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Support Information

A Novel Thermosensitive Growth-promoting Collagen Fiber Composite Hemostatic Gel

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1. Preparation of COF

Separately, CF and OBSP were dissolved in 0.5 mol/L acetic acid and prepared into 5 mg/mL solutions. Stirred the solutions slowly for 24 hours at a constant temperature of 4°C, and then CFOB was obtained. Finally, F-107 and PVP were dissolved in to obtain hemostatic gel COF. The inner factors affecting hemostasis are the ratio of CF, OBSP, and F-107.

2. Purification of Bletilla striata polysaccharide (BSP)

A specific amount of Bletilla powder was accurately weighed at room temperature and dissolved in deionized water with a liquid ratio of 1:50. To thoroughly dissolve the solution, it was magnetically agitated for 1 hour. A specific amount of papain was accurately weighed and added to the Bletilla striata crude polysaccharide solution and stirred magnetically for an hour. After thoroughly dissolving the solution, 1 mol/L NaOH was added to retain the pH at 7, and the solution was enzymatically hydrolyzed at 48°C for 120 min. Anhydrous ethanol was added to the solution after the reaction at a liquid ratio of 1:9 to precipitate the BSP in a flocculent condition. After centrifugation at 8000r/min for 5min, the precipitate was collected and redissolved in water. During this period, the insoluble matter was removed by suction filtration. The collected filtrate was centrifugated again at 8000r/min for repeating 4-5 times. The final product was dried to constant weight in a constant temperature drying oven to obtain purified BSP. [1]

3. Preparation of oxidized Bletilla striata polysaccharide (OBSP)

An appropriate amount of purified BSP was taken and dissolved in deionized water with a liquid ratio of 1:50. Sodium periodate was added in a ratio of 1:1.3, wrapped with tin foil to protect it from light, and oxidized under magnetic stirring for 24 h at room temperature. After the reaction, ethylene glycol was added and reacted for 0.5 h, and the product was put into a dialysis bag, dialyzed in distilled water for three days and freeze-dried to obtain OBSP.

4. Orthogonal experiment section

Orthogonal experimental design is an important mathematical method to study multi-factor experiments, and it is also a reasonable and effective arrangement of experimental factors to minimize experimental errors and achieve the purpose of high efficiency, speed, and economy. This method uses a set of standard tables to conduct experiments with random errors due to interaction among multiple factors, multiple indicators, and multiple factors and uses ordinary statistical analysis methods to analyze the experimental results. Therefore, orthogonal experimental design has special significance in practical work.

The orthogonal design method is used to optimize the experimental design of the dosage ratio of the three factors, and the orthogonal test factor level table is obtained, as shown in Table S1. The experimental arrangement in table S2 is obtained from table S1.

Factor	**CF/mg**	**OBSP/mg**	**F-107/g**
1	20	5	2.0
2	50	10	2.5
3	100	15	3.0

Table S1 Orthogonal test factors level.

Using BCI as evaluation indicators, the screening results of the dosage ratio of each influential factor were evaluated, as shown in Table S2.

	CF/mg	OBSP/mg	F-107/g	BCI
COF-1	20	5	2.0	41.22
COF-2	20	10	2.5	35.88
COF-3	20	15	3.0	19.85
COF-4	50	5	2.5	22.90
COF-5	50	10	3.0	22.14
COF-6	50	15	2.0	26.72
COF-7	100	5	3.0	30.53
COF-8	100	10	2.0	26.72
COF-9	100	15	2.5	30.53
t_1	32.32	31.55	31.55	
t_2	26.21	28.24	29.77	
t_3	21.63	25.70	24.17	
R	10.69	5.85	7.38	

Table S2 Orthogonal experimental arrangements and results.

In Table S2, referring to Table S1, t_1 is the mean value of BCI when each influential factor is factor 1 (CF is 20 mg, OBSP is 5 mg, and F-107 is 2.0 g). t_2 is the mean value of BCI when each influential factor is factor 2 (CF is 50 mg, OBSP is 10 mg, and F-107 is 2.5 g). t_3 is the mean value of BCI when each influential factor is factor 3 (CF is 100 mg, OBSP is 15 mg, and F-107 is 3.0 g). R is the difference between the maximum and minimum values in t_1, t_2 and t_3.

Through orthogonal experimental design, it was obtained that CF had the greatest influence on the in vitro coagulation performance, followed by OBSP, and F-107 had the least influence. The detailed effects of different evaluation indicators received by CF, OBSP and F-107 are shown in Figure S1.

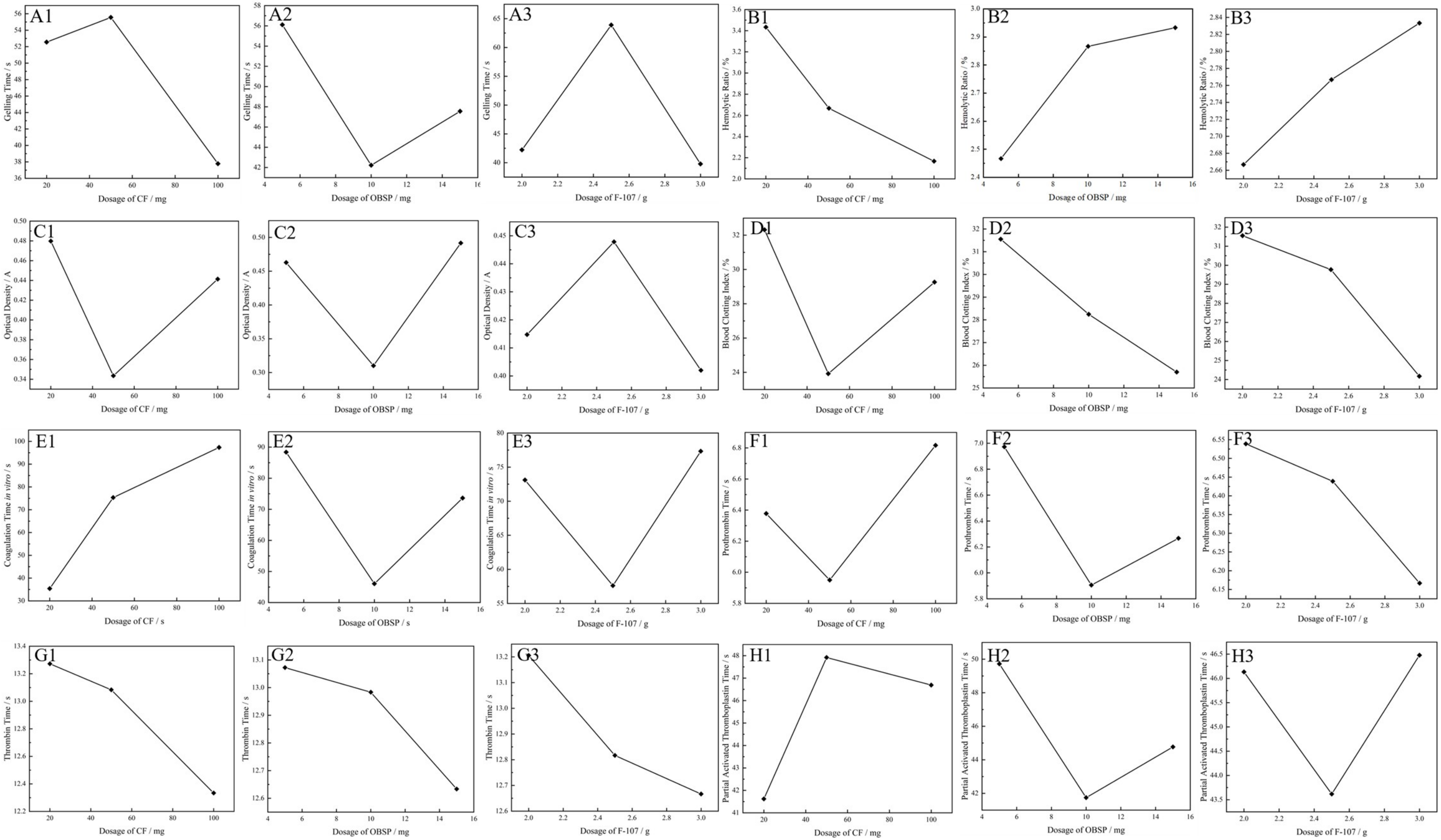

Figure S1 The effects of the dosage of CF, OBSP and F-107 on different indicators.

5. Results of microtopography analysis

The cross-sections of samples with different dosage ratios were recorded through SEM (Figure S2).

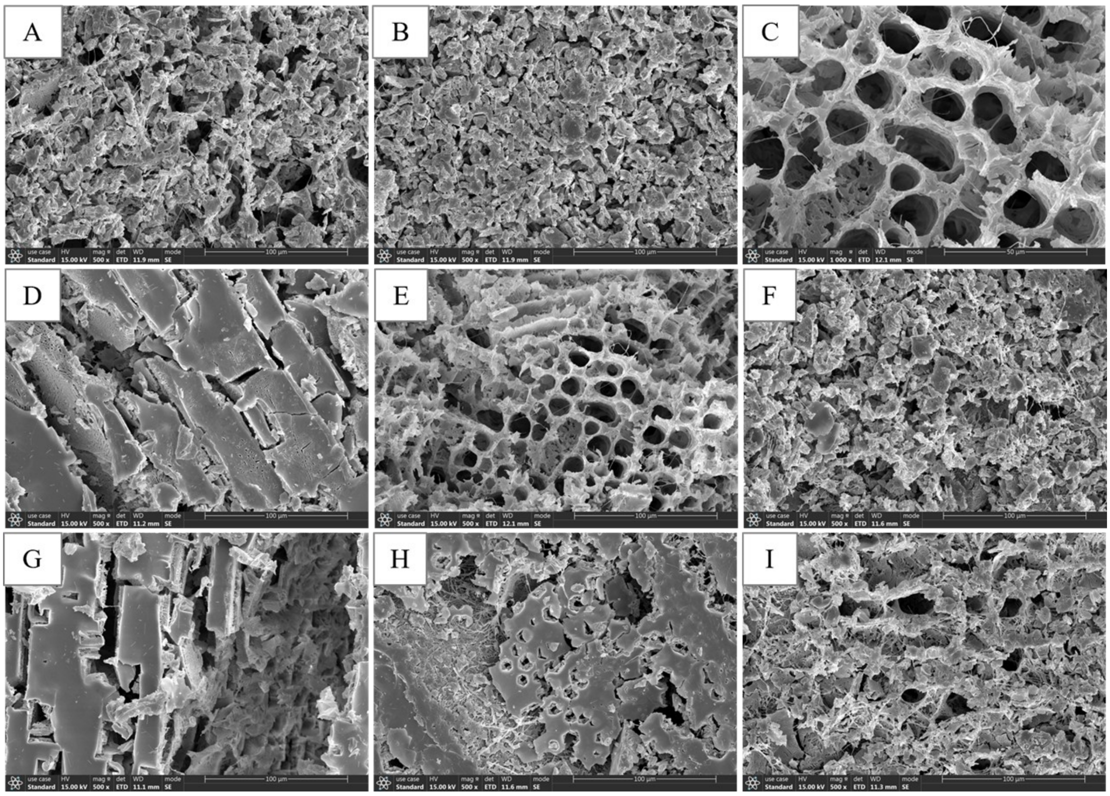

Figure S2 Cross-sectional SEM inspection images of COF with different ratios. (A) COF-1; (B) COF-2; (C) COF-3; (D) COF-4; (E) COF-5; (F) COF-6; (G) COF-7; (H) COF-8; (I) COF-9.

6. Lap shear test

Lap shear tests were performed using a Kinexus rheometer with custom clamps at an across head speed of 3 mm min^{-1}. For lap shear tests, different adhesives were sandwiched between two tissues with an adhesion area of 2 cm × 1 cm. The adhesion stress (AS) was calculated as follows:

$$AS = F_{max} / (wl)$$

where F_{max} is the maximum force, and w and l are the width and length of the adhesion area. Three specimens per condition were tested to ensure the reliability of the data. [2]

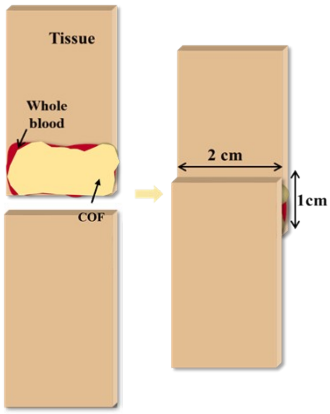

Figure S3 Schematic diagram of the lap shear test results.

Reference

1. Y. Qu, C. Li, C. Zhang, R. Zeng and C. Fu, *Carbohydrate Polymers*, 2016, **148**, 345-353.
2. X. Peng, X. Xia, X. Xu, X. Yang, B. Yang, P. Zhao, W. Yuan, P. W. Y. Chiu and L. Bian, *Science Advances*, 2021, **7**, eabe8739.