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Electronic supplementary information for the manuscript:

One-Pot Gamma Ray-Induced Green Synthesis of a Prussian Blue-Laden Polyvinylpyrrolidone/Reduced Graphene Oxide Aerogel for the Removal of Hazardous Pollutants

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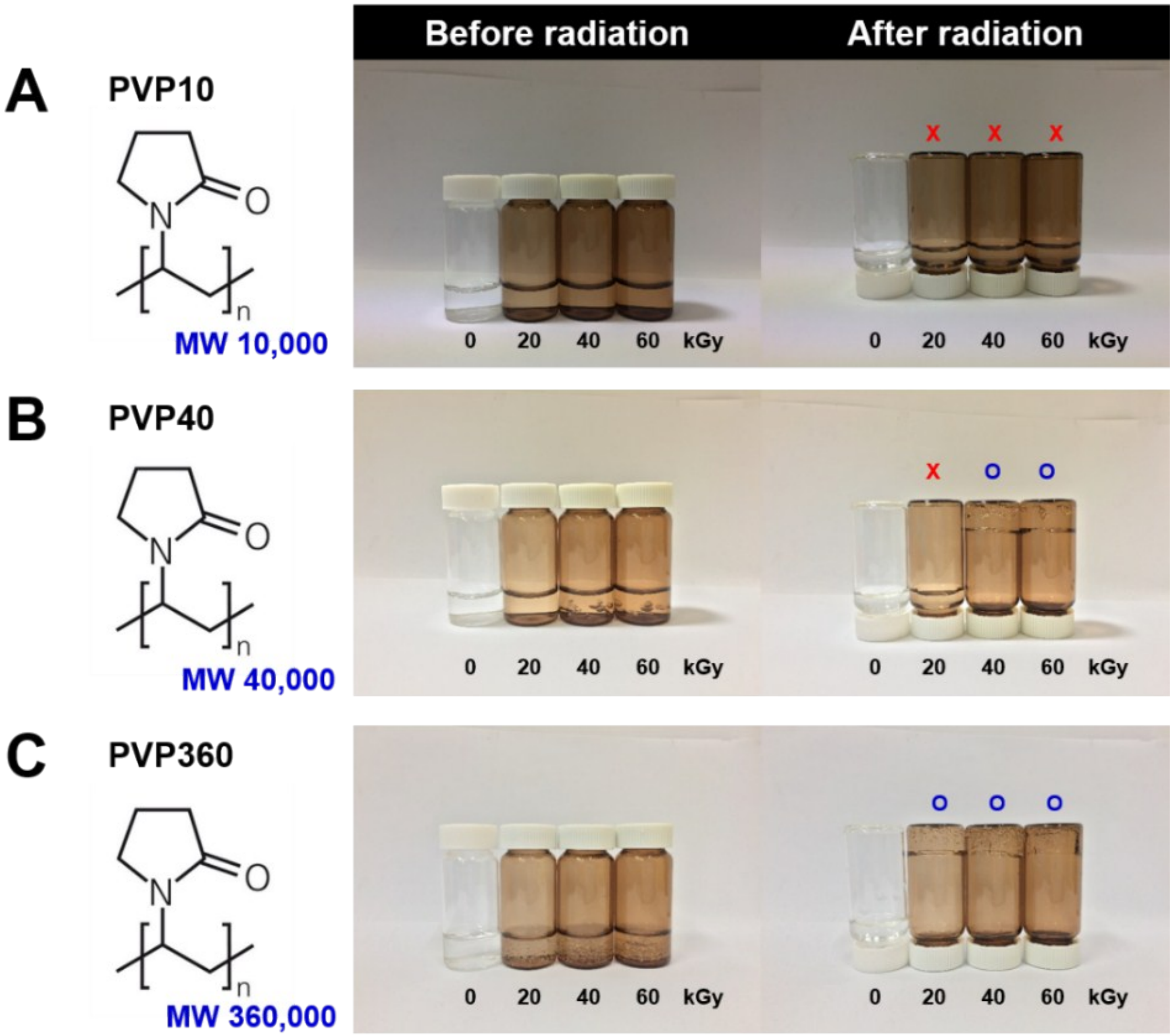

Fig. S1 Photograph of the gelation of PVP of different molecular weights before γ-radiation and after being irradiated by γ-ray radiation at different absorbed doses (0, 20, 40, and 60 kGy). (A) PVP (Mw = 10,000), (B) PVP (Mw = 40,000), and (C) PVP (Mw = 360,000).

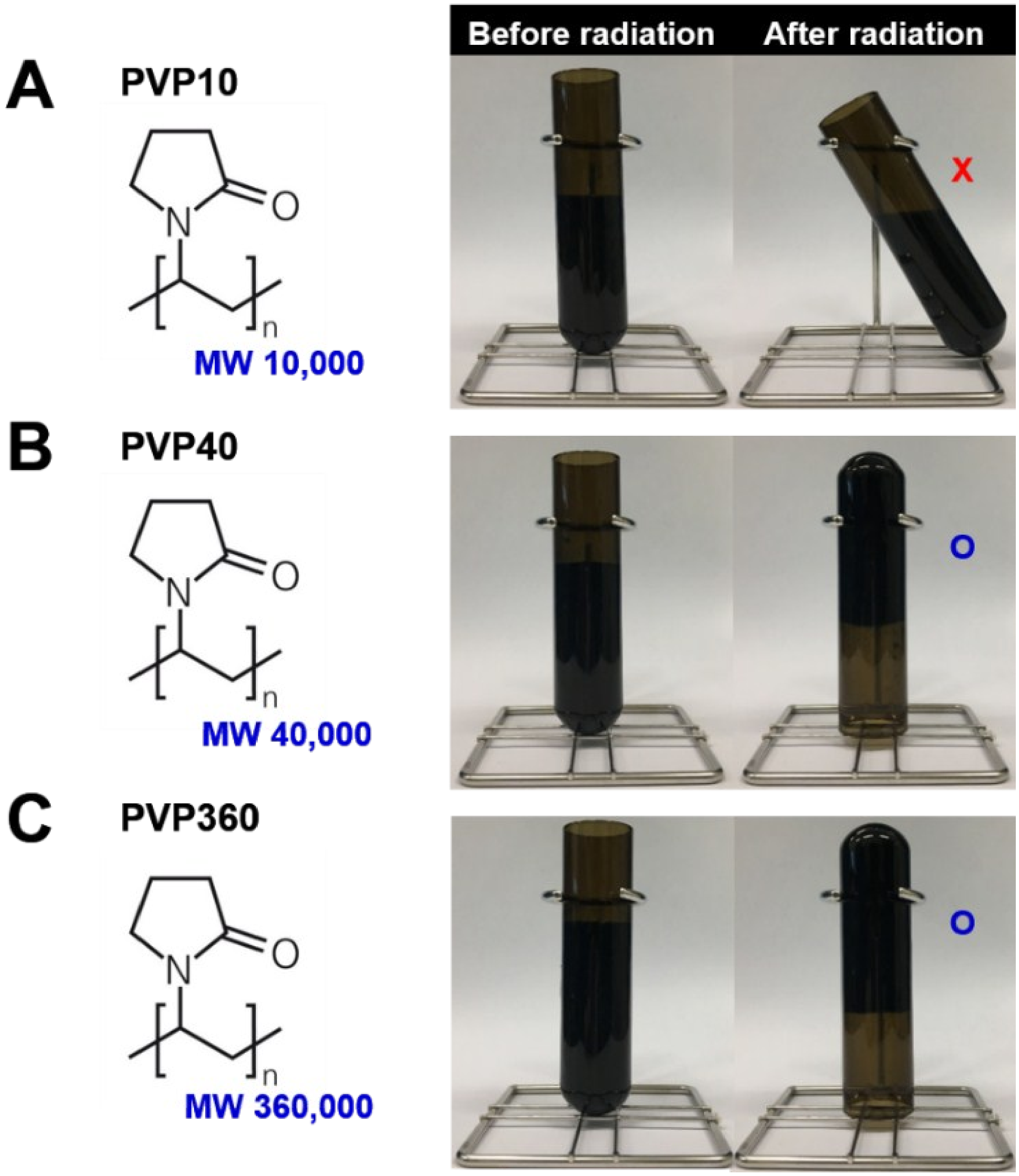

Fig. S2 Photograph of the gelation of PB@PVP/rGO using PVP of different molecular weights after being irradiated by γ-ray radiation (50 kGy). (A) PB@PVP/rGO ($PVP_{MW\ =\ 10,000}$), (B) PB@PVP/rGO ($PVP_{MW\ =\ 40,000}$), and (C) PB@PVP/rGO ($PVP_{MW\ =\ 360,000}$).

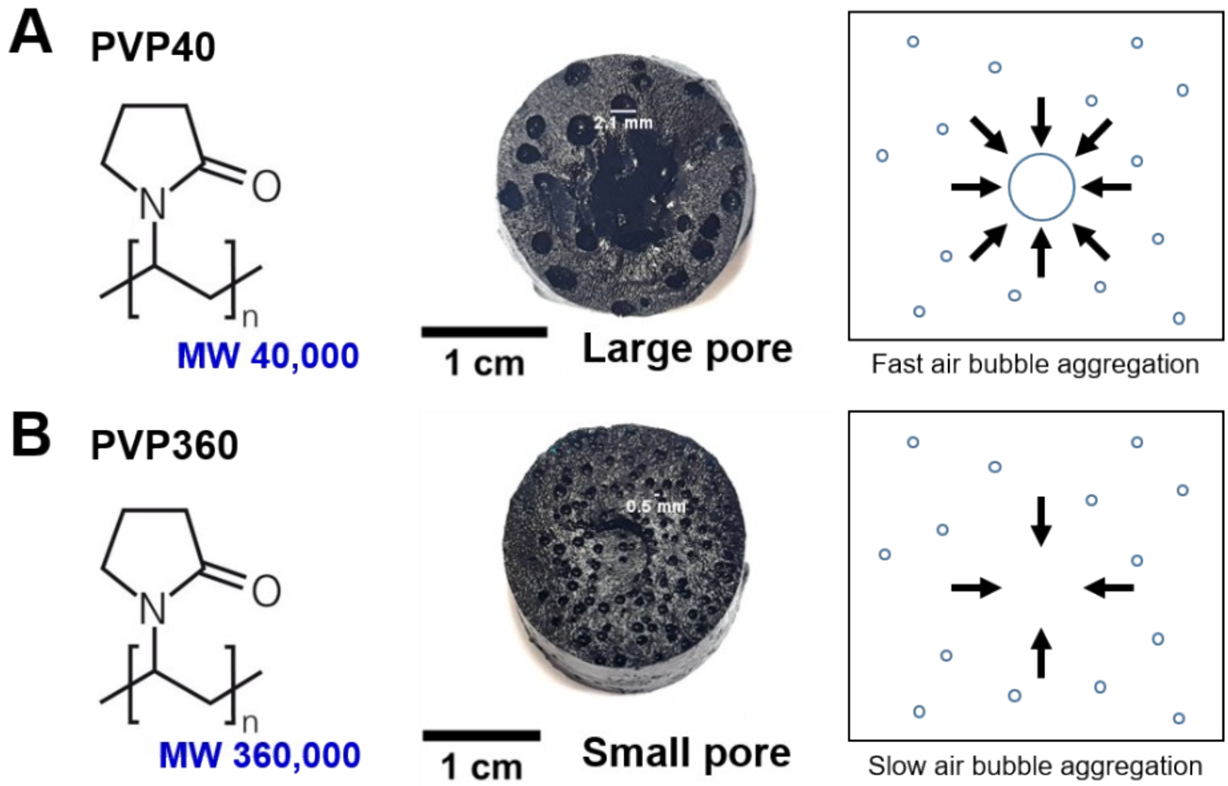

Fig. S3 Surface morphology (pore formation) of PB@PVP/rGO aerogel using PVP polymers of two different molecular weight irradiated by γ-rays of intensity of 50 kGy. (A) PB@PVP/rGO ($PVP_{MW = 40,000}$), and (B) PB@PVP/rGO ($PVP_{MW = 360,000}$).

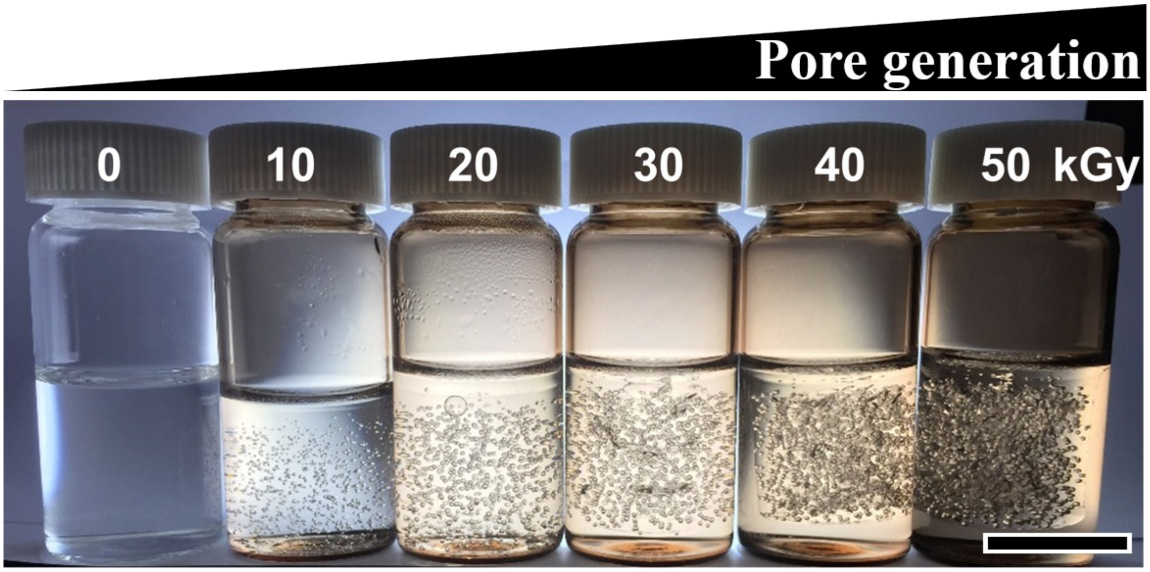

Fig. S4 The radiolysis induced gelation of PVP hydrogel as a function of the absorbed dosages at 0, 10, 20, 30, 40, and 50 kGy. The scale bar was 2 cm.

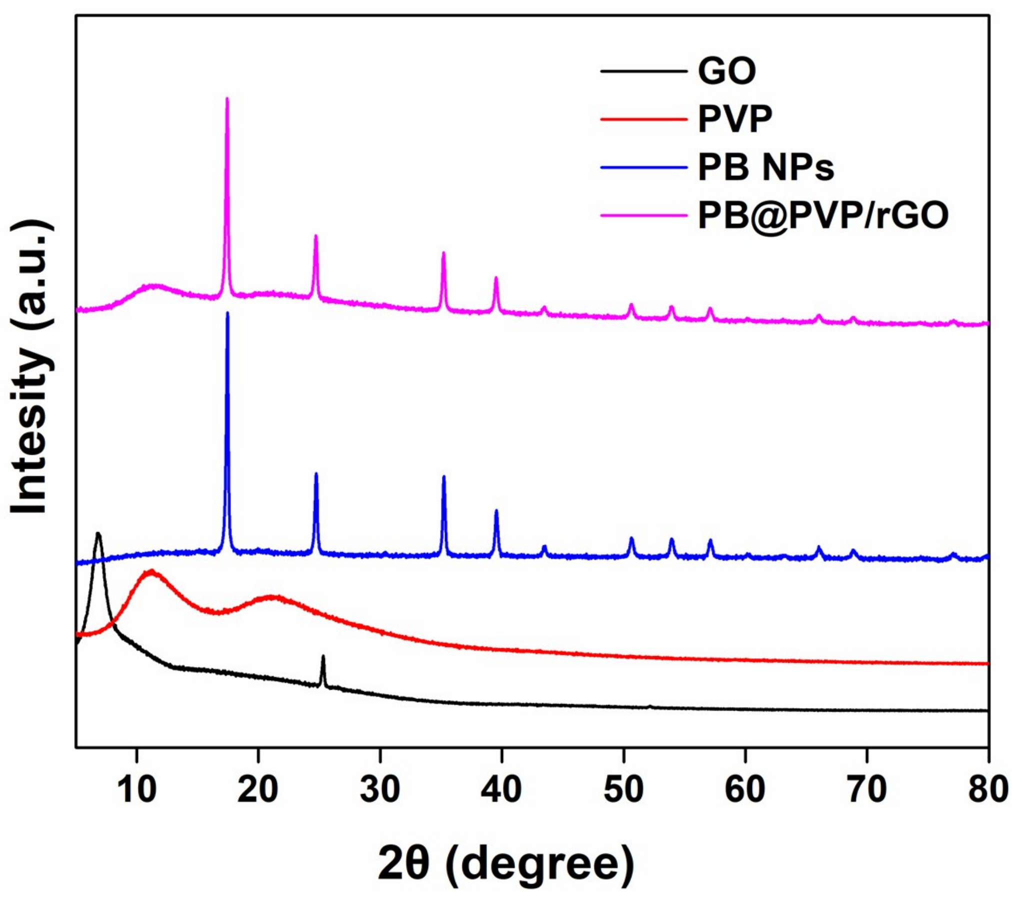

Fig. S5 XRD analysis of PB@PVP/rGO aerogel.

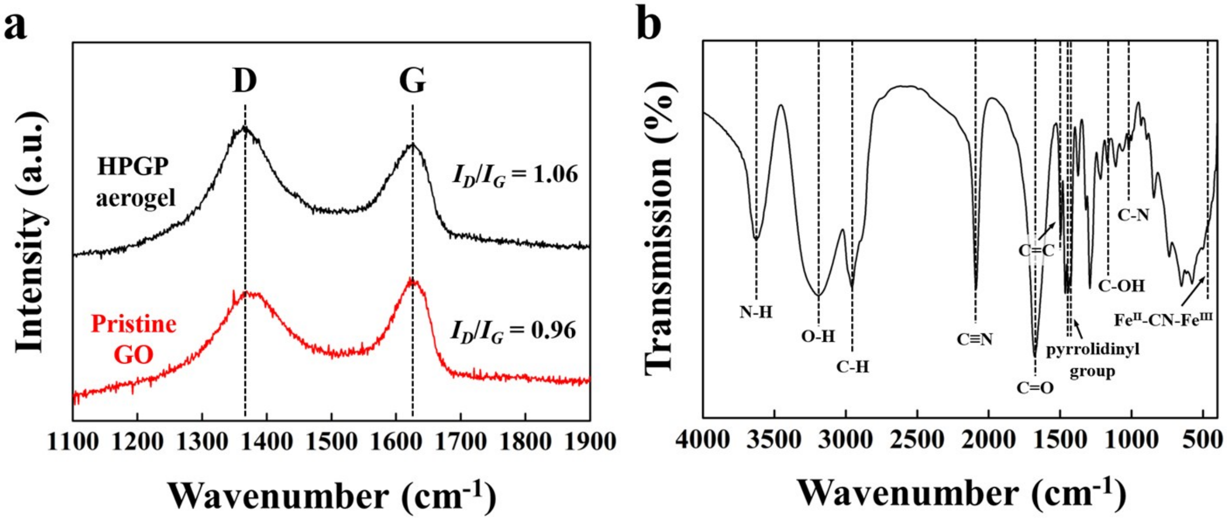

Fig. S6 (a) Raman and (b) FT-IR spectrum of PB@PVP/rGO aerogel.

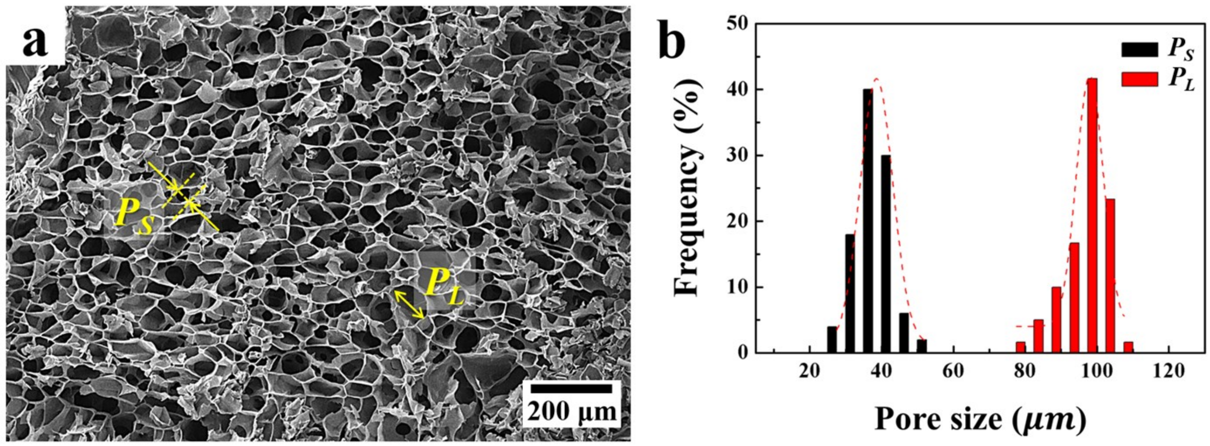

Fig. S7 Pore size distribution calculation in the PB@PVP/rGO aerogel. (a) SEM image of monolithic PB@PVP/rGO aerogel and (b) normal distribution curve of the pore size distribution.

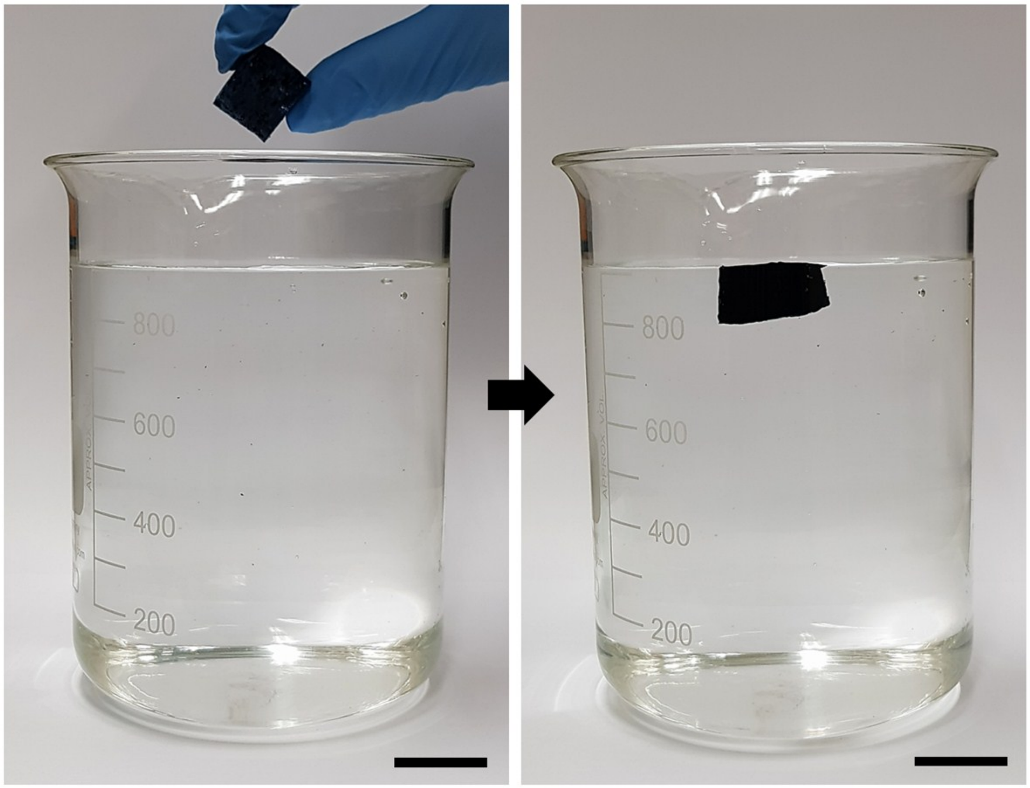

Fig. S8 PB@PVP/rGO aerogel with hydrophilic nature at an air/water interface. The scale bars represent 2 cm.

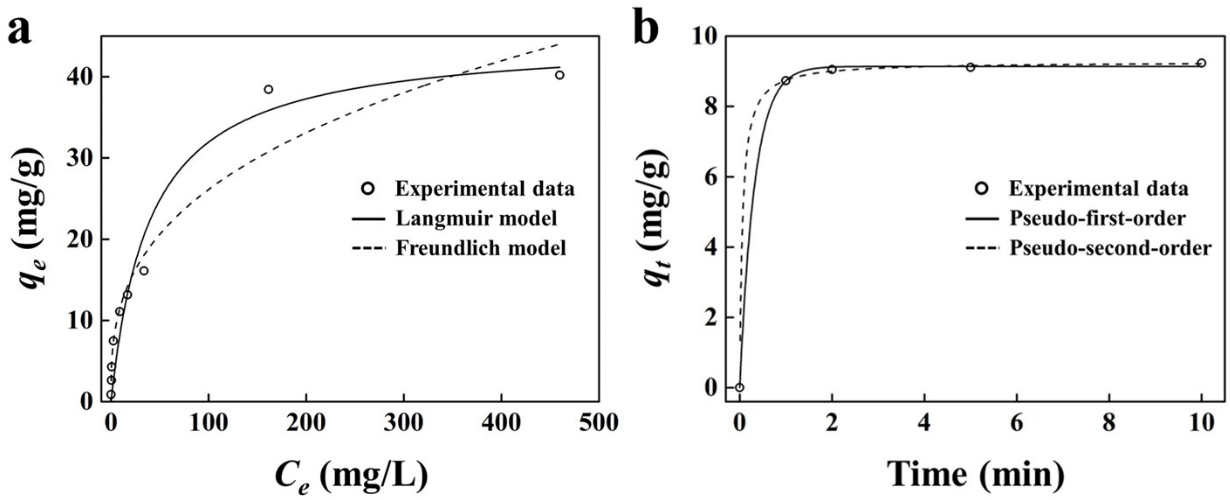

Fig. S9 (a) Effect of initial methylene blue concentration and (b) contact time on the adsorption of methylene blue onto PB@PVP/rGO aerogel.

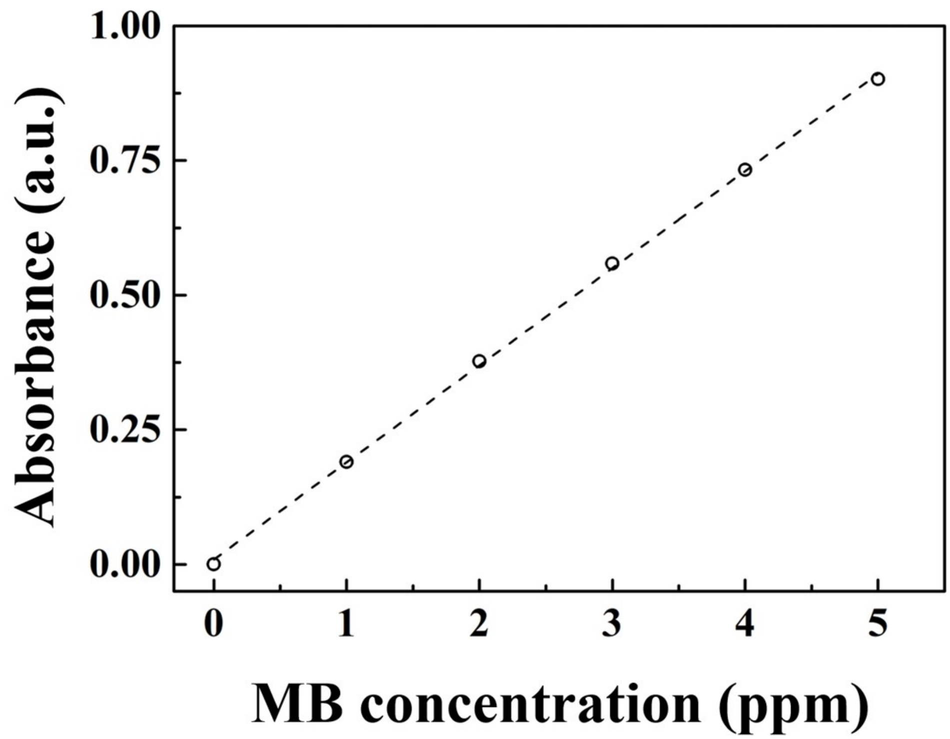

Fig. S10 Standard curve for methylene blue concentration at their maximum absorption peak at 670 nm.

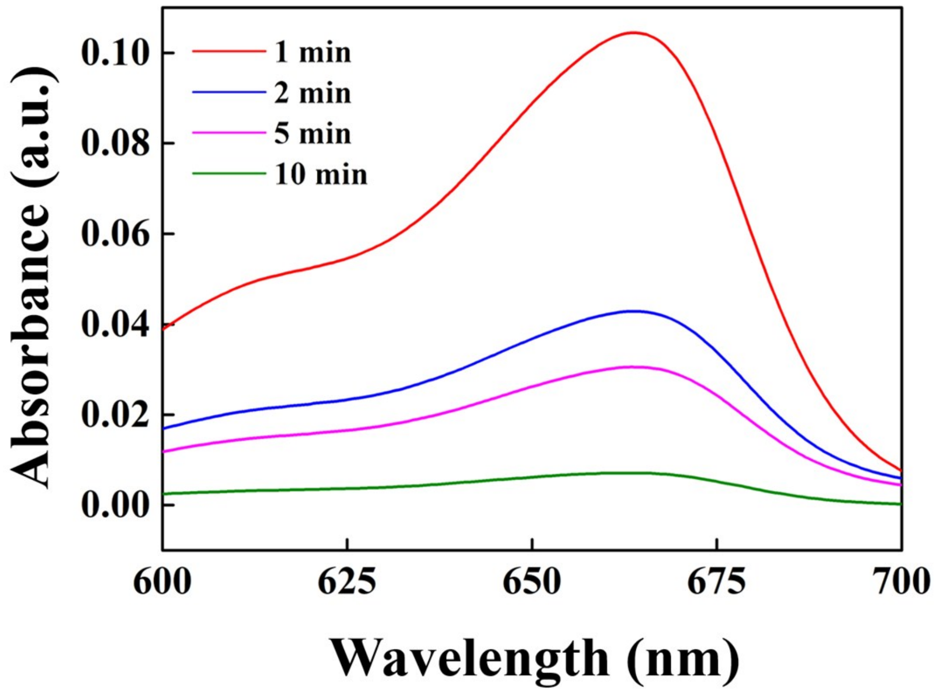

Fig. S11 UV-vis absorbance plotted versus different times for removal of methylene blue dye.

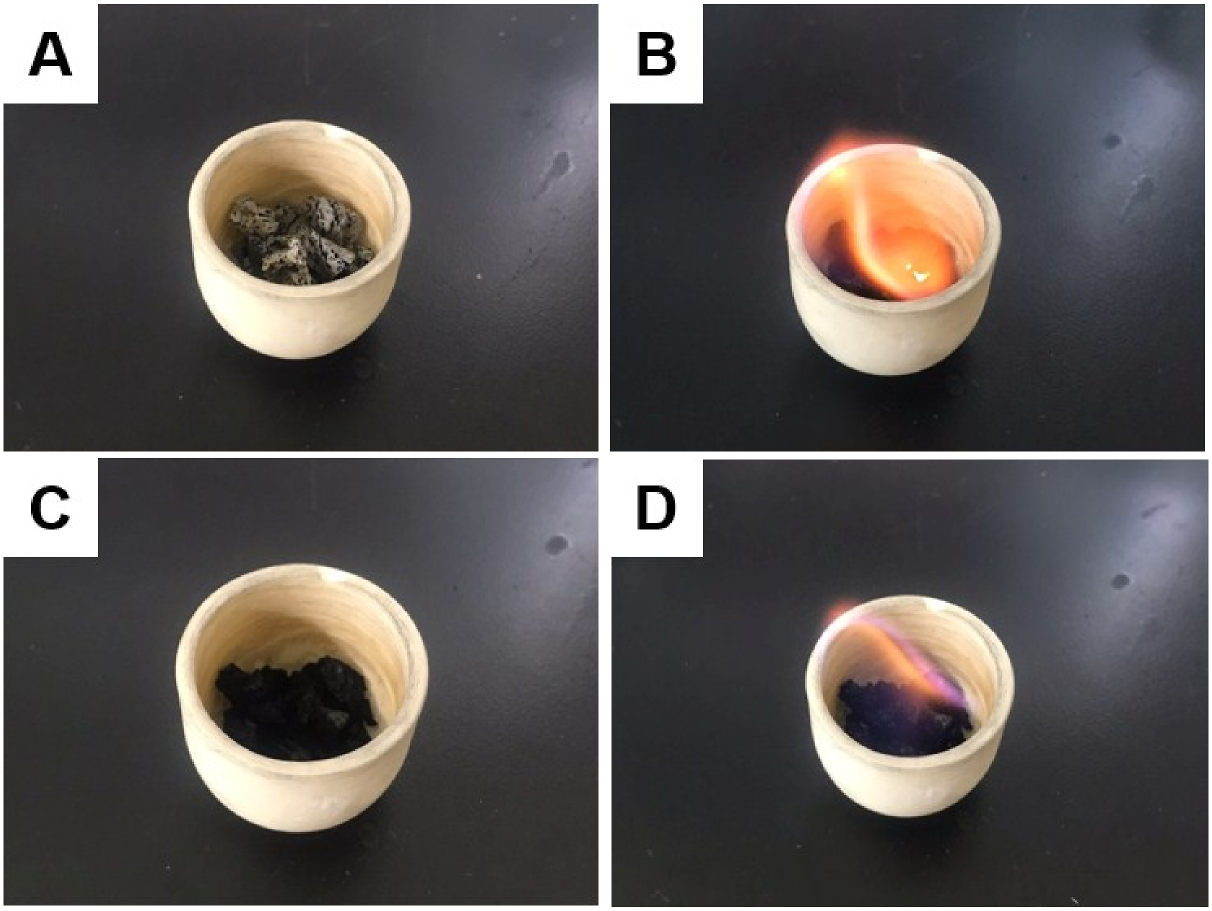

Fig. S12 Recycle study of PB@PVP/rGO for oil absorption through absorption–combustion experiment. (A) PB@PVP/rGO aerogel before combustion, (B) combustion – 1 cycle, (C) PB@PVP/rGO aerogel after 5 cycles, (C) combustion – 6th cycle.

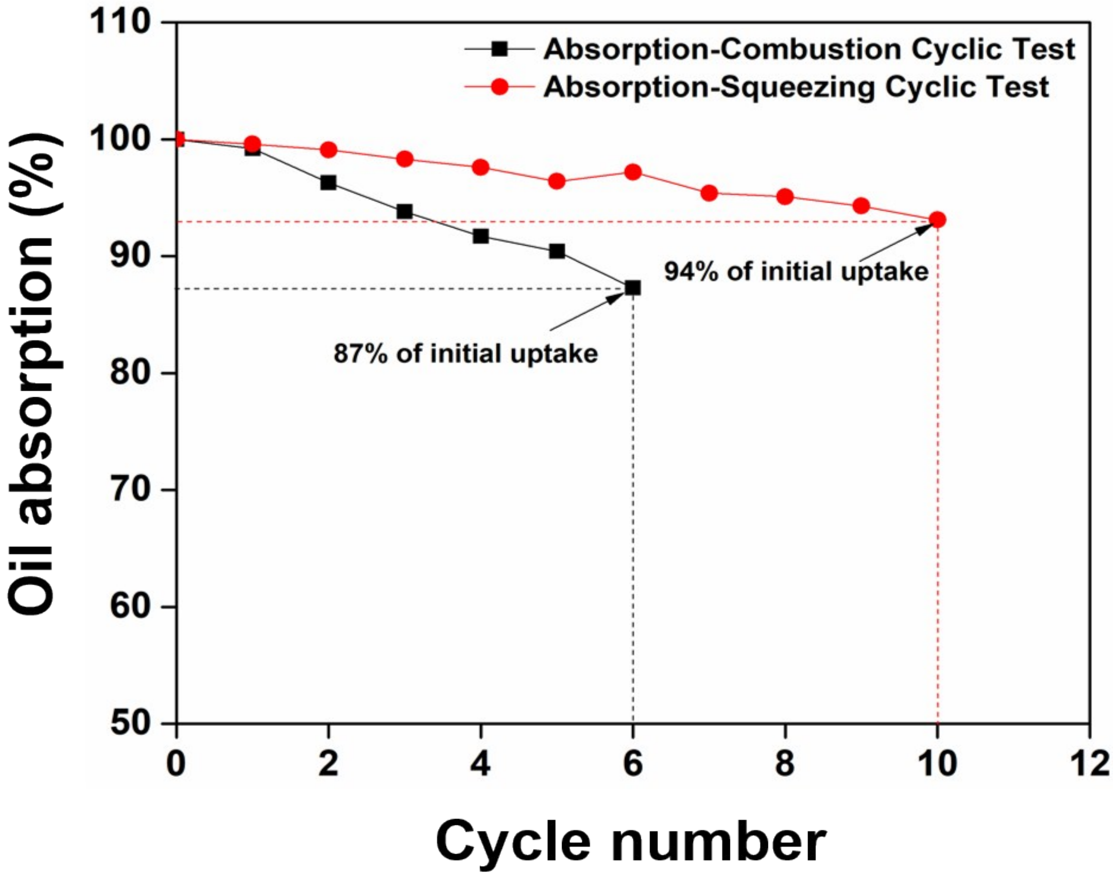

Fig. 13 Recycle studies of PB@PVP/rGO for oil absorption through absorption–combustion cyclic test and absorption–squeezing cyclic test.

Table S1 Gelation of PVP polymers of different molecular weights irradiated by γ-radiation of different doses.

Polymer	Molecular Weight	Radiation Dose		
		20 kGy	**40 kGy**	**60 kGy**
PVP10	10,000	No Gelation	No Gelation	No Gelation
PVP40	40,000	No Gelation	Gelation	Gelation
PVP360	360,000	Gelation	Gelation	Gelation

Table S2 Methylene blue adsorption parameters of Langmuir and Freundlich models of PB@PVP/rGO aerogel.

Langmuir model			Freundlich model		
K_L (L/mg)	q_{max} (mg/g)	R^2	K_F (L/mg)	n	R^2
0.02498	44.73	0.9492	5.4167	2.9269	0.9452

Table S3 Adsorption capacities of Cs^+ ions and MB on PB@PVP/rGO aerogel and other reported aerogels.

Adsorbate	**Adsorbent**	**Synthesis Method**	**Adsorption Capacity ($mg\ g^{-1}$)**	**Refs.**
Cesium (Cs^+) ions	Prussian blue/cellulose aerogel	Chemical reduction	13.70	[1]
	N, *N*, *N′*, *N′*-tetraoctyldiglycolamide impregnated graphene aerogel (GA-TODGA)	Chemical Reduction	66.8	[2]
	Prussian blue/graphene aerogel	Chemical Reduction	58.82	[3]
	Potassium copper hexacyanoferrate (KCuHCF)/Fe_2O	Chemical Reduction	82.8	[4]
	PB@PVP/rGO	**Gamma-irradiation Technique**	**143.88**	**This Work**

Methylene blue (MB)	Graphene oxide (GO)/sodium alginate (SA)	Chemical Reduction	833	[5]
	Organi-inorganic Cr^{3+}/Fe^{3+} aerogels with rigid bridging carboxylates	Chemical reduction	20.2	[6]
	Hydrophilic silica aerogels (HSA)	Chemical reduction	47.21	[7]
	Graphene (G)/Carbon spheres (CS)/Silver nanoparticles (G/AgCS) hybrid aerogel	Chemical reduction	65.83	[8]
	Silica aerogel	Chemical reduction	49.2	[9]
	PB@PVP/rGO	**Gamma-irradiation Technique**	**44.73**	**This Work**

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