Chitosan/rectorite nanocomposite with injectable functionality for skin hemostasis

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Quaternized Carboxymethyl Chitosan/Organic Rectorite Nanocomposites (QCORs) Formation

Quaternized carboxymethyl chitosan (QCMC) was prepared by using chloroacetic acid and 2,3-epoxypropyltrimethyl ammoniumchloride as modification agent according to previous work [19].

OREC was prepared according to previous work [13]. Rectorite was reacted with Gemini 18-3-18 under microwave heating at 800W and 80 ºC for 1h. Then the solid sediments were washed with 50% isopropanol until there was no Cl^- and OREC was obtained after lyophilization.

DS_{CM} was determined using potentiometric titration. 0.2 g of sample was dissolved in 40 mL of 0.1M hydrochloric acid and then titrated with 0.1M NaOH standard solution. The alkalinetric curve was recorded on a 888 Titrino Plus (Metrohm, Switzerland). DS_{CM} was calculated as follows:

$$DS_{CM} = \frac{0.203 \times A}{1 - 0.080A} \times 100\%$$

$$A = \frac{V_{NaOH} \times C_{NaOH}}{W}$$

Where 0.203 is the (milli–molar) molecular weights of acetylglucosamine residues (chitosan skeleton unit); 0.080 stands for the weight of sodium carboxymethyl per milligram–equivalent; V_{NaOH} (mL) and C_{NaOH} (mol/L) represent the volume and molarity of NaOH standard solution, respectively; W (g) is the weight of sample.

DS_Q was estimated from the deposit–titration method, which is used to determine the concentration of chloride ion on QCMC by $AgNO_3$ standard solution with K_2CrO_4 as

indicator. DS_Q could be calculated as follows:

$$DS_Q = \frac{\dfrac{C_{AgNO_3} \times V_{AgNO_3}}{1000}}{\dfrac{C_{AgNO_3} \times V_{AgNO_3}}{1000} + \dfrac{W - C_{AgNO_3} \times V_{AgNO_3} \times \mathrm{M}_2 / 1000}{\mathrm{M}_1}} \times 100\%$$

Where C_{AgNO3} (mol/L) and V_{AgNO3} (mL) represent the molarity and volume of $AgNO_3$ standard solution, respectively; W (g) is the weight of sample; M_1 (g/mol) is the molar mass of glucosamine and M_2 (g/mol) is the molar mass of QCMC.

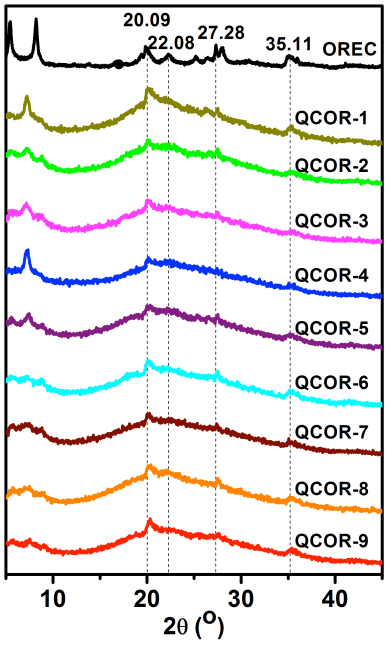

Figure S1 X-ray diffraction patterns of OREC and QCORs.

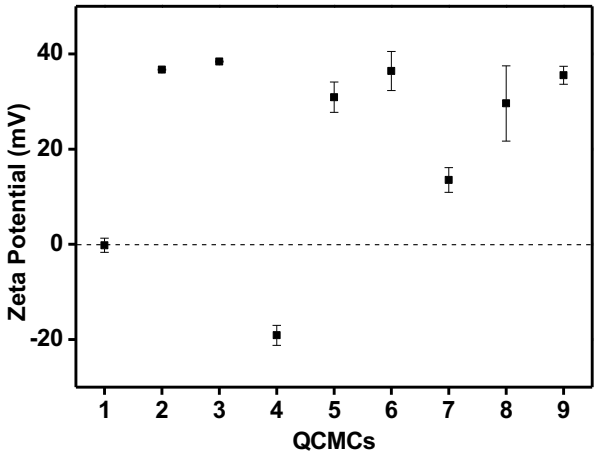

Figure S2 Zeta potential of QCMCs.

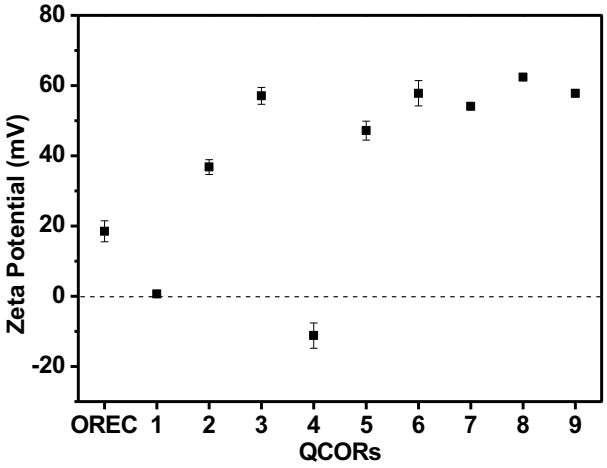

Figure S3 Zeta potential of QCORs.

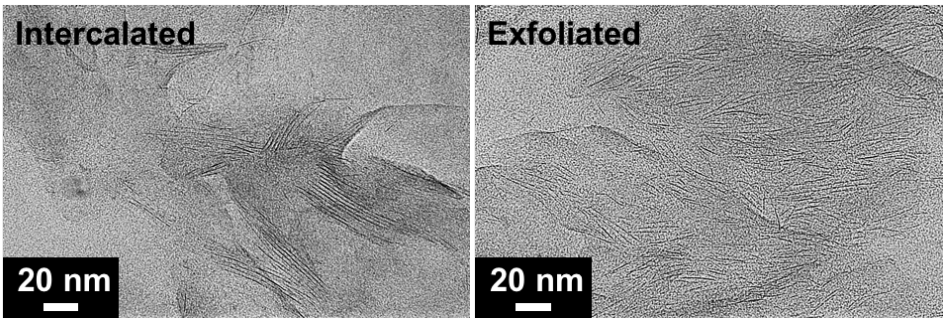

Figure S4 TEM image of intercalated and exfoliated nanocomposites, the distribution of rectorite exhibited more homogenous in the chitosan matrix in the exfoliated nanocomposite (the black lines were the rectorite particles, and the gray matrix was chitosan matrix).

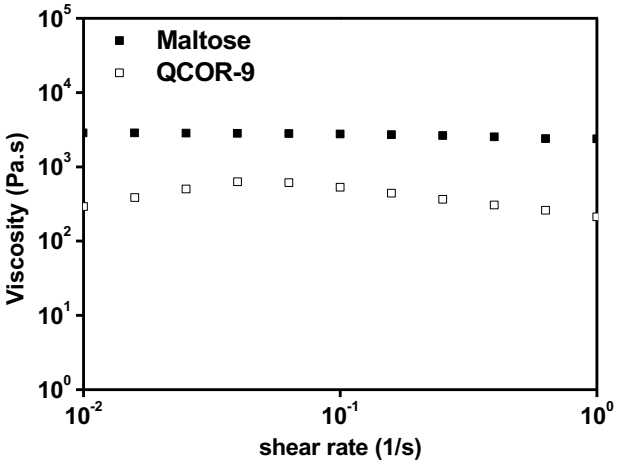

Figure S5 Viscosity curves of maltose and QCOR-9 at 37 ºC.

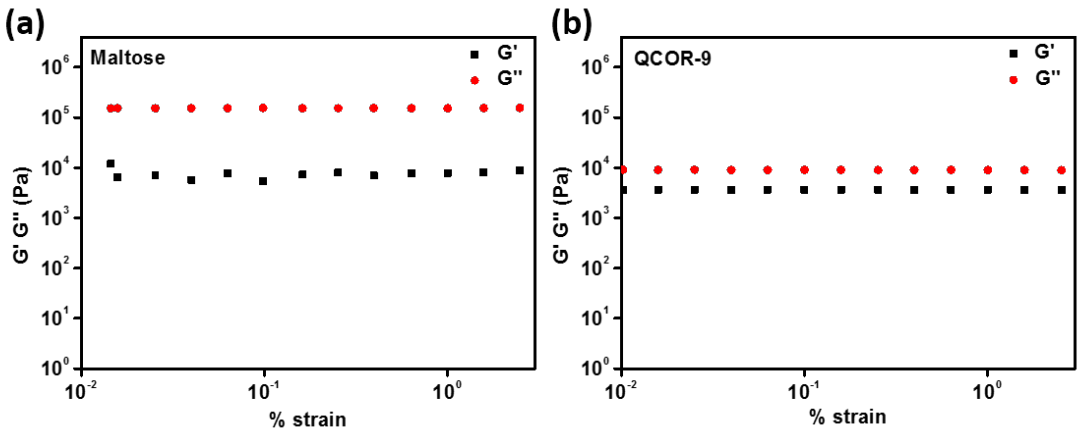

Figure S6 Storage modulus (G') and loss modulus (G'') of maltose (a) and QCOR-9 (b) at room temperature.

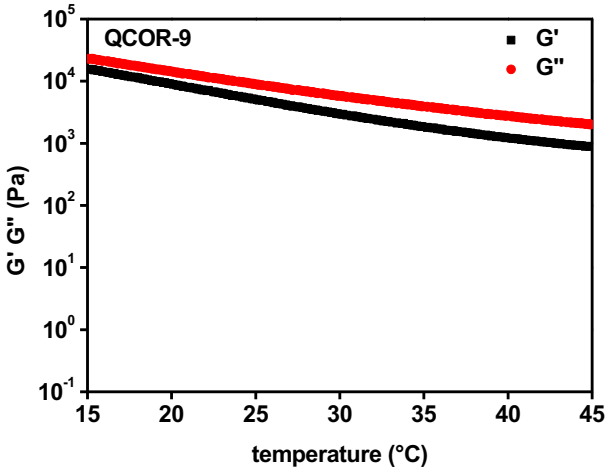

Figure S7 Storage modulus (G') and loss modulus (G'') of QCOR-9 were monitored from 15 to 45 °C. All temperature sweeps were performed at 1% strain and a frequency of 1 Hz.