Electronic Supplementary Information

Aqueous Compatible Boron Nitride Nanosheets for High-Performance Hydrogels

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Materials

Acrylamide and h-BN were purchased from Aladdin Industrial Corporation. Citric acid was ordered from Beijing HWRK Chem Co., Ltd. *N,N′*-methylenebisacrylamide (BIS) and *N,N,N′,N′*-tetramethyl-ethylenediamine (TMEDA) were obtained from Energy Chemical. Ammonium peroxydisulfate (APS) was supplied by Guangdong Guanghua Sci-Tech Co., Ltd. Acrylamide was recrystallized from acetone and water was purified by a secondary distillation before use.

Measurement

Atomic force microscopy (AFM) images were captured on a MultiMode Nanoscope

IIIa scanning probe microscope (Veeco Instruments Inc.). The AFM specimens were prepared by depositing an ethanol suspension on a mica substrate and dried in a vacuum oven at 60 ºC for 12 h. Scanning electron microscopy (SEM) analyses were carried out on a JSM-6360LA microscope (JEOL) at an accelerating voltage of 10.0 kV. The SEM specimens were prepared by placing a xerogel on a conductive carbon adhesive, followed by gold coating in a sputter coater (Desk-II; Den-ton Vacuum). Transmission electron microscopy (TEM) measurements were conducted on a FEI Tecnai G2 F20 instrument at an accelerating voltage of 200 kV. The specimen was prepared by dropping a drop of the dilute ca-BNNS dispersion onto a holey carbon-coated copper grid. Raman spectra were obtained on a Horiba Jobin Yvon's Labram HR 800 spectrometer with a 532 nm laser. Fourier transform infrared (FT-IR) spectra were recorded on a Nicole Magna-IR 750 spectrometer. UV-visible (UV-vis) spectra were measured on a Lambda 950 UV-vis spectrometer. Thermogravimetric analysis (TGA) was performed on Shimadzu TGA-50H thermal analyzer under N_2 at a heating rate of 20 ºC min^{-1}, respectively. The compressive and tensile measurements were performed on a SANS CMT4304 or HSV-1000 universal testing machine at a crosshead speed of 10 and 100 mm min^{-1}, respectively. Hydrogels with cylindrical (26 mm in diameter and 25 mm in height) and tubular (8 mm in diameter and 45 mm in length) shapes are used for compressive and tensile evaluations, respectively.

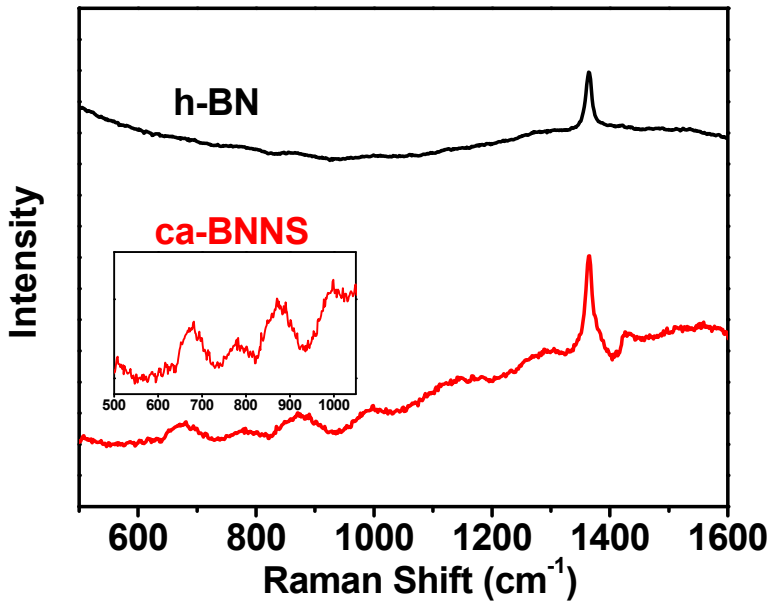

Fig. S1 Raman spectra of pristine h-BN and ca-BNNS (inset: enlarged ca-BNNS spectrum between 500 and 1050 cm^{-1}).

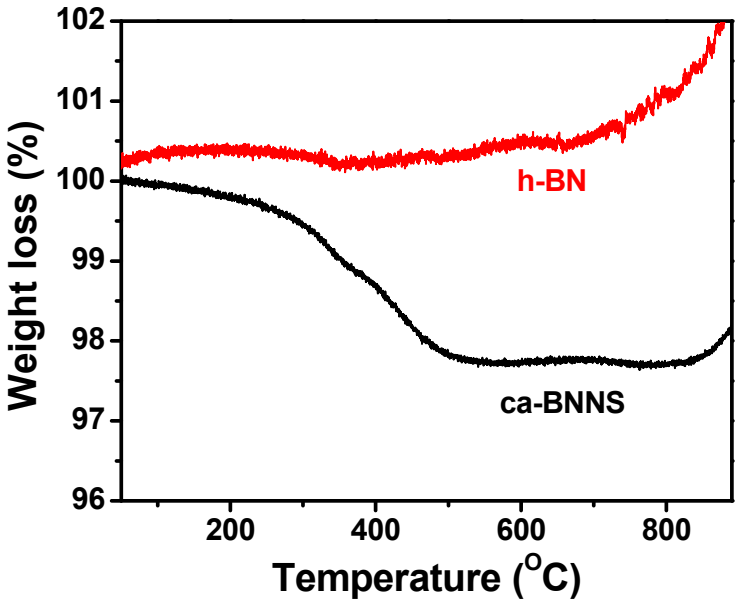

Fig. S2 TGA curves of pristine h-BN and ca-BNNS.

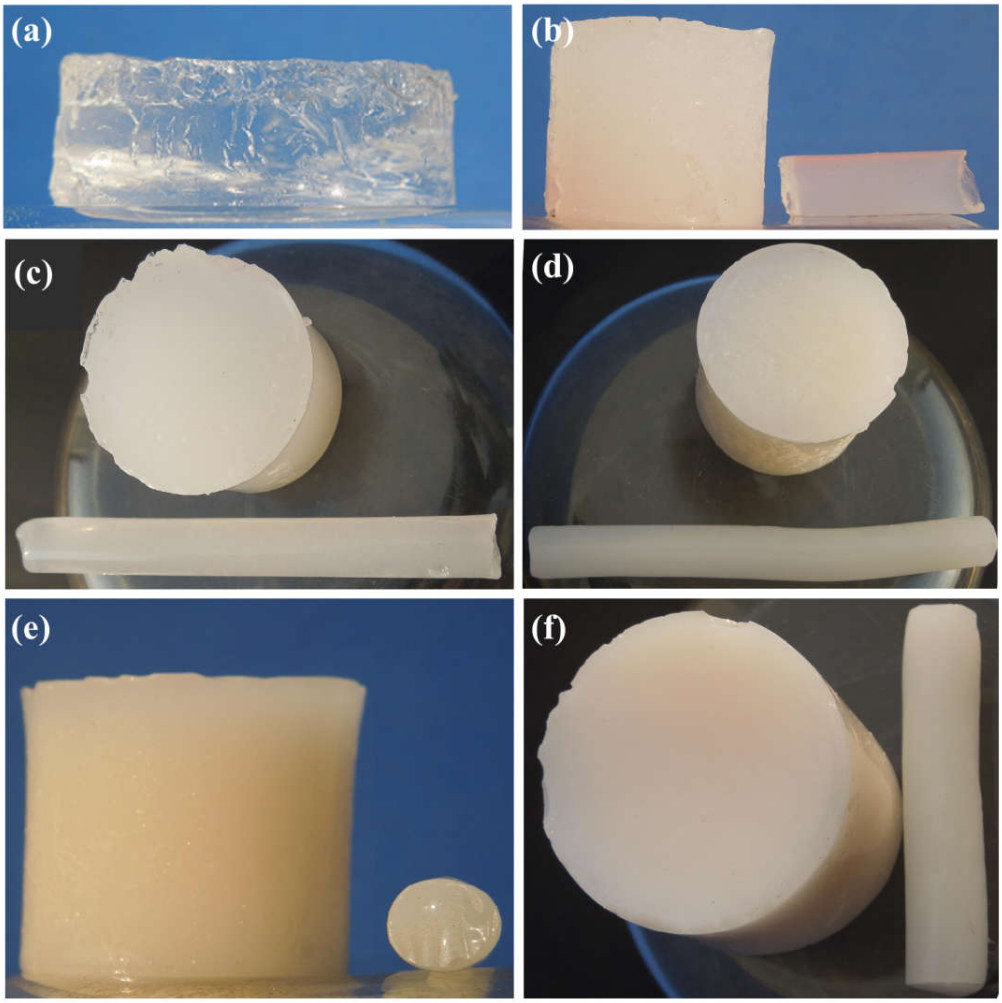

Fig. S3 The photographs of hydrogels with variant ca-BNNS contents: (a) PAAm, (b) $BNNS_{0.1}$/PAAm, (c) $BNNS_{0.5}$/PAAm, (d) $BNNS_{1.0}$/PAAm, (e) $BNNS_{1.5}$/PAAm, (f) $BNNS_{2.5}$/PAAm.

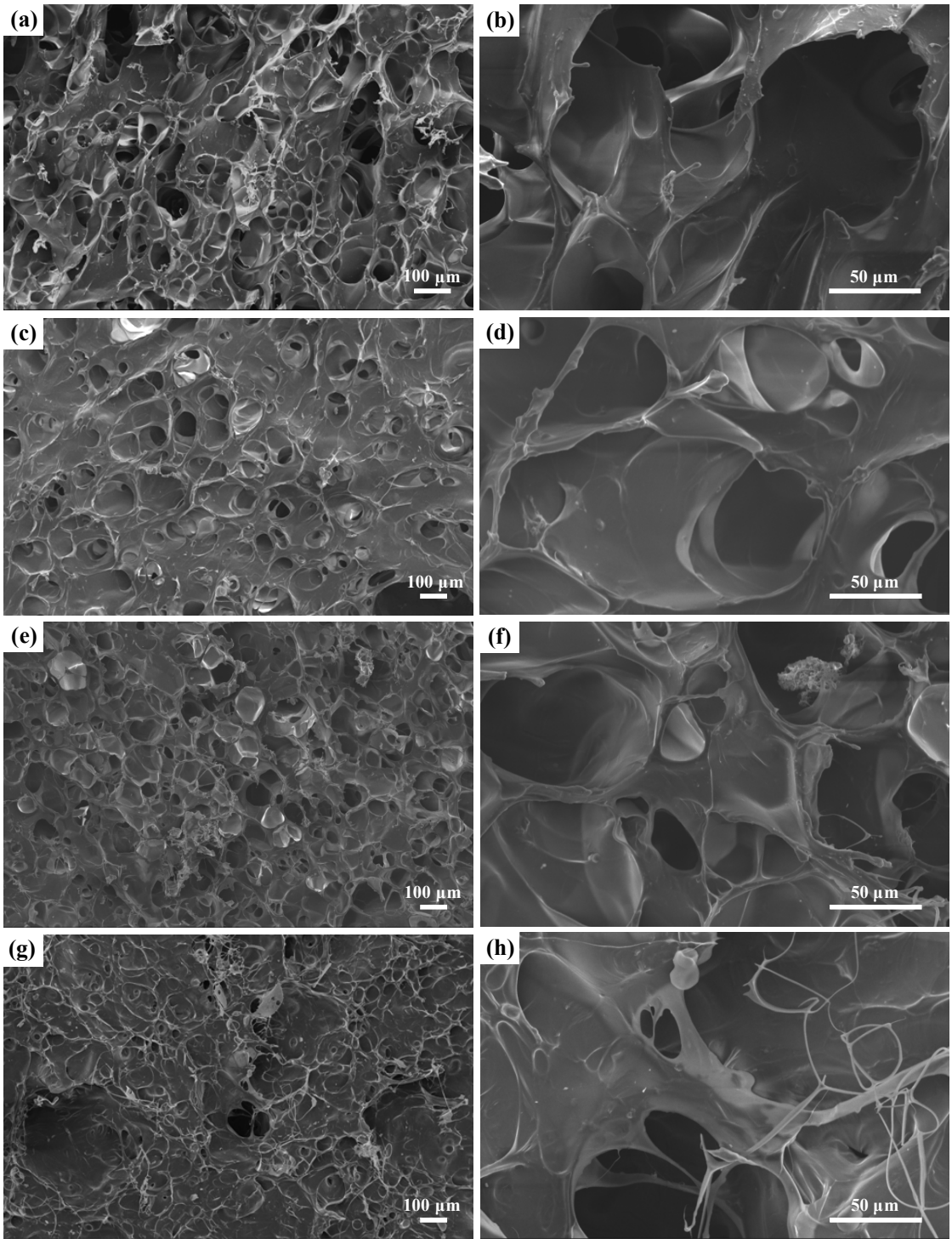

Fig. S4 The SEM images of $BNNS_{0.1\text{-}1.5}$/PAAm hydrogels with variant ca-BNNS contents: (a, b) $BNNS_{0.1}$/PAAm, (c, d) $BNNS_{0.5}$/PAAm, (e, f) $BNNS_{1.0}$/PAAm, (g, h) $BNNS_{1.5}$/PAAm.

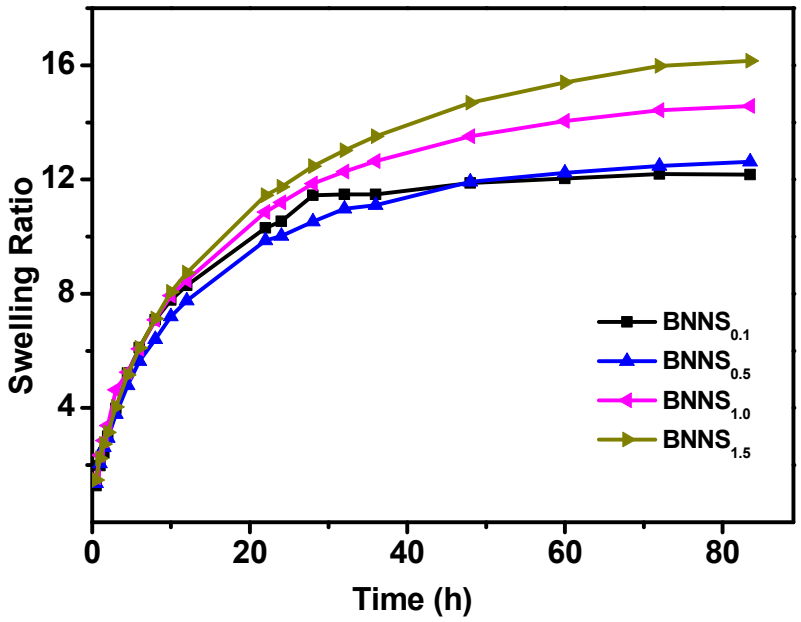

Fig. S5 Swelling ratio–time curves of $BNNS_{0.1\text{-}1.5}$/PAAm hydrogels.

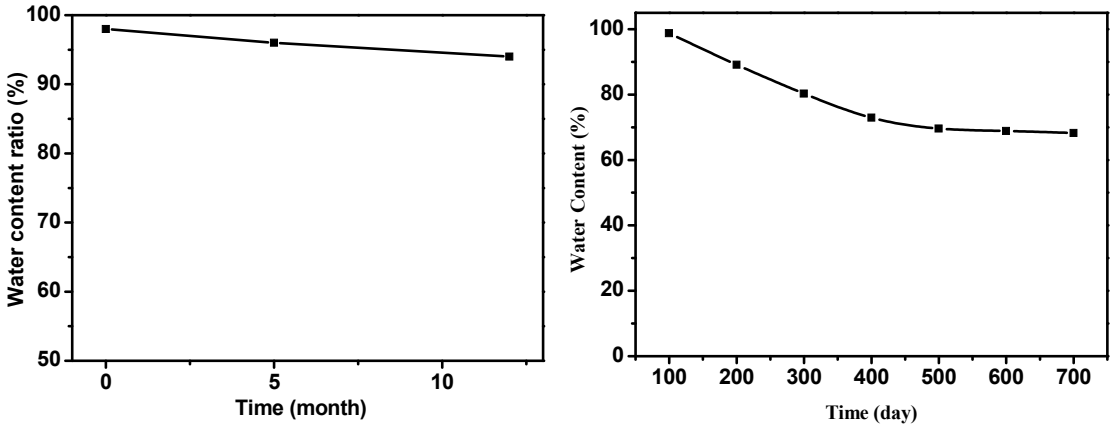

Fig. S6 Water content–time curves of $BNNS_{2.5}$/PAAm hydrogel. The hydrogel was stored in a beaker and covered with foil (left) and the hydrogel was placed on watch glass in air without cover (average relative humidity ~ 70%, right).

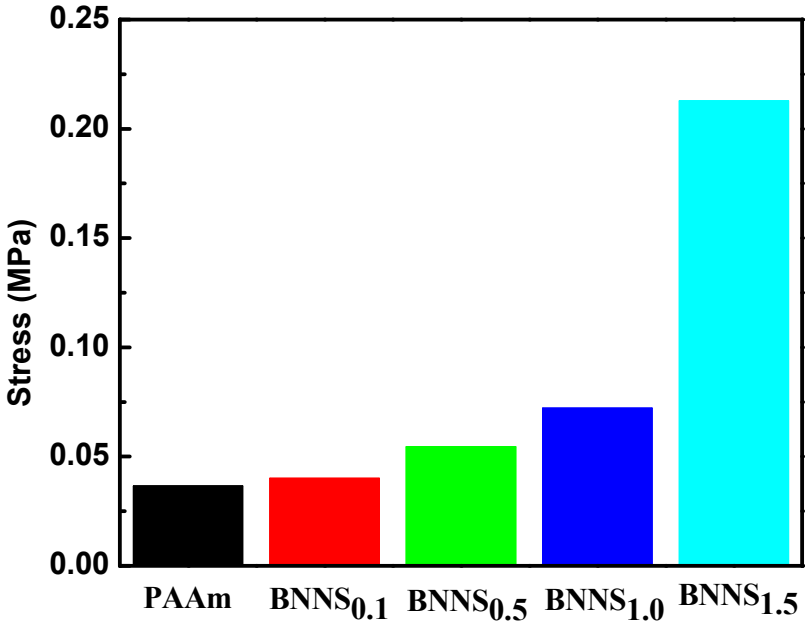

Fig. S7 The compression stress at rupture of PAAm and $BNNS_{0.1\text{-}1.5}$/PAAm hydrogels.