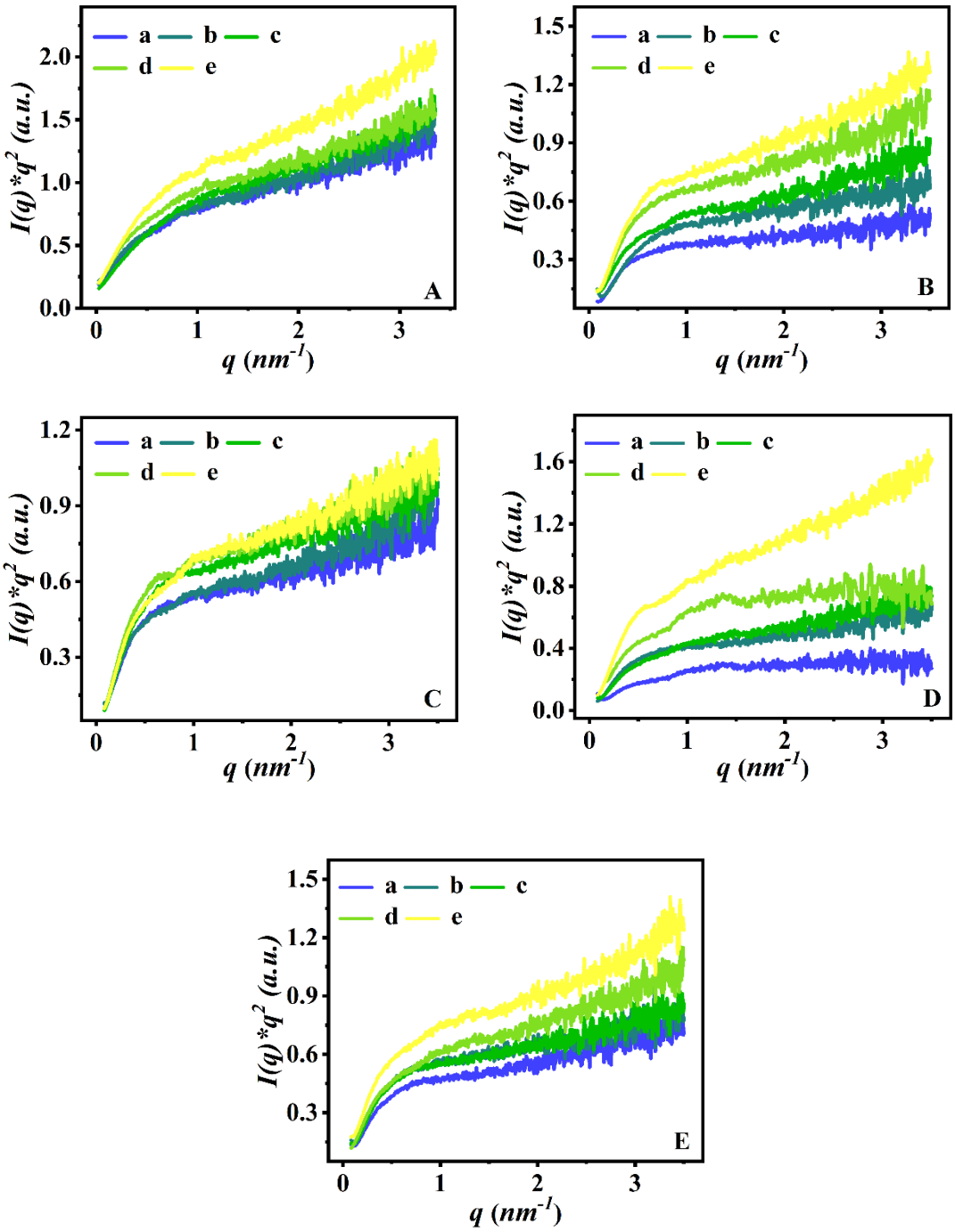



**Figure S14.** Kratky plots of the swollen P(NA-AA)-0-0.1 (A), P(NA-AA)-0-1 (B), P(NA-AA)-0-10 (C), P(NA-AA)-1-0.1 (D), and P(NA-AA)-7-0.1 (E) under pH 7.4 with the extension of the swelling time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

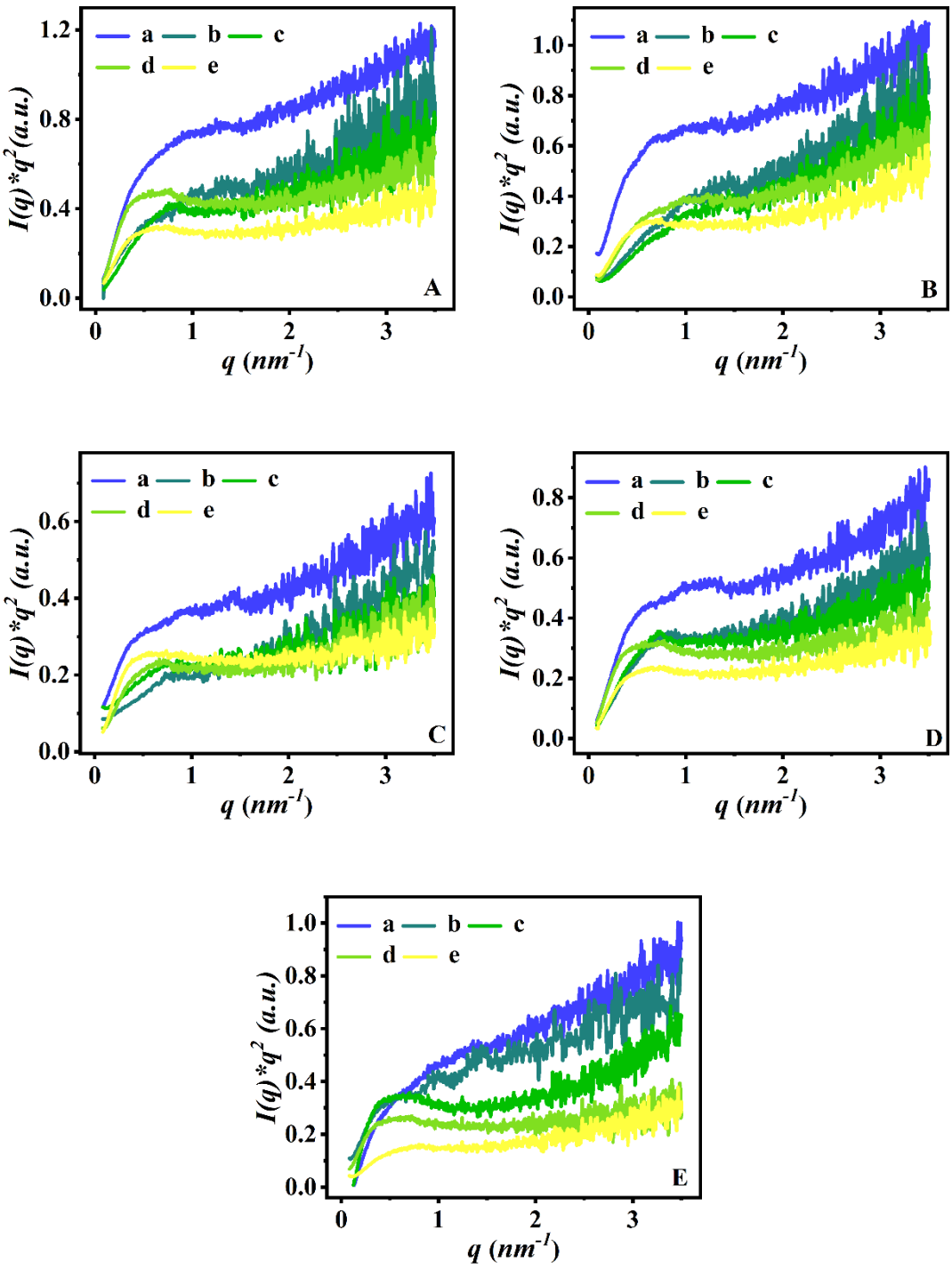



**Figure S15.** Kratky plots of the shrunken P(NA-AA)-0-0.1(A), P(NA-AA)-0-1 (B), P(NA-AA)-0-10 (C), P(NA-AA)-1-0.1 (D), and P(NA-AA)-7-0.1 (E) under pH 2.0 with the extension of the shrinking time. (a) 1 h, (b) 3 h, (c) 5 h, (d) 8 h, and (e) 24 h.

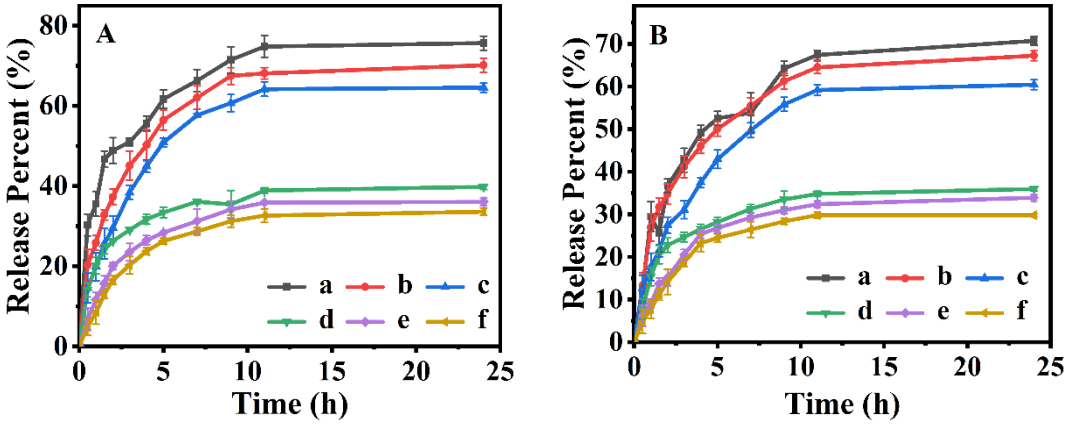



**Figure S16.** Cumulative IBU-releasing profiles from drug-loaded P(NA-AA)-1-y (A) and P(NA-AA)-7-y (b) at 37.0 °C under pH 2.0 (y = 0.1 (a), 1.0 (b), 10.0 (c)) and 7.4 (y = 0.1 (d), 1.0 (e), and 10.0 (f)).

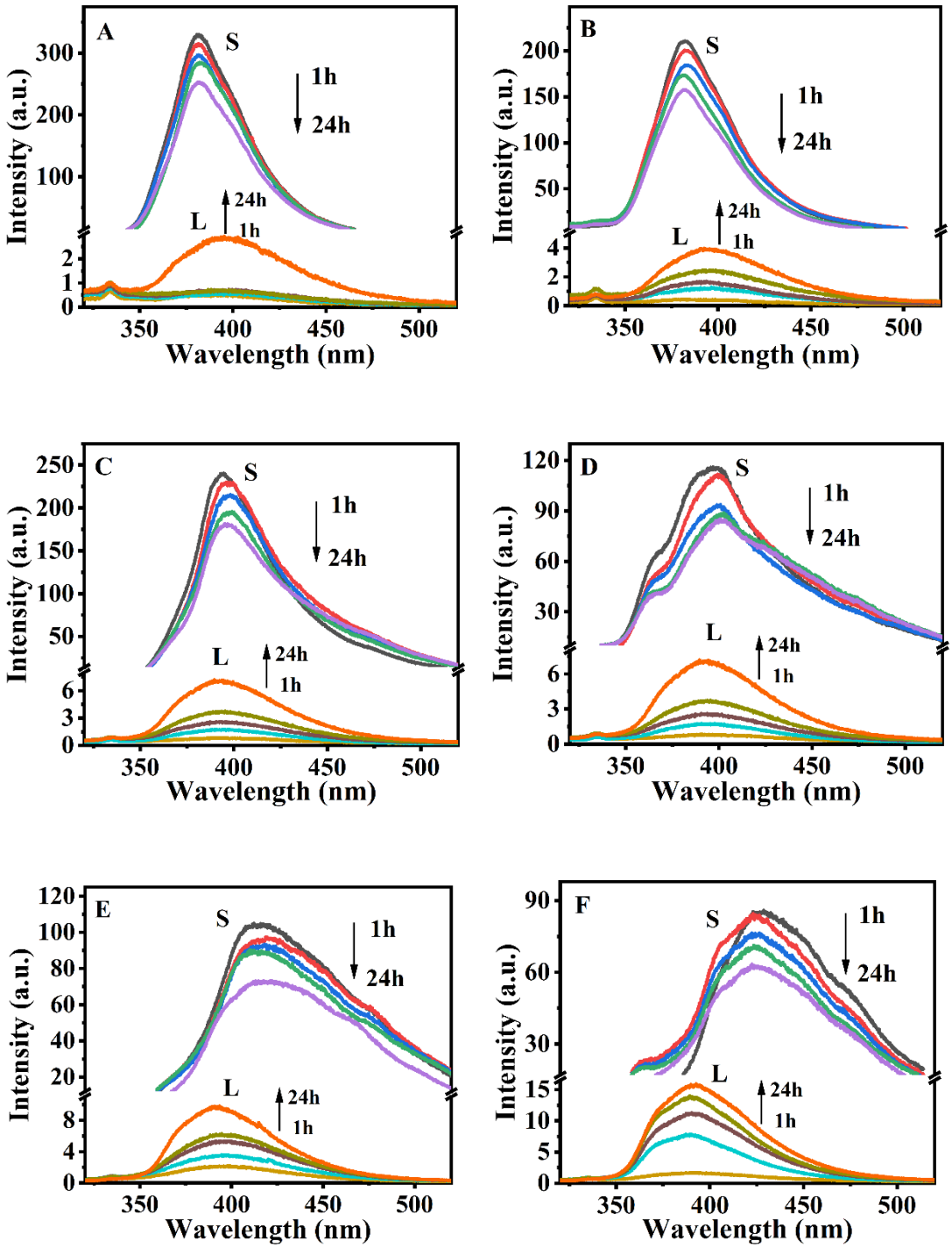



**Figure S17.** PL spectra of the drug-released (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different releasing time under pH 7.4. Notes: As described in experimental methods, the drug loaded samples were immersed in PBS system, 1.0 mL of releasing solution was withdrawn at a predetermined time. After filtered, the obtained solid was defined S, and corresponding filtrate liquid was defined L.

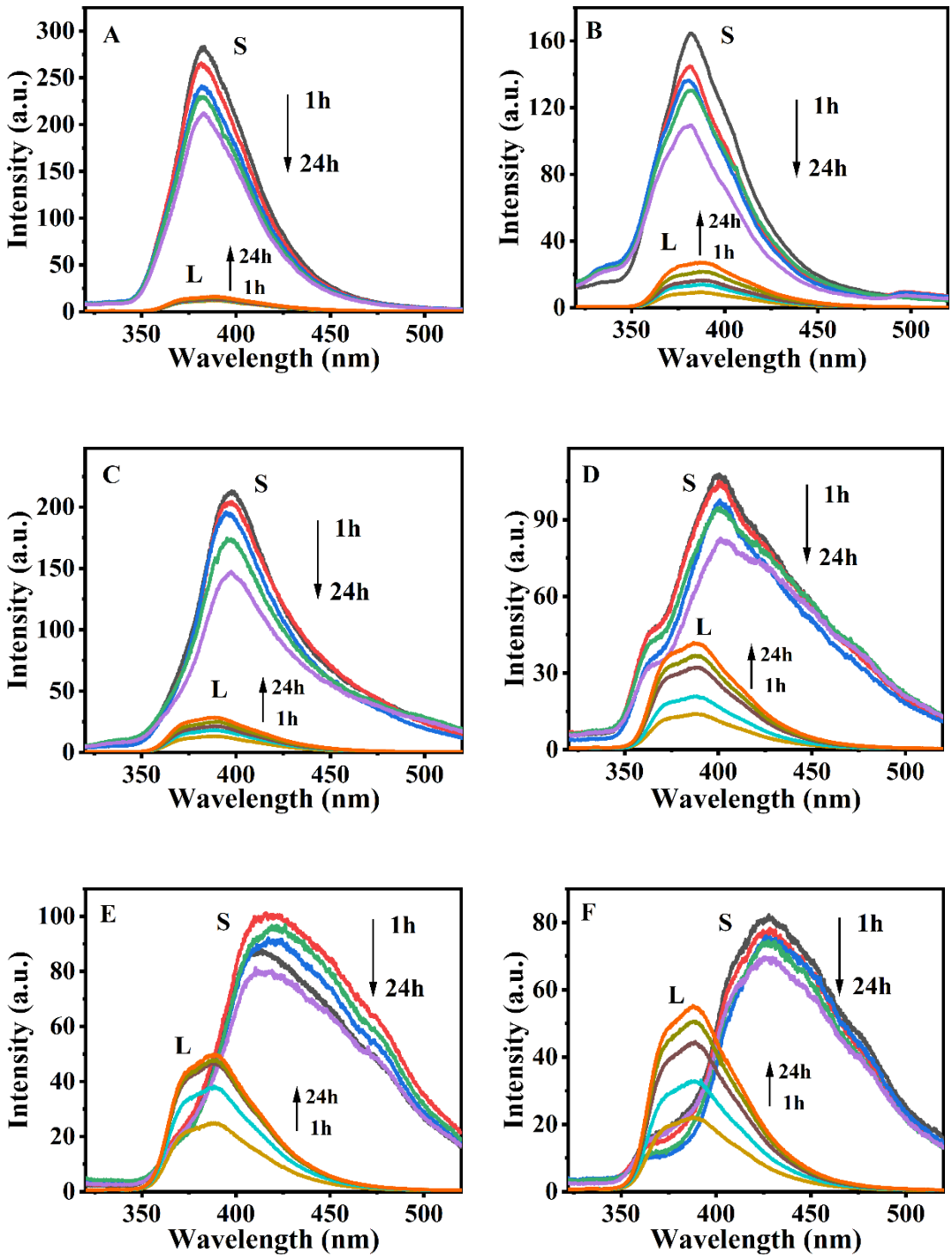



**Figure S18.** PL spectra of the drug-released (A) P(NA-AA)-0-0.1, (B) P(NA-AA)-7-0.1, (C) P(NA-AA)-0-1, (D) P(NA-AA)-7-1, (E) P(NA-AA)-0-10, and (F) P(NA-AA)-7-10 with different releasing time under pH 2.0.

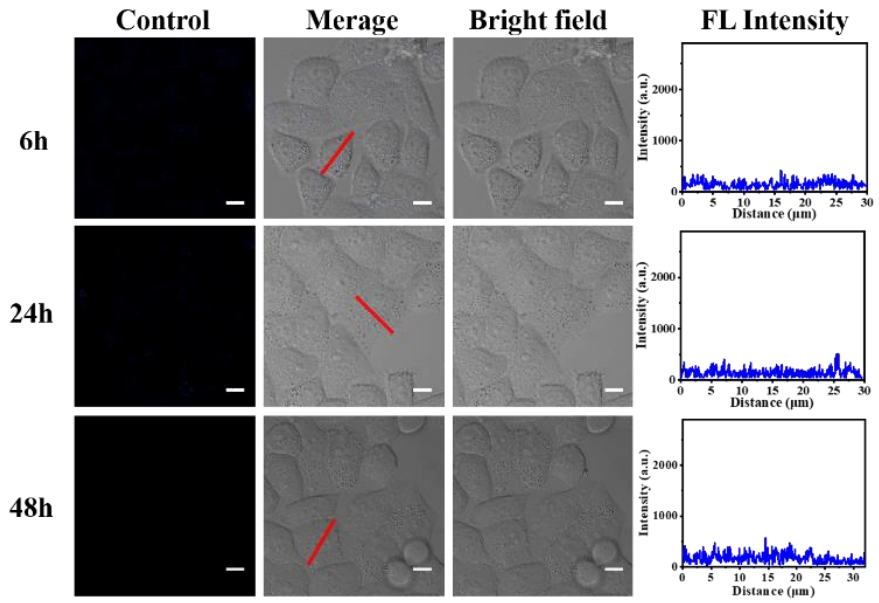



**Figure S19.** Time-dependent CLSM images of HeLa cells incubated as controlled samples. The scale bars are 10 μm.

**Table S1.** Summaries of P(NA-AA)-x-y drug-loaded capacity and cumulative release rate at pH 7.4 and pH 2.0.

| Sample | IBU-Loaded capacity (%) | cumulative release rate (%) | |
|---|---|---|---|
| | | pH 7.4 | pH 2.0 |
| P(NA-AA)-0-0.1 | 5.93 | 39.9 | 76.6 |
| P(NA-AA)-0-1 | 5.47 | 36.5 | 72.6 |
| P(NA-AA)-0-10 | 4.92 | 36.3 | 69.2 |
| P(NA-AA)-1-0.1 | 5.66 | 39.8 | 75.6 |
| P(NA-AA)-1-1 | 5.31 | 36.1 | 70.1 |
| P(NA-AA)-1-10 | 4.38 | 33.6 | 64.5 |
| P(NA-AA)-7-0.1 | 5.51 | 35.9 | 70.7 |
| P(NA-AA)-7-1 | 5.17 | 33.9 | 67.2 |
| P(NA-AA)-7-10 | 4.02 | 29.8 | 60.4 |