

## Supporting Information to manuscript

# Facile preparation of clay reinforced konjac glucomannan aerogels

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## Experimental Section

### Materials

Konjac glucomannan (KGM) was purchased from Hubei Konson Konjac Gum Co., Ltd. Sodium Montmorillonite (Na<sup>+</sup>-MMT; PGW grade, cation exchange capacity (CEC) 145 meq/100 g) was purchased from Nanocor Inc. Sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) was purchased from Sinopharm Chemical Reagent Company. They were all used without further purification. Deionized water was obtained with a Mini-Q system (Millipore).

### Aerogel Preparation

Na<sup>+</sup>-MMT was mixed with DI water and stirred at 30 °C for 5 min to obtain a clay aqueous suspension. Sodium carbonate was then added to the clay aqueous suspension under constant stirring. KGM was added slowly into the mixture and stirring was maintained for 1 min. The mixture was poured into cylindrical vials with

a diameter of 21 mm, covered with preservative film and allowed to stand for 4 h at room temperature. The vials with mixture were placed into a thermostat water bath kept at 90 °C for 1 h. Polymer/clay suspensions were then frozen by immersing the vials into low-temperature thermostat bath for 8 h after being cooled to room temperature. The samples were then freeze-dried using a LGJ-10 lyophilizer (Songyuanhuaxing Technology Develop Co., Ltd, Beijing). The samples were placed in ambient environment (25 °C, humidity: 50%) for 1 d before testing. To simplify the expressions, KxMy is used in Figures and Tables where K stands for konjac glucomannan, M stands for sodium montmorillonite, and the number (x and y) after letters represents weight percentage of each component in the initial solution. The ratios of alkali to KGM are all 0.12:1 unless otherwise specified.

### **Characterization**

The density of the aerogels was calculated from the weight and dimension measurements using an analytical balance and digital calipers.

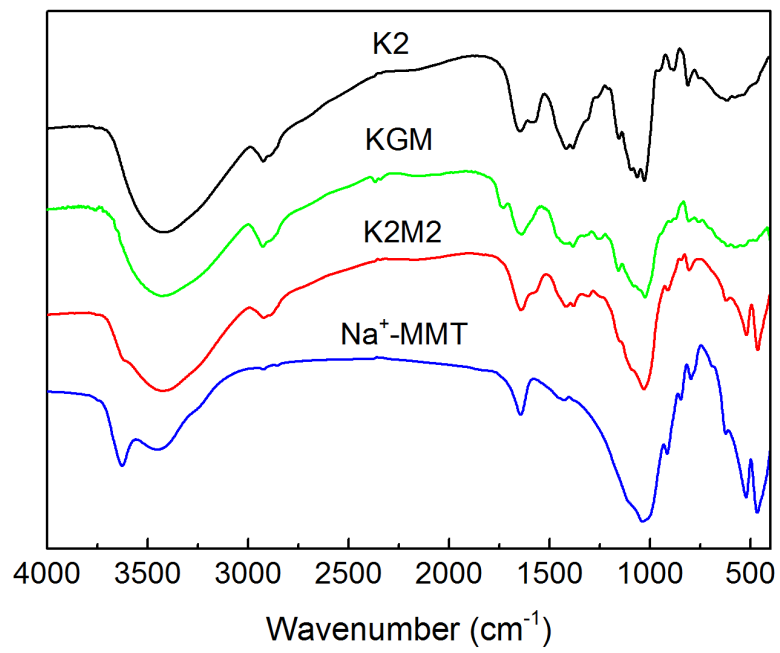
Compression testing was conducted on the cylindrical specimens (~21 mm in diameter and 20 mm in height), using an Texture Analyzer TA.XT plus (Stable Micro Systems, Surrey, England), at a crosshead of 10 mm/min. Five replicates were performed for each sample. The initial compressive modulus was calculated from the slope of the linear portion of the stress-strain curve.

Fourier transform infrared (FT-IR) spectra were recorded at room temperature using a Nicolet (USA) Nexus 470 FTIR spectrometer at a resolution of 4 cm<sup>-1</sup> in the range 400-4000 cm<sup>-1</sup>.

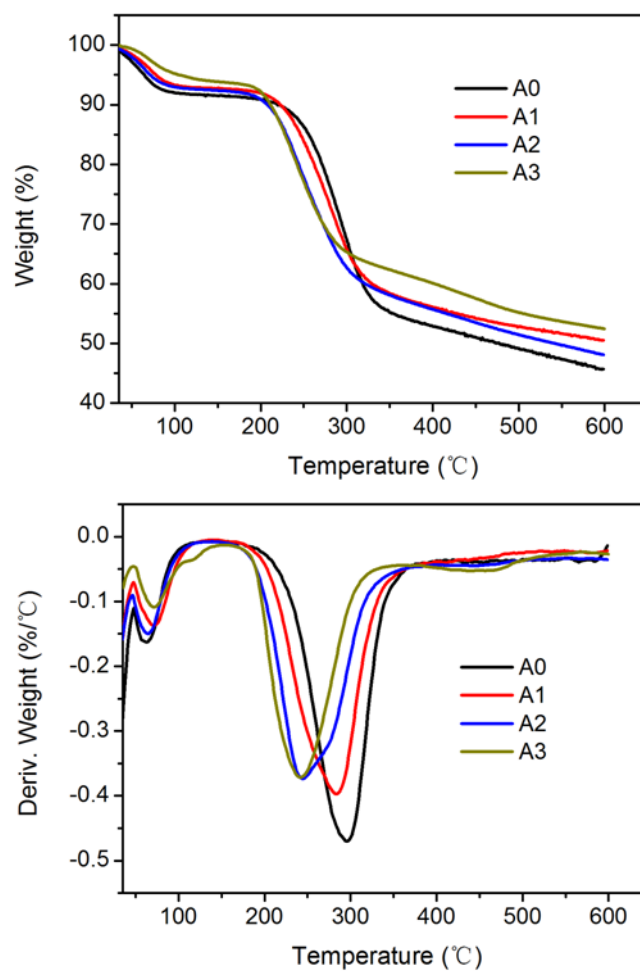
The microstructure of samples was observed by means of a scanning electron microscope (SEM, JSM-6390/LV, Japan). The samples were prepared by fracturing in liquid nitrogen, mounted on a metal stub, and coated with gold before testing.

XRD patterns of pure Na<sup>+</sup>-MMT powder and aerogels pressed into thin slices were recorded by D/Max-III A X-ray diffractometry (Rigaku, Japan) using Cu-K $\alpha$  radiation in the  $2\theta$  range 5-85°.

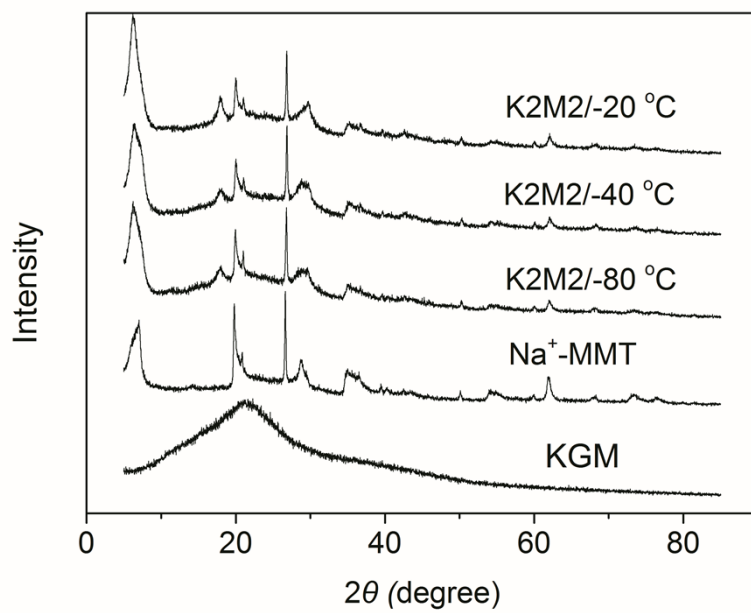
Thermogravimetric analyses (TGA) were conducted on a Netzsch TG 209 analyzer (Selb, Germany). The samples ( $10.0 \pm 0.2$  mg) were placed in an aluminum pan and heated under a flowing nitrogen atmosphere from 30 to 600 °C at a rate of 10 °C/min.



**Fig. S1 FT-IR spectra of raw KGM, Na<sup>+</sup>-MMT and aerogels**

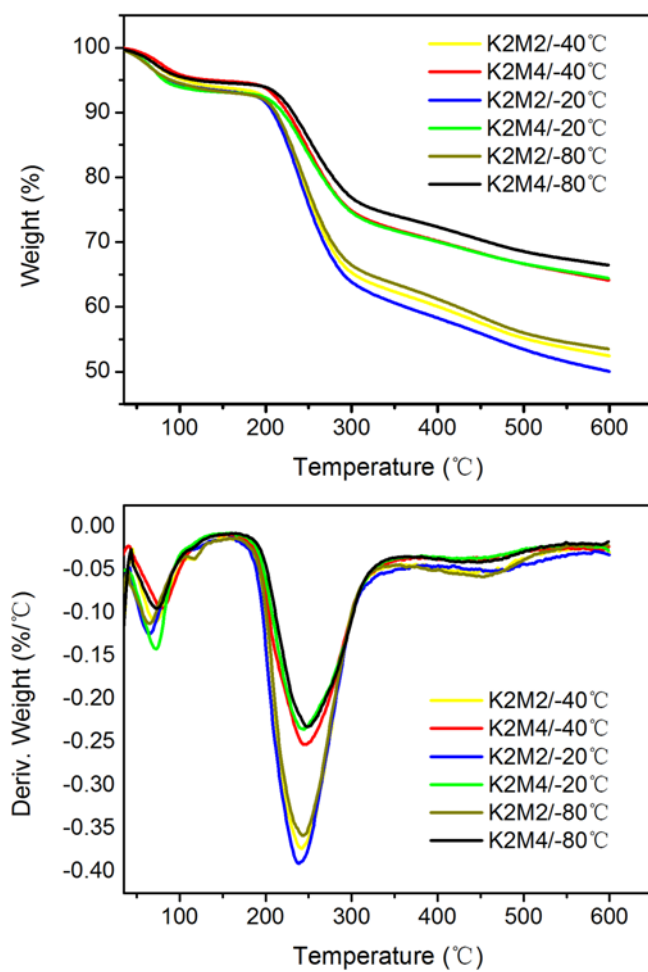


**Fig. S2 Thermogravimetric analysis (TGA) and differential thermal gravimetry (DTG) curves of aerogels with different alkali amount,  $\text{Na}_2\text{CO}_3 : \text{KGM} = 0:1$  (A0), 0.03:1 (A2), 0.06:1 (A2), 0.12:1 (A3)**



**Fig. S3 XRD profiles of raw KGM, Na<sup>+</sup>-MMT and aerogels prepared under different freezing temperature**

**Fig. S4 Schematic of deacetylation of konjac glucomannan and the interaction of deacetylated konjac glucomannan with montmorillonite.**



**Fig. S5 Thermogravimetric analysis (TGA) and differential thermal gravimetry (DTG) curves of aerogels frozen at different temperature**