Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Resilient and Lightweight Bacterial Cellulose Derived C/rGO Aerogel Based Electromagnetic Wave Absorber Integrated with Multiple Functions

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Calculation of density and porosity

The density was calculated using the following equation:

$$\rho = \frac{m}{V}$$

Where m and V are the mass and bulk volume of BC/GO or C/rGO aerogel, respectively.

In addition, the porosity of samples was calculated using the following equation:

$$Porosity(\%) = 1 - \frac{\rho}{\rho_s}$$

Where ρ is the density of BC/GO or C/rGO, ρ_s is the skeleton density of bacterial cellulose (1.59 g/cm^3) or carbon (2.2 g/cm^3)

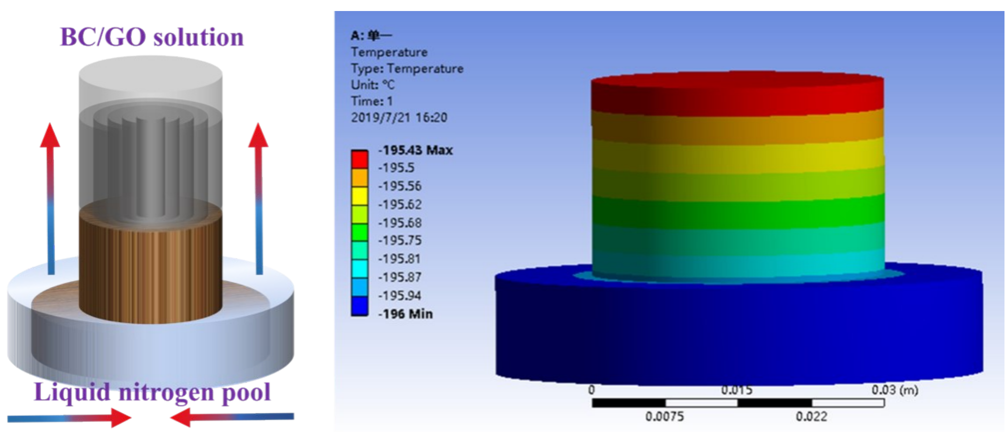

Fig. S1 (a) Schematic illustration and (b) thermal conduction simulation of the home-made unidirectional freeze-casting equipment.

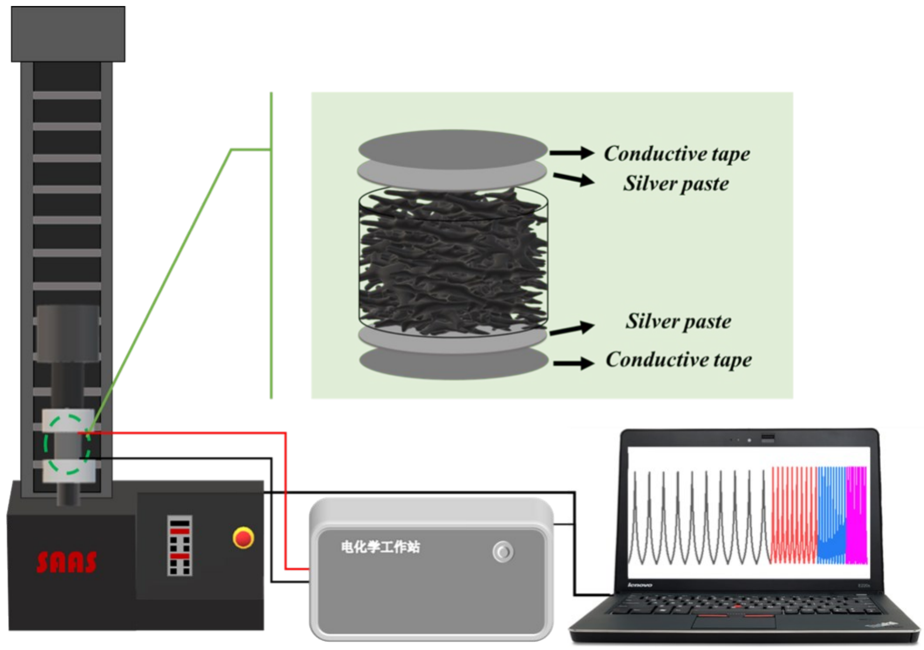

Fig. S2 Schematic illustration of the piezoresistive testing system.

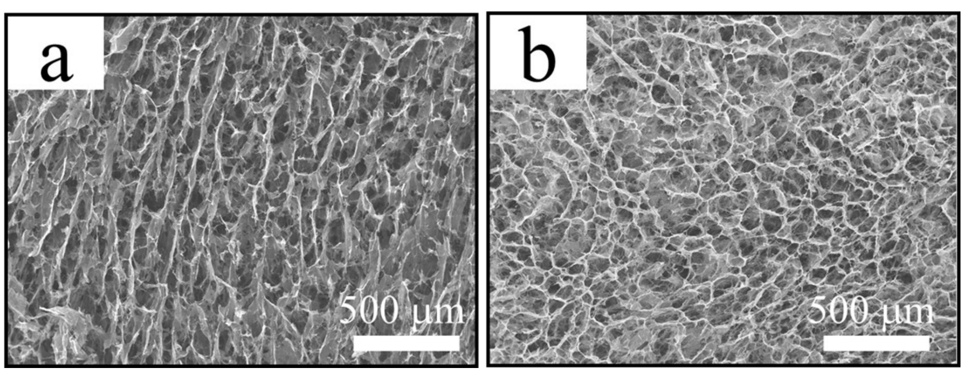

Fig. S3 SEM images showing the cellular structure of BC/GO-10 aerogel in (a) longitudinal plane and (b) transverse plane.

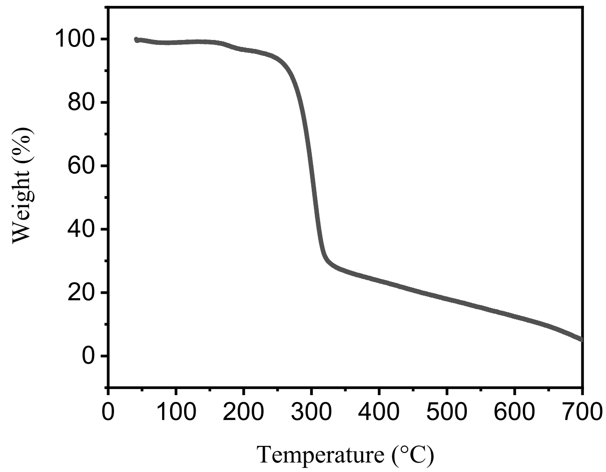

Fig. S4 TGA curve of BC/GO-10 under nitrogen atmosphere.

Fig. S4 shows the thermogravimetric analysis (TGA) curves of the BC/GO-10 aerogel. The weight of the cellulose composite aerogel decreased slightly (2.7%) in the temperature range of 40 to 100 ℃, which contributed to the loss of moisture. Then, the weight of the cellulose composite aerogel decreased sharply from 250 to 370 ℃, indicating the transformation of organic components to carbon with the cleaving of the alkyl and methoxy groups of cellulose. After that, the downtrend goes slowly with the increasing temperature between 600 to 700 ℃ indicating the stability of the carbon aerogel in this range.

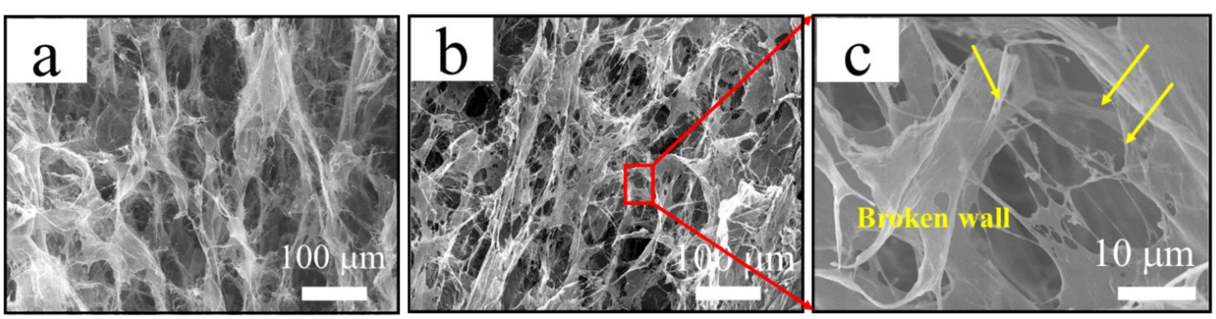

Fig. S5 SEM images showing the cellulat structure of pure BC aerogel in the (a) longitudinal plane and (b) transverse plane.

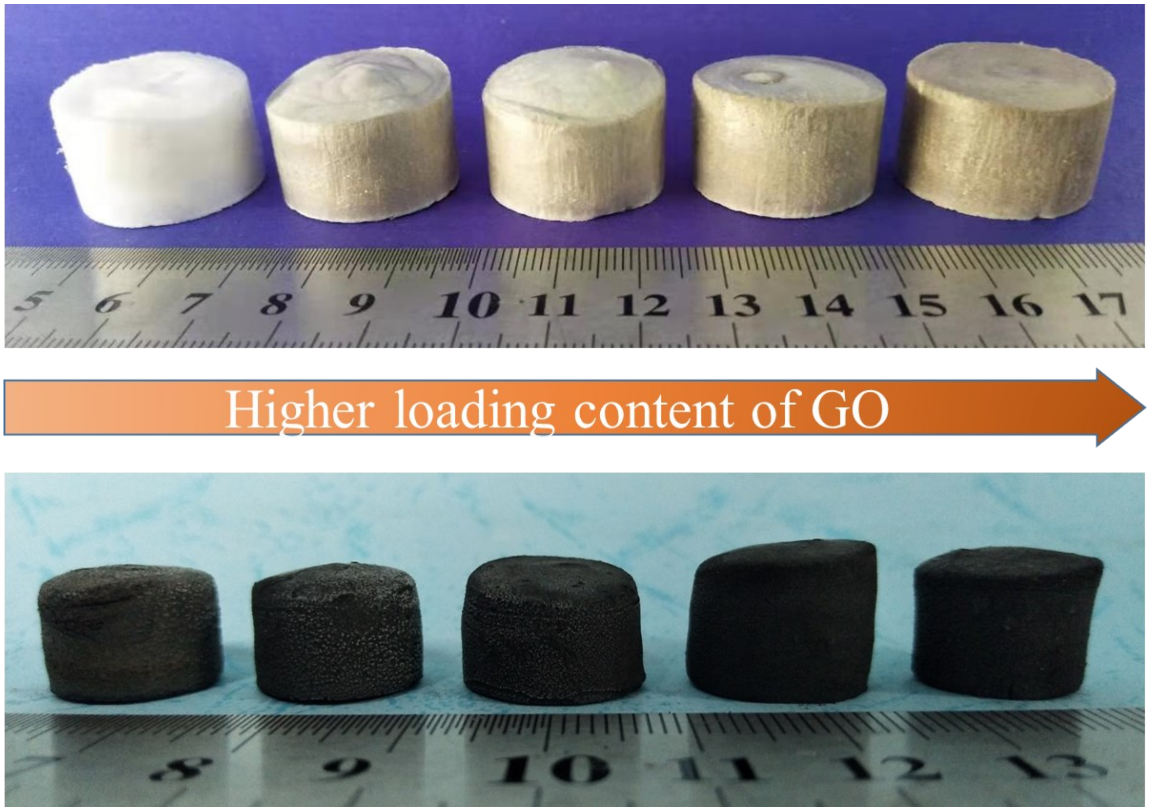

Fig. S6 Digital images of (a) BC/GO and (b) C/rGO aerogels with different GO loading (0%, 5%, 10%, 15%, 20%).

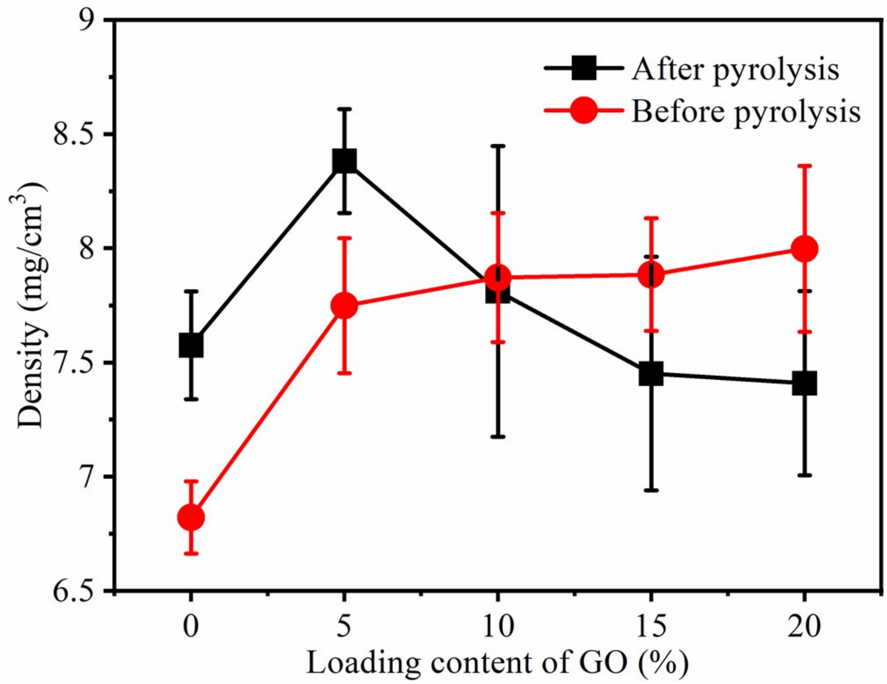

Fig. S7 Density of BC/GO aerogels with different GO loadings before and after the pyrolysis process.

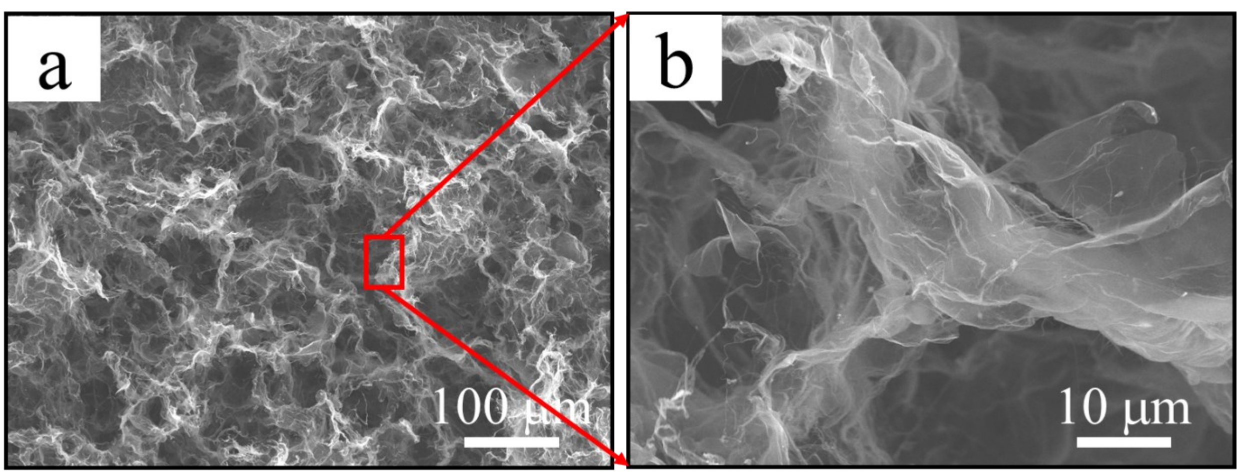

Fig. S8 SEM images showing the cellular structure of the transverse plane of C/rGO-20.

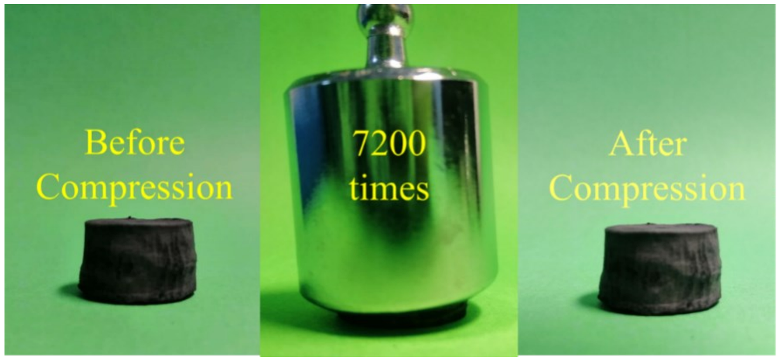

Fig. S9 Digital photos showing the state of the prepared C/rGO-10 aerogel upon a heavy weight.

Fig. S10 Digital photos showing the state of the pure BC during one 50% compression strain cycle.

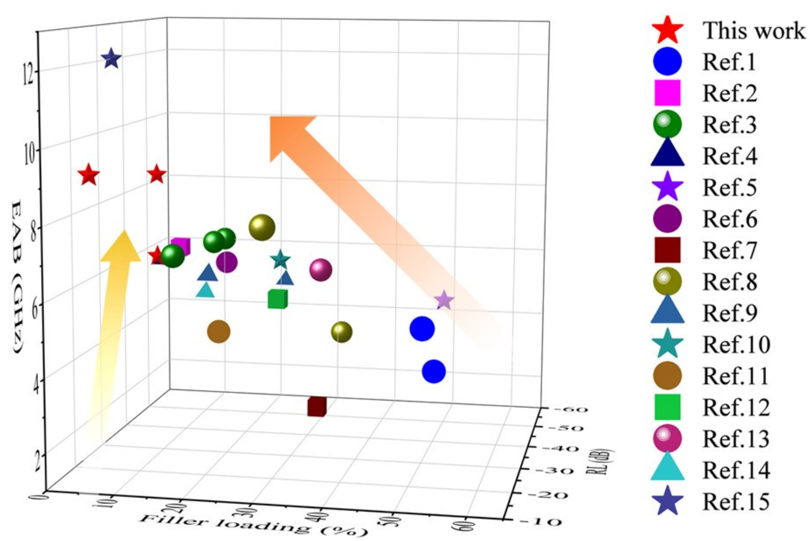

Fig. S11 RL_{min}, $EAB_{\max}$ versus filler loading for typical microwave absorbing materials.

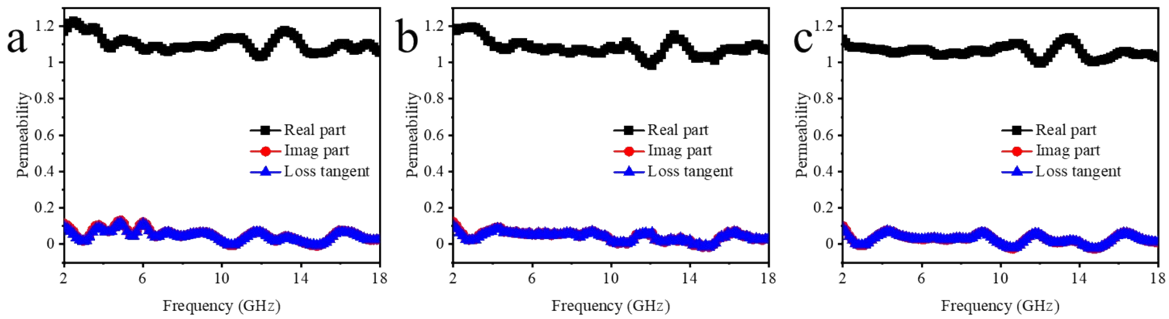

Fig. S12 The permeability for (a) pure C, (b) C/rGO-10 and (c) C/rGO-20.

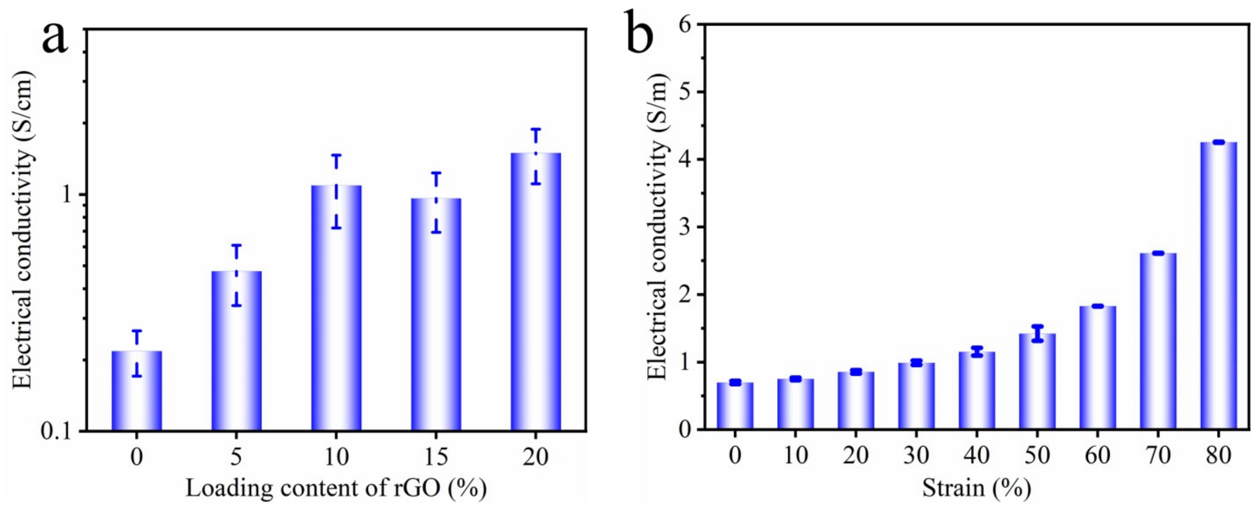

Fig. S13 Electrical conductivity of (a) C/rGO aerogels with different rGO loading and (b) C/rGO-10 aerogel under different compression strain.

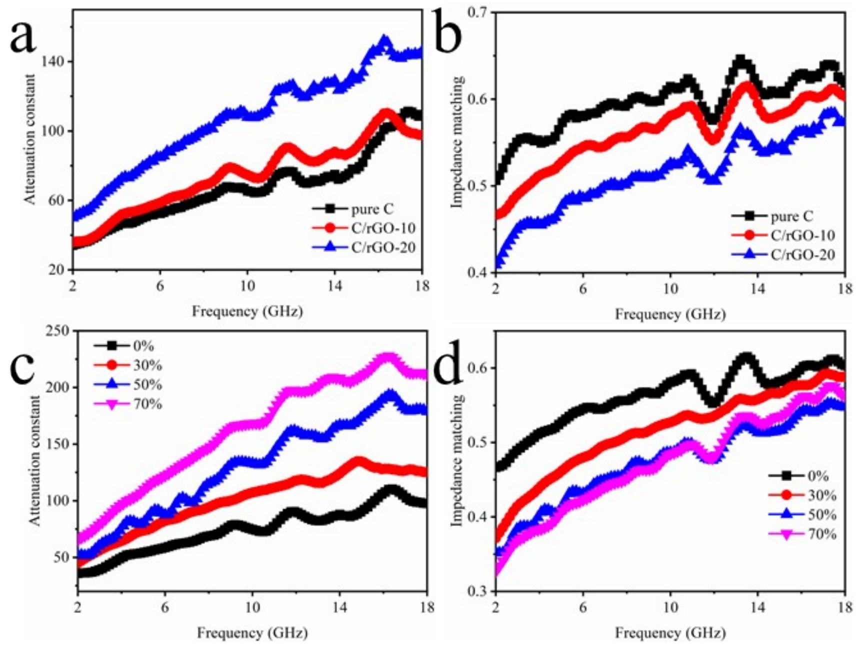

Fig. S14 (a, c) Attenuation constant and (b, d) impedance matching for pure C, C/rGO-10, C/rGO-20 aerogels and the C/rGO-10 aerogel under compression of 0%, 30%, 50% and 70%.

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