Supporting Information For

Low-Density, Mechanical Compressible, Water-Induced Self-Recoverable Graphene Aerogels for Water Treatment

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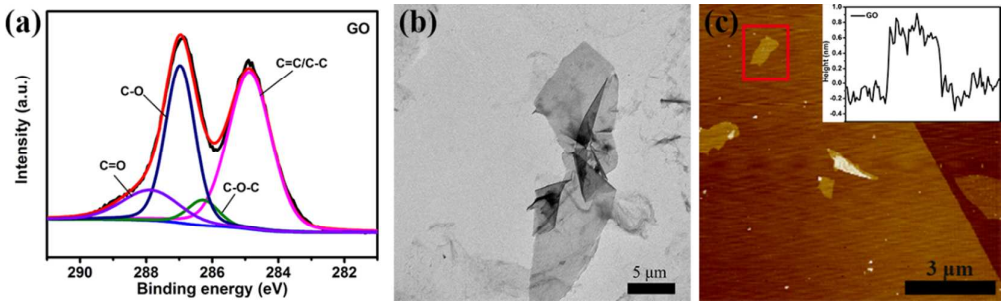

Figure S1. (a) The C 1s peak in the XPS spectra, (b) TEM image and (c) AFM image of GO**.** (Transmission electron microscopy (TEM) was performed with a Tecnai G2 20 TWIN transmission electron microscope. Atomic force microscopy (AFM) images of the GO sheets were taken on a Multimode 8 atomic force microscope (Bruker) with typical tapping mode. The samples for AFM were prepared by spin-coating the GO/water solution onto freshly exfoliated mica substrates).

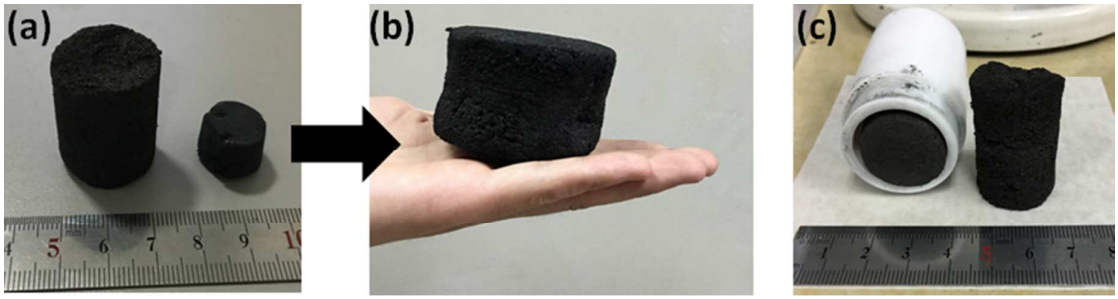

Figure S2. Photographs showing (a-b) the scale-up of the synthesis of the xGAs and (c) the almost shrinkage-free xGA.

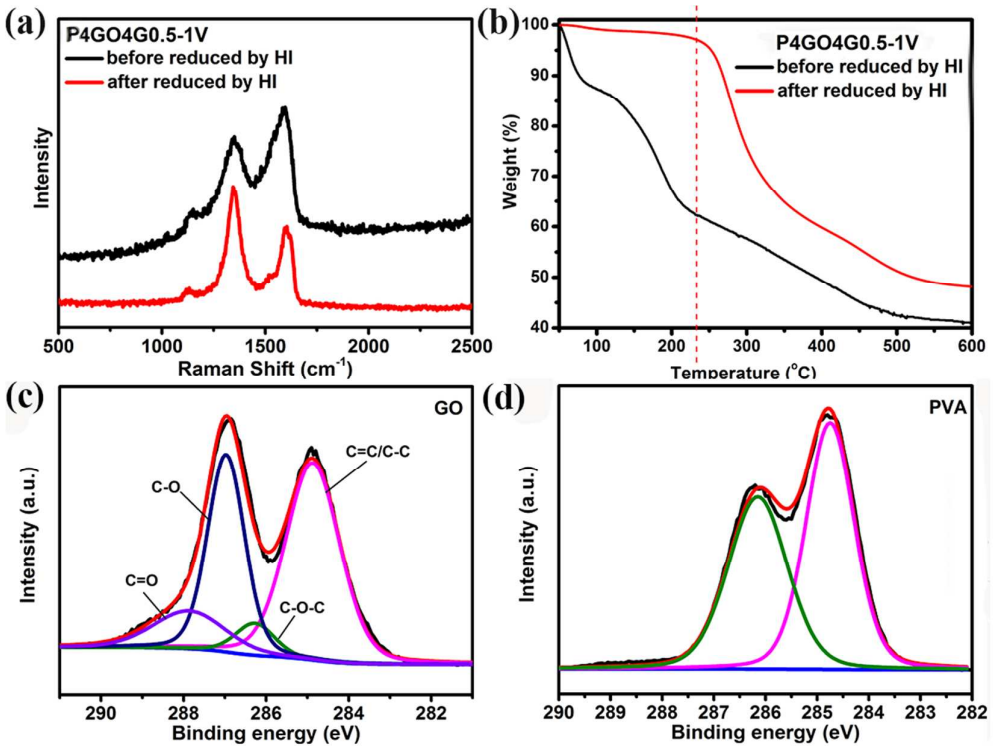

Figure S3. (a) The Raman spectra and (b) TGA curve of $P_4GO_4G_{0.5}$-1V before and after reduced by HI. The C 1s peak in the XPS spectra of (c) GO, (d) PVA. (Raman spectra were collected on XploRA Raman spectrophotometer from 500-3000 cm^{-1}. The laser was excited with a wavelength of 532 nm).

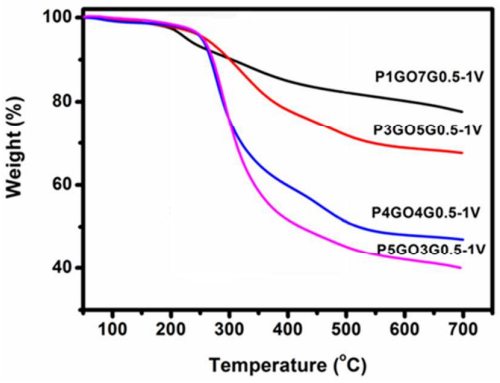

Figure S4. TGA curves of different xGA samples.

The actual ratio of PVA and GO in the resulting xGAs was determined by the TGA curves. PVA weight was determined by the mass loss of PVA (between 200 and 500 °C). The mass weight loss of GO (between 100 and 200 °C) cannot be seen in the TGA curves, so the GO weight was determined based on the overall weight and the PVA weight. The PVA/GO feeding ratio and the actual ratio in the resulting xGAs were shown in Table S1.

Table S1. The PVA/GO feeding ratio and the actual ratio in the resulting xGAs.

	PVA/GO feeding ratio (g/g)	Actual PVA/GO ratio (g/g)
$P_1GO_7G_{0.5}$-1V	0.14	0.18
$P_3GO_5G_{0.5}$-1V	0.60	0.45
$P_4GO_4G_{0.5}$-1V	1.00	1.00
$P_5GO_3G_{0.5}$-1V	1.67	1.13

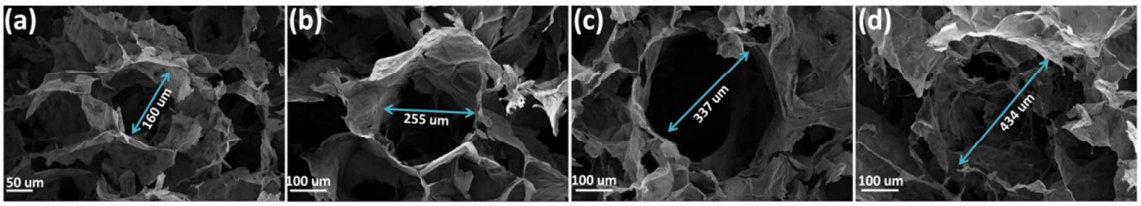

Figure S5. SEM images showing the typical macropores of the (a) $P_4GO_4G_{0.5}$-1V, (b) $P_4GO_4G_{0.5}$-1.25V, (c) $P_4GO_4G_{0.5}$-1.5V and (d) $P_4GO_4G_{0.5}$-2V.

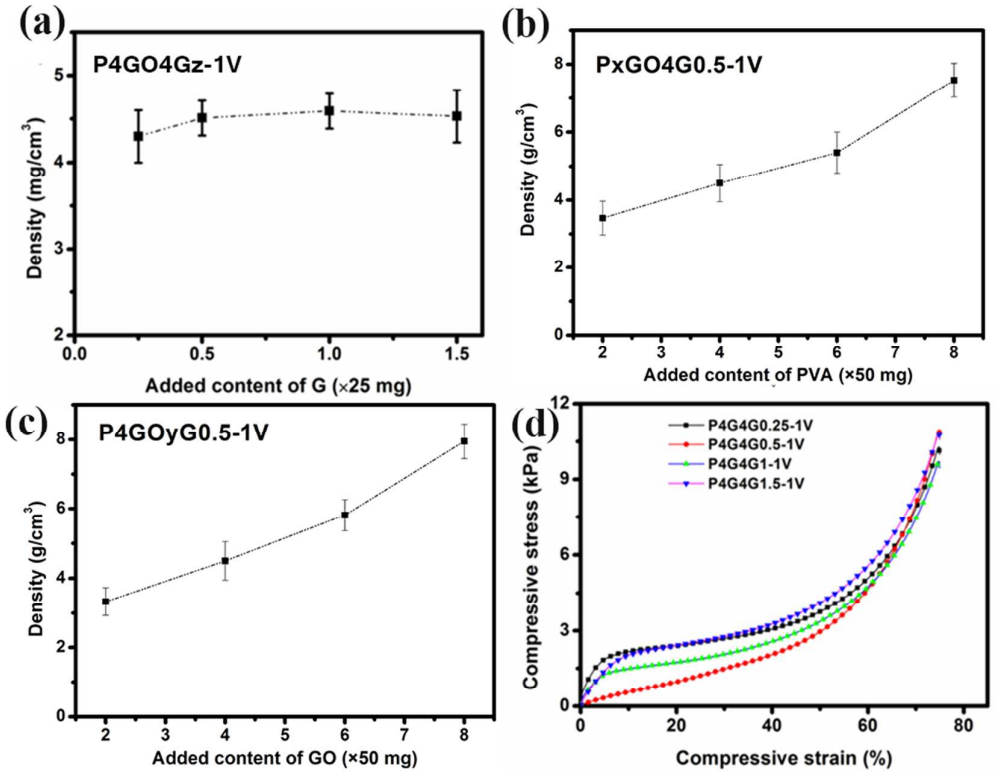

Figure S6. Change in bulk density of xGAs as a function of added content of (a) G cross-linker, (b) PVA and (c) GO. (d) Compressive stress-strain curves of the xGAs with different added content of G cross-linker.

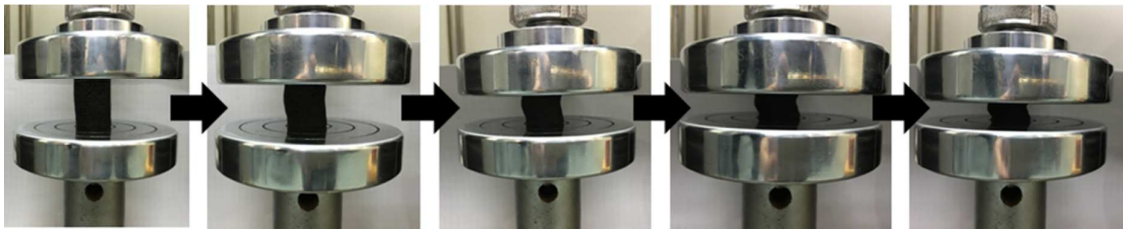

Figure S7. Photographs showing the compressive process of the $P_4GO_4G_{0.5}$-1V.

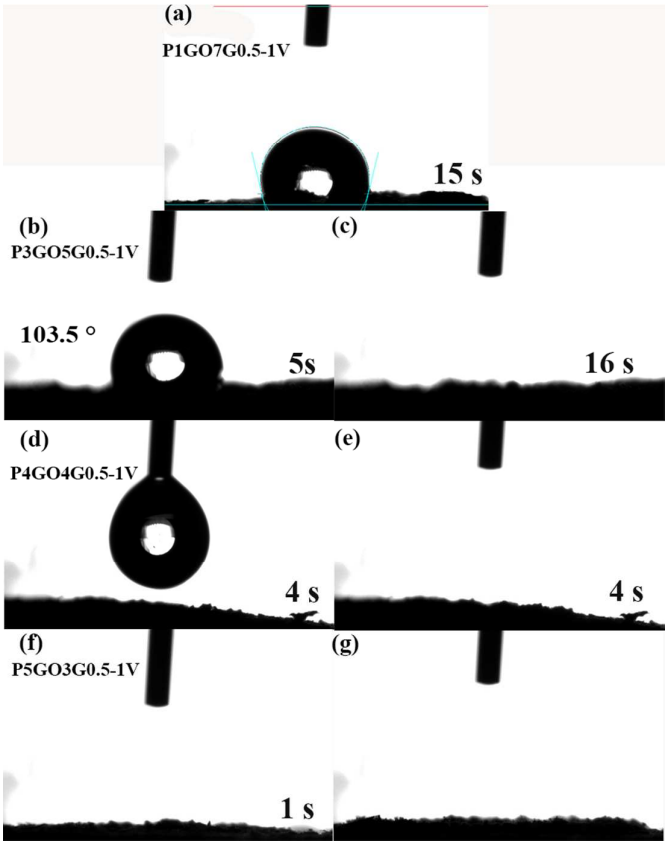

Figure S8. Digital photographs for the water contact angle tests of different xGA samples.