Supporting Information

Smart Strain Sensing Organic-Inorganic Hybrid Hydrogels with Nano Barrium Ferrite as Cross-linker

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S1. SEM Images of Barium Ferrite Nanoparticles

Fig. S1 SEM images of barium ferrite nanoparticles.

S2. Digital Photo of BaFe$_{12}$O$_{19}$/PAA Hydrogel with Thickness of 1 mm

Fig. S2 Digital photo of BaFe$_{12}$O$_{19}$/PAA hydrogel with thickness of 1 mm, the transparent hydrogel illustrates the uniform dispersion of BaFe$_{12}$O$_{19}$ within PAA matrix.
S3. TGA curves of BaFe$_{12}$O$_{19}$/PAA Hydrogels

*Fig. S3* TGA curves of MBA/PAA hydrogel and BaFe$_{12}$O$_{19}$/PAA hydrogels with different BaFe$_{12}$O$_{19}$ nanoparticle loadings.

S4. Strain Sensing of BaFe$_{12}$O$_{19}$/PAA Hydrogel at Cycle of 1-10.

*Fig. S4* Resistance variation of BaFe$_{12}$O$_{19}$/PAA hydrogel with a BaFe$_{12}$O$_{19}$ nanoparticle loading of 0.3 wt% under cyclic compression with a strain up to 40% at cycles of 1-10.
S5. Measurement set-up for BaFe$_{12}$O$_{19}$/PAA Hydrogel.

**Fig. S5** Electrochemical impedance spectroscopy (EIS) measurement set-up of BaFe$_{12}$O$_{19}$/PAA hydrogel.

**Fig. S6** Nyquist plots of MBA/PAA hydrogel and BaFe$_{12}$O$_{19}$/PAA hydrogel with BaFe$_{12}$O$_{19}$ nanoparticle loading of 0.3 wt%.

S6. Schematic of Strain Sensing Measurement

**Figure S7** Schematic of the strain sensing measurement.