Supplementary Materials

A macromolecular assembly directed ceramic aerogel monolith material

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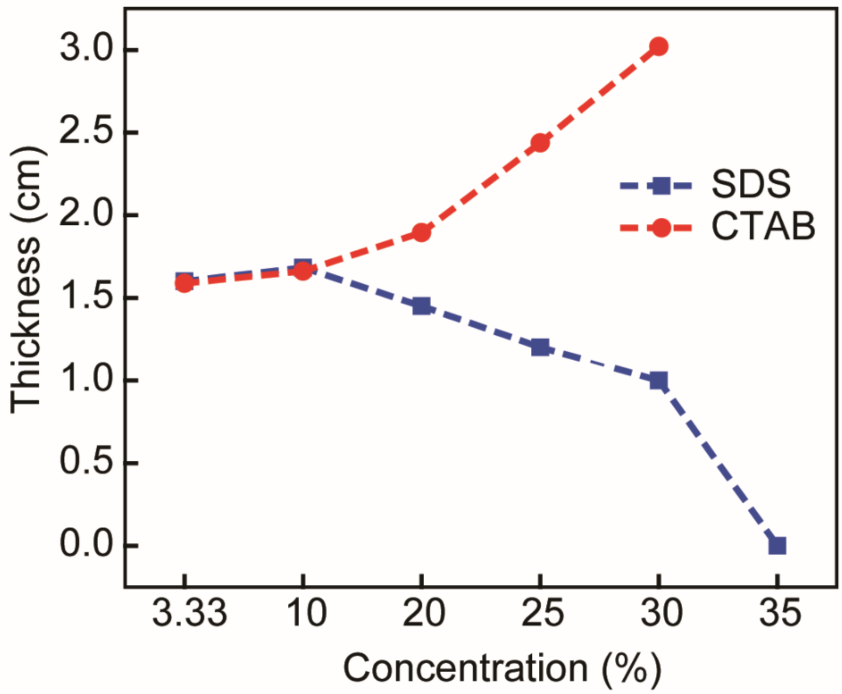

Figure S1. Thickness change of the opaque part with increase of concentration change of surfactant SDS and CTAB.

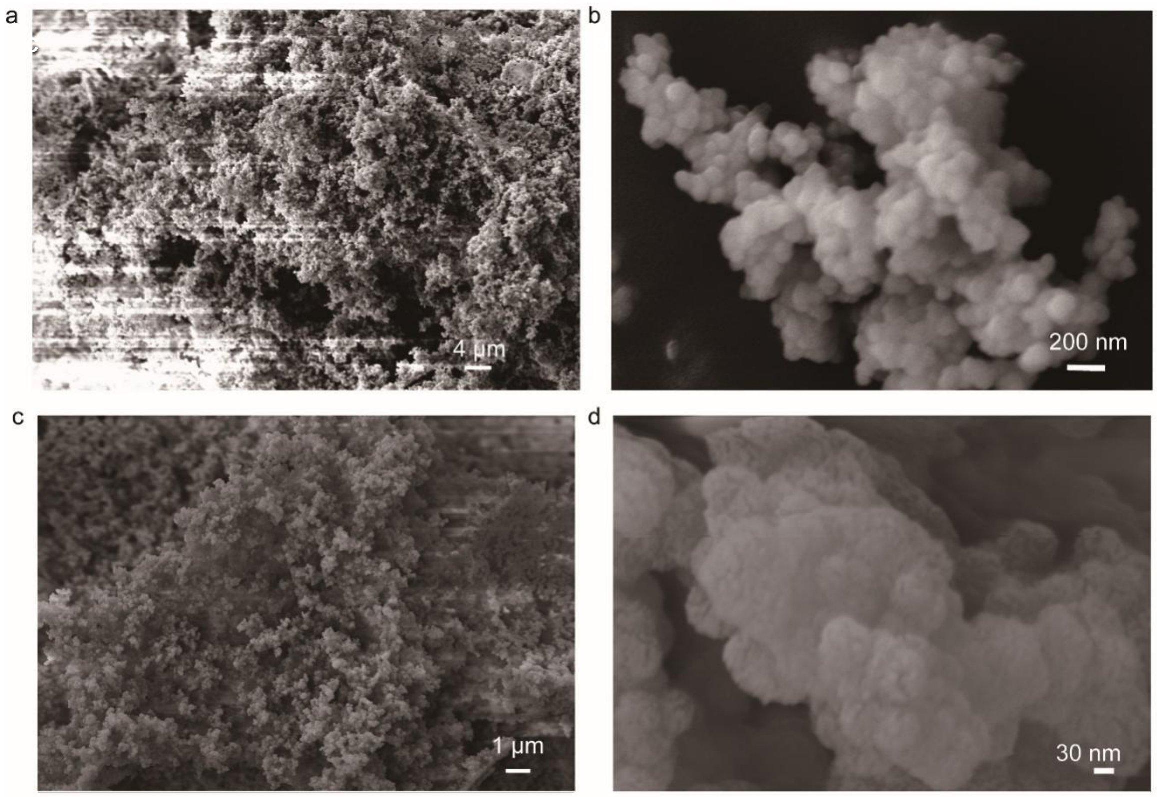

Figure S2. (a-b) SEM images of opaque aerogel synthesized with 10 wt.% CTAB; (c-d) SEM images of opaque aerogel synthesized with 20 wt.% CTAB. Scale bars are labelled in images.

Table S1. Pycnometer information about opaque part of aerogel changing with concentration of CTAB.

Sample (wt.%)	Pycnometer (cm^3)	Porosity (%)	Density (g/cm^3)	Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
CTAB 10	0.1734	74.110 %	0.4947	0.045789
CTAB 20	0.09	86.630 %	0.2258	0.049144
CTAB 30	0.0901	86.615 %	0.2332	0.047519

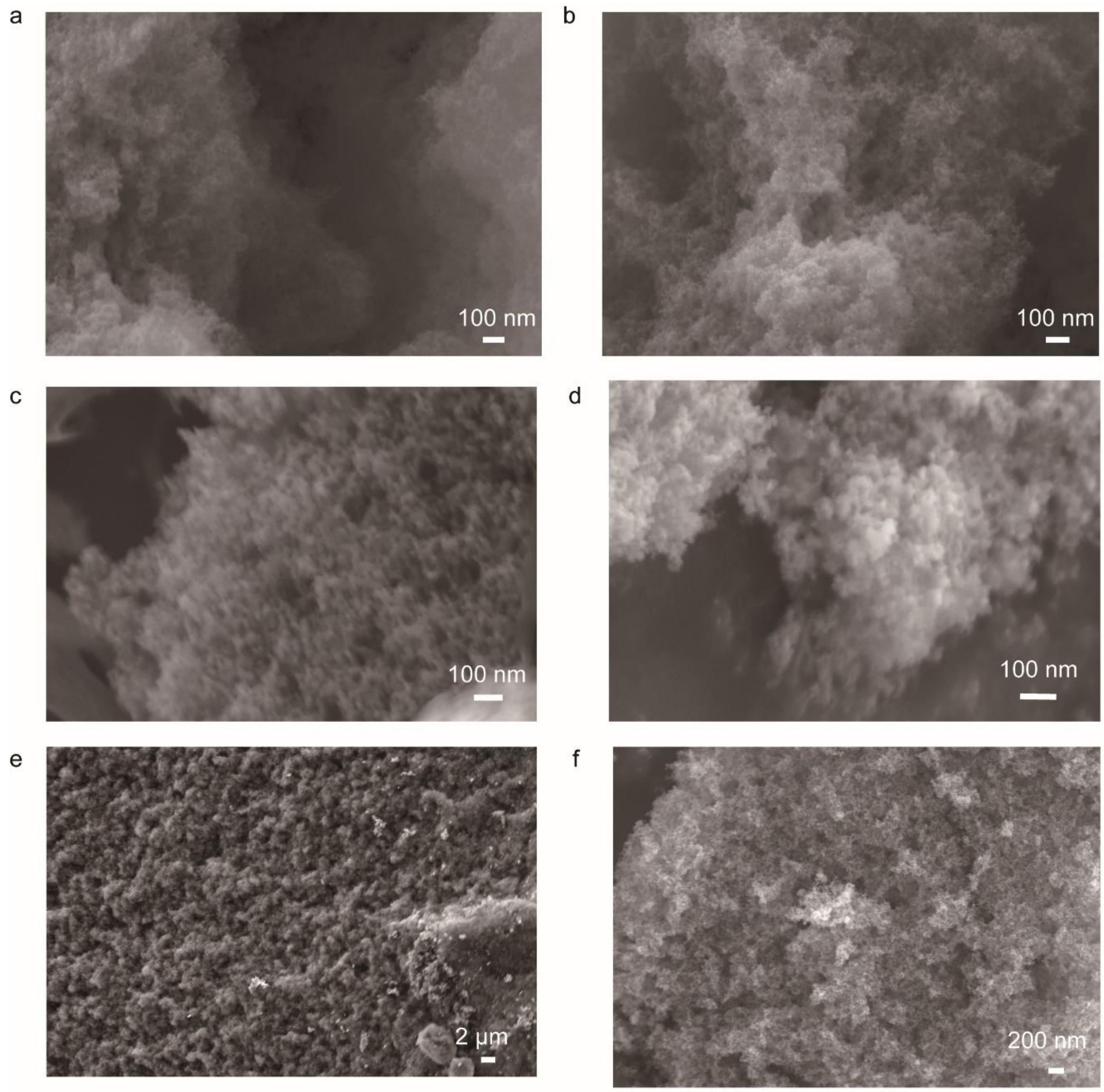

Figure S3. (a-b) SEM images of transparent aerogel synthesized with 3.33 wt.% SDS; (c-d) SEM images of transparent aerogel synthesized with 20 wt.% SDS; (e-f) SEM images of transparent aerogel synthesized with 35 wt.% SDS. Scale bars are labelled in images.

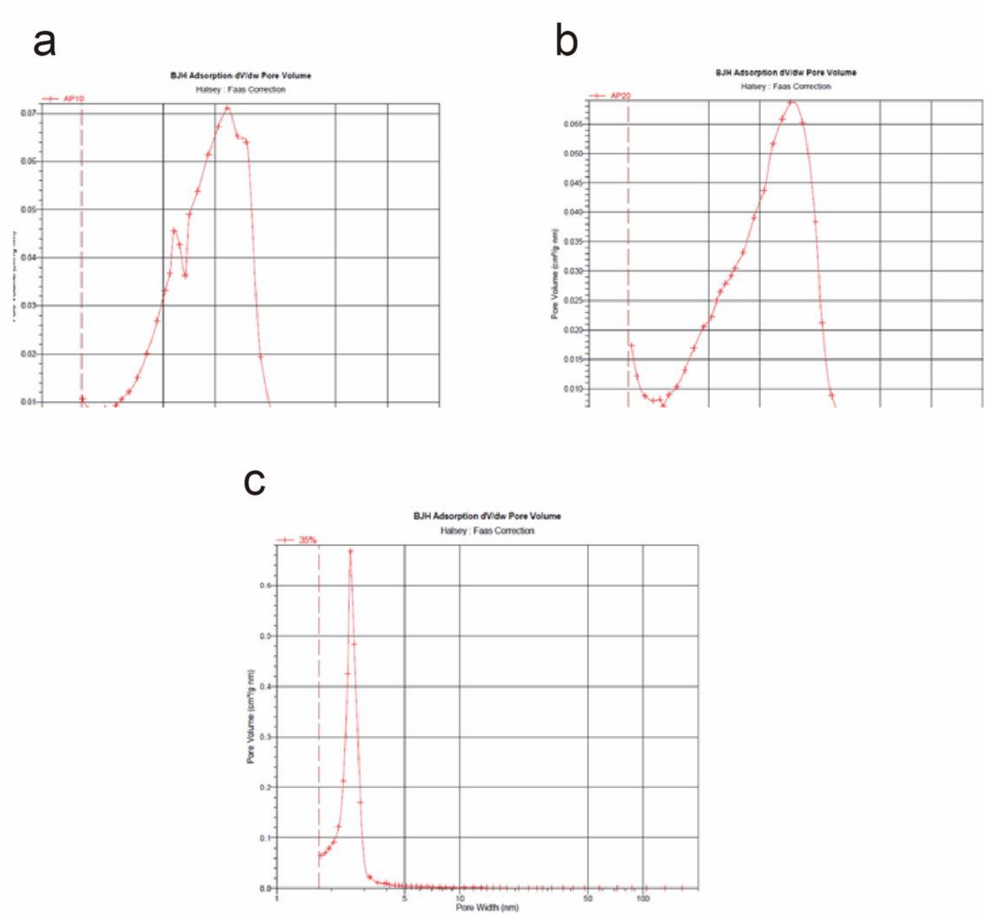

Figure S4. a, b and c Show pore width distribution of the gel part that prepared with 10 wt.%, 20 wt.% and 35 wt.% SDS and dries under ambient pressure respectively.

Table S2. Pycnometer information about gel part of aerogel changing with concentration of SDS.

SDS Concentration (wt.%)	Pycnometer (cm^3)	Porosity (%)	Density (g/cm^3)	Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
3.33	0.0236	96.494	0.0951	0.04416
10	0.0562	92.513	0.1337	0.04156
20	0.0561	90.567	0.1604	0.03549
25	0.0995	88.948	0.1827	0.0394
30	0.0679	90.553	0.1976	0.03256
35	0.1057	94.742	0.1310	0.03225

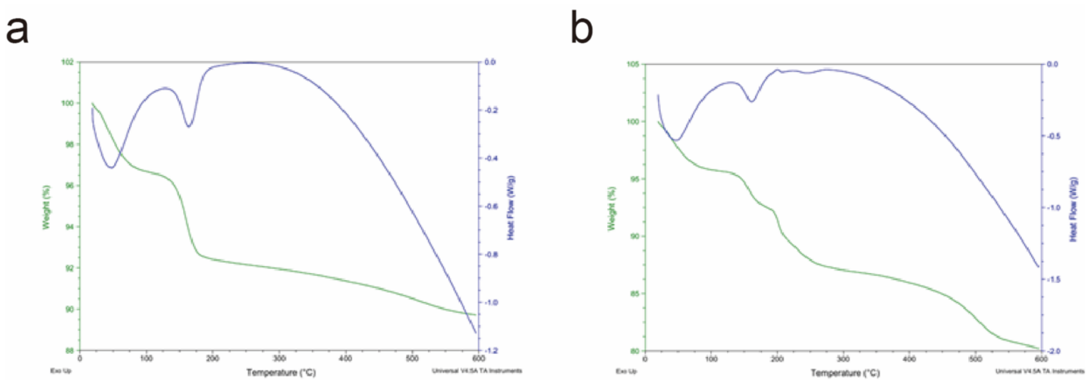

Figure S5. (a) TGA image of gel part that generated with 3.33 wt.% SDS. (b) TGA image of gel part that generated with 35 wt.% SDS.

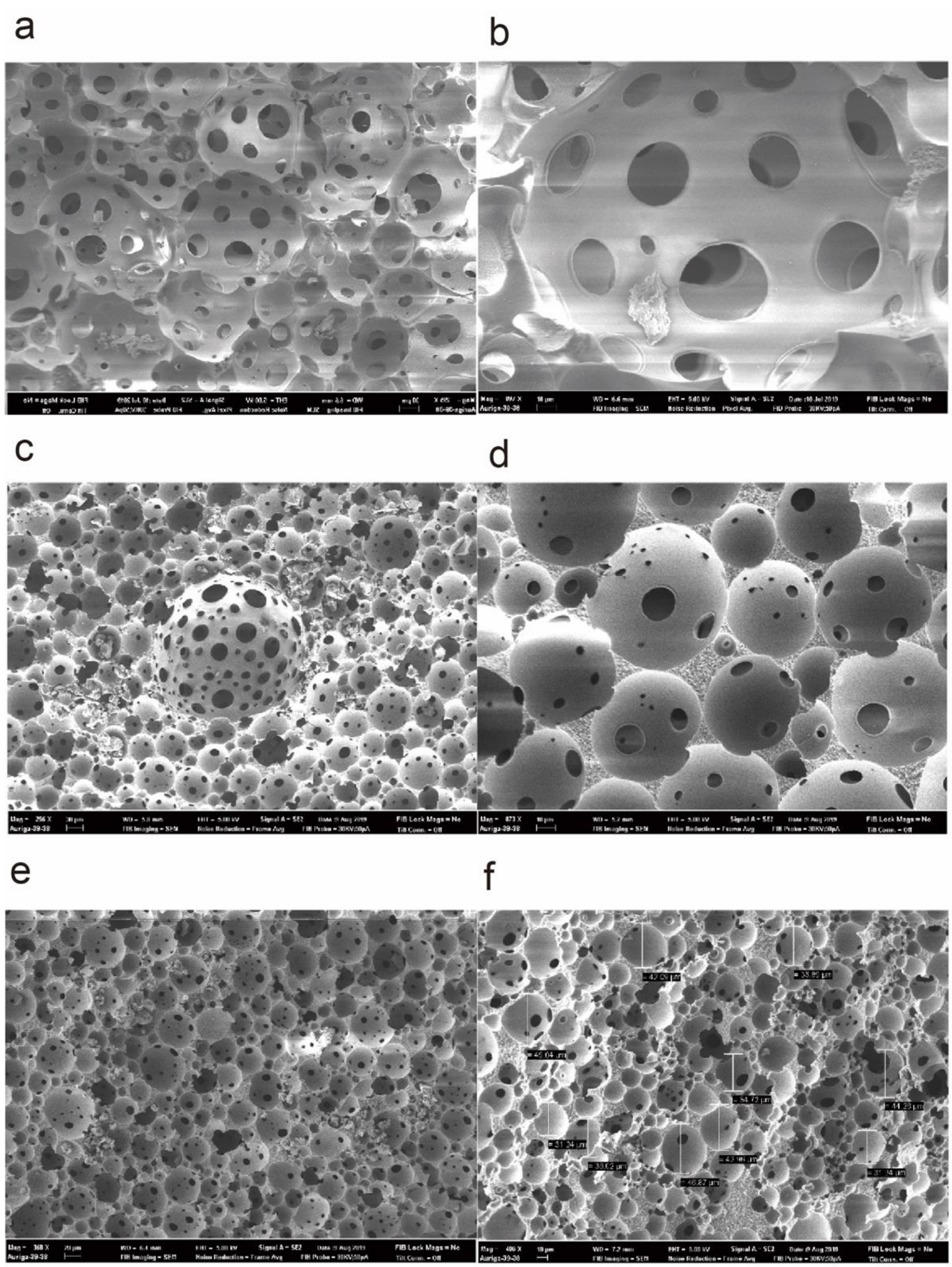

Figure.S6. (a-b) SEM images of opaque aerogel synthesized with 3.33 wt.% SDS at 30 μm and 10 μm respectively; (c-d) SEM images of opaque aerogel synthesized with 10 wt.% SDS at 30 μm and 10 μm respectively; (e-f) Shows SEM images of opaque aerogel synthesized with 20 wt.% SDS at 20 μm and 10 μm respectively.

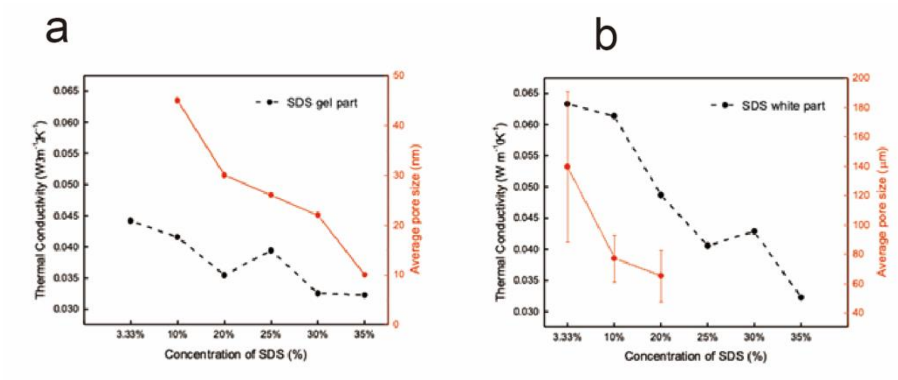

Figure S7. (a) Thermal conductivity of gel part and average pore size changing with increasing the concentration of the surfactant SDS. (b) Thermal conductivity of white part and average pore size changing with increasing the concentration of the surfactant SDS.

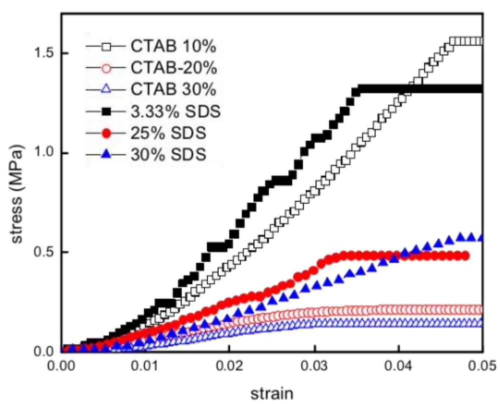

Figure S8. Stress-strain curves show mechanical strength of opaque monolith synthesized with different concentration of surfactant SDS and CTAB.

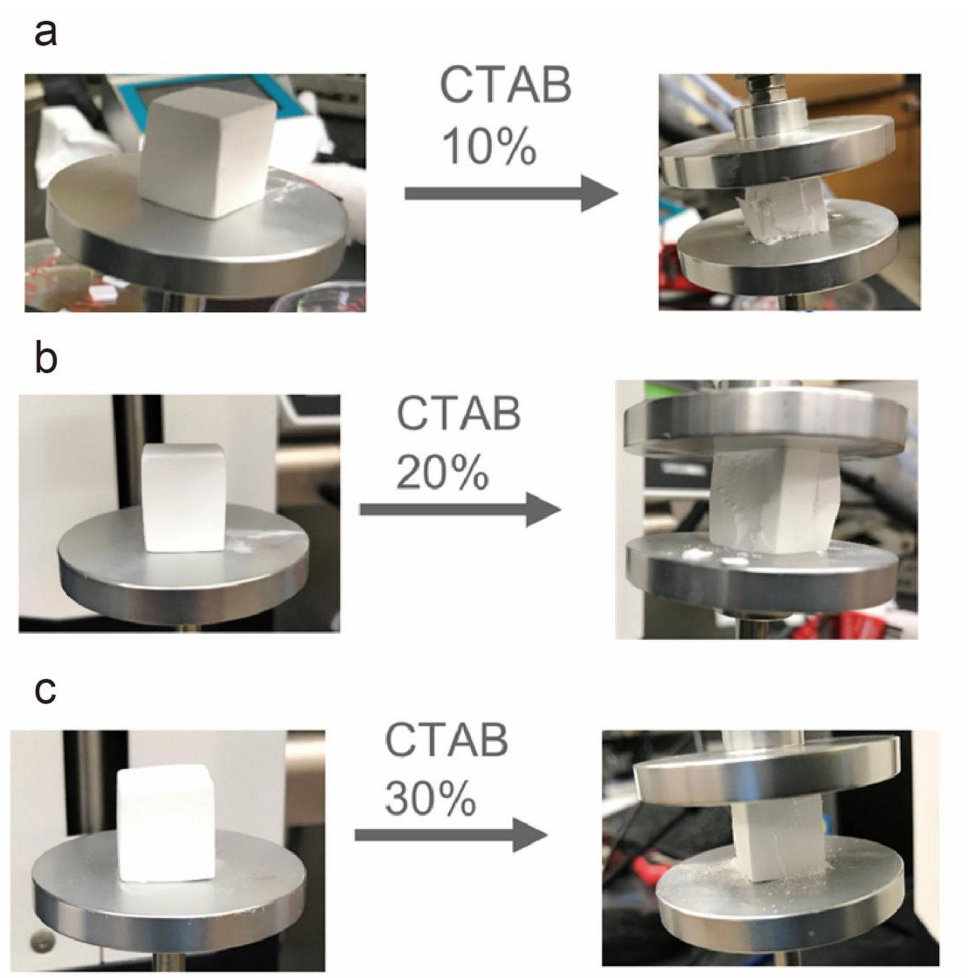

Figure S9. Optical images of (a) 10, (b) 20 and (c) 30 wt.% CTAB samples before and after mechanical compressive test.

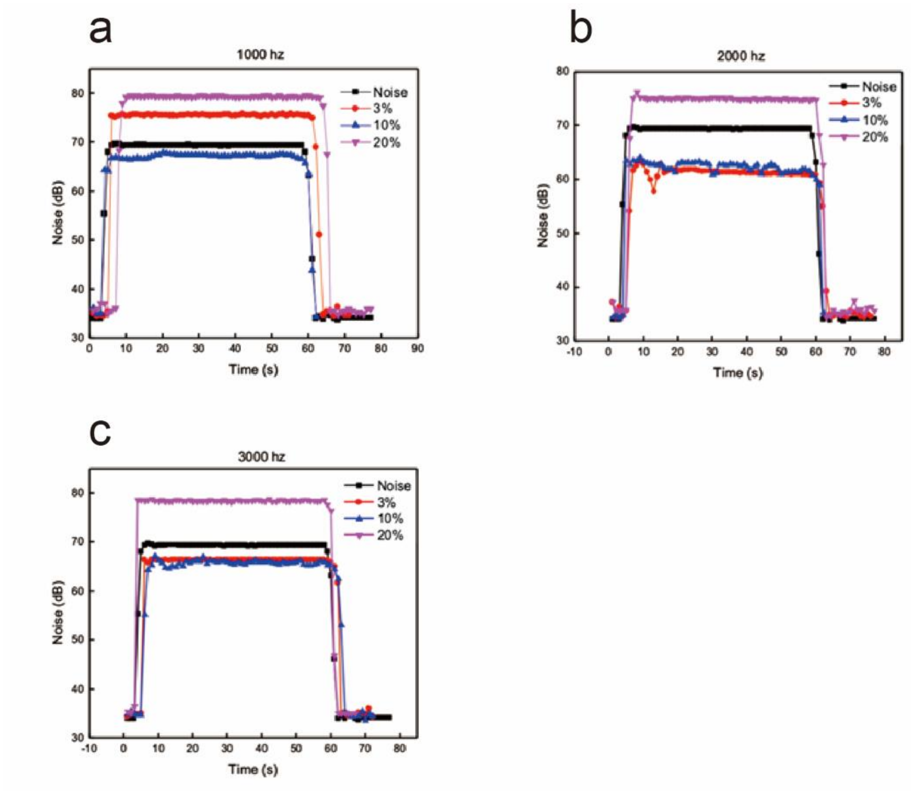

Figure S10. Soundproof performance of different concentration of SDS under sound frequency of (a) 1000 Hz, (b) 2000 Hz, (c) 3000 Hz.