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An X-State Solid-liquid Mixture with Unusual Mechanical Properties by Water and Coordination Polymer Nanosheets Nanoarchitectonics

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Table S1. Illustration of mechanical characteristics of liquid-solid mixtures. The content of the liquid phase in the mixture decreases from the top rows to the bottom rows.

		Deformation characteristic	Elastic modulus	Type
Content of continuous liquid phase	Sol	Fluidic (*i.e.*, shear thining)	N/A	Liquid-like
	Slurry	Fluidic (*i.e.*, shear thining)	N/A	Liquid-like
	Dough	Fluidic (*i.e.*, Bingham plastic)	N/A or very low	Liquid-like
	X-state	?	?	?
	Solid	Elastic	High	Solid-like

Fig. S1

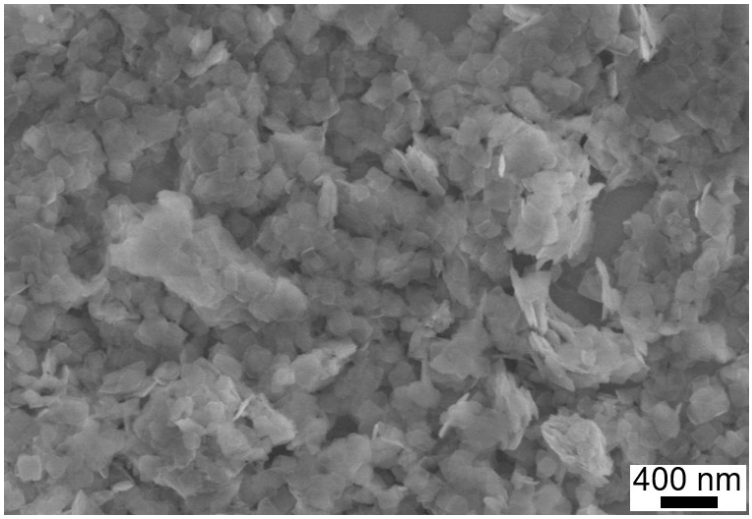

Fig. S1 SEM image of the $Ni(H_2O)_2[(Ni(CN)_4]\cdot H_2O$ nanosheets.

Fig. S2

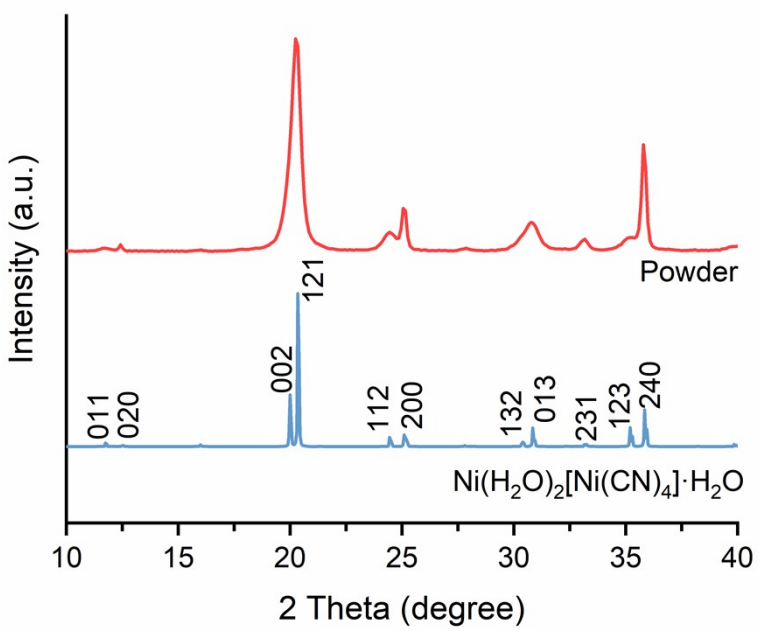

Fig. S2 Powder XRD profile of the $Ni(H_2O)_2[(Ni(CN)_4]\cdot H_2O$ nanosheets.

Fig. S3

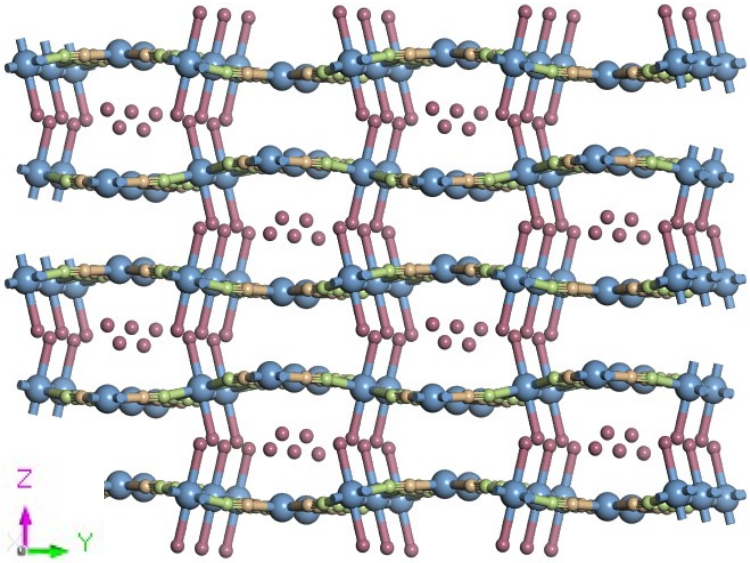

Fig. S3 Illustration for L_1 phase. Coordinated water molecules from different layers remain linked through aquo bridges. Along the x axis, the layers are stacked according to out-of-phase waves in order to minimize the interlayer region free space.

Fig. S4

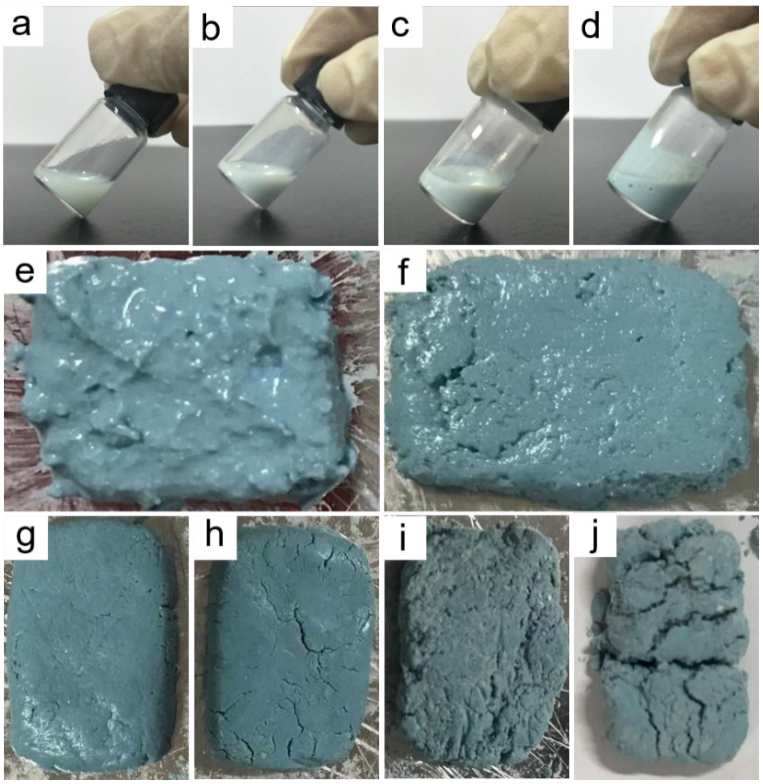

Fig. S4 Photos of the nanosheets/water mixtures with varied concentration of the solids. (a) 20 mg/mL (liquid). (b) 50 mg/mL (liquid). (c) 200 mg/mL (liquid). (d) 500 mg/mL (liquid). (e) 800 mg/mL (slurry). (f) 1000 mg/mL (slurry). (g) 1200 mg/mL (dough). (h) 1500 mg/mL (dough). (i) 1800 mg/mL (dough). (j) 2000 mg/mL (dough).

Fig. S5

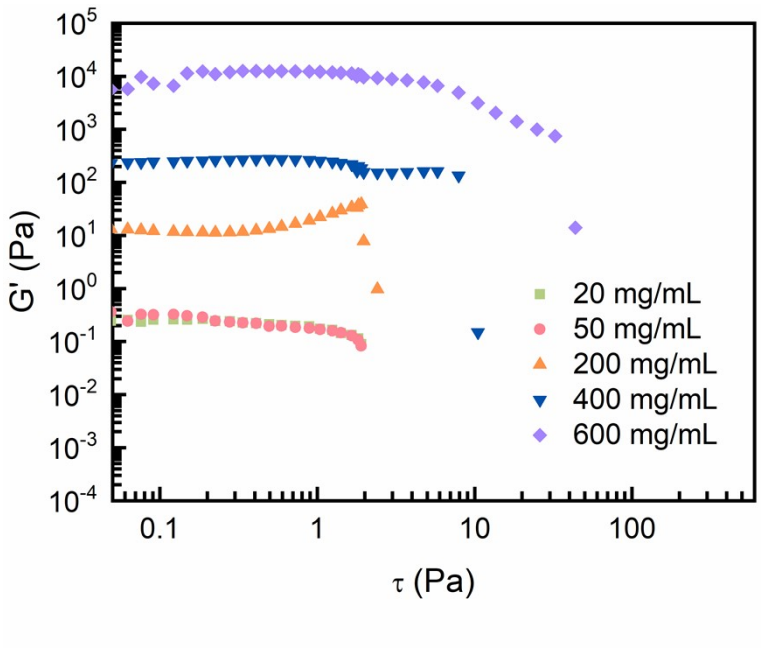

Fig. S5 Rheological diagram of the water/nanosheets mixtures with varied concentration of the solids. (from liquid to slurry states).

Fig. S6

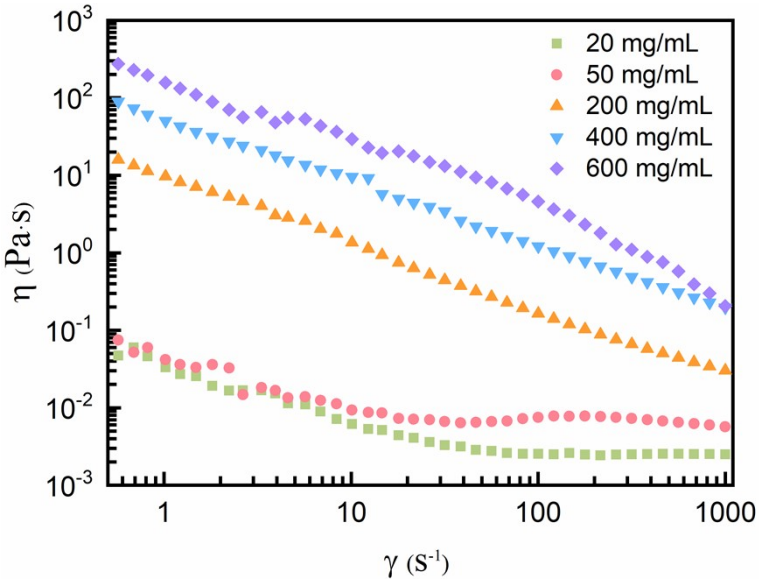

Fig. S6 Viscosity versus shear strain rate curves of the water/nanosheets mixtures with varied concentration of the solids (from liquid to slurry states).

Fig. S7

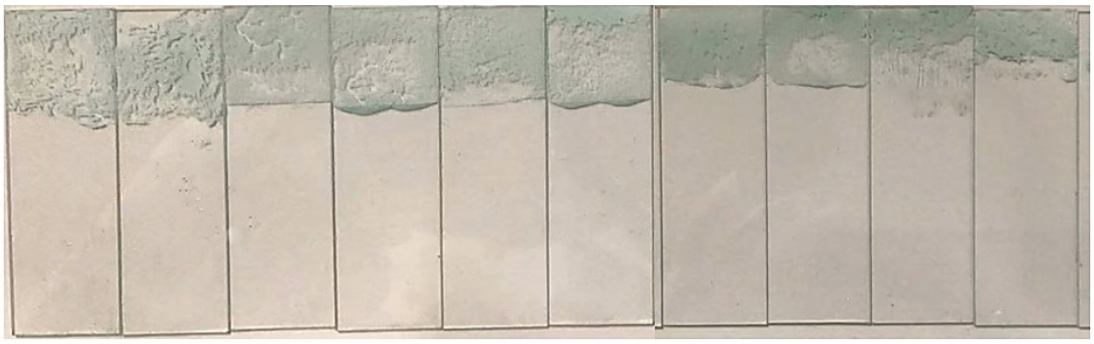

Fig. S7 Photograph of the glass sides after shear tensile tests.

Fig. S8

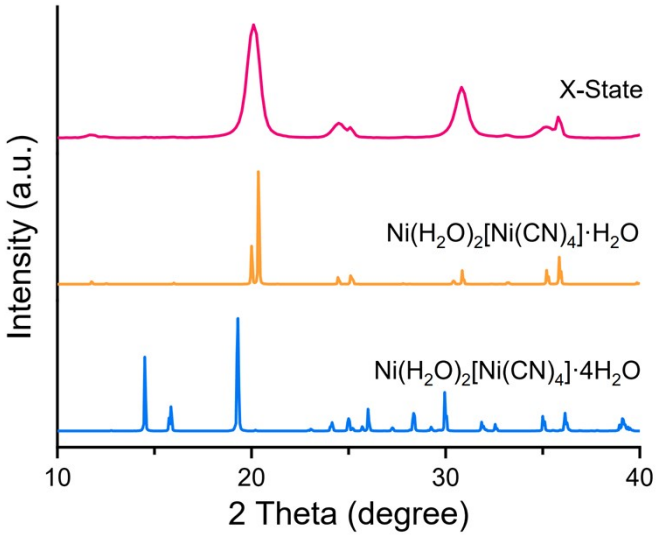

Fig. S8 XRD profile of the X-state sample.

Fig. S9

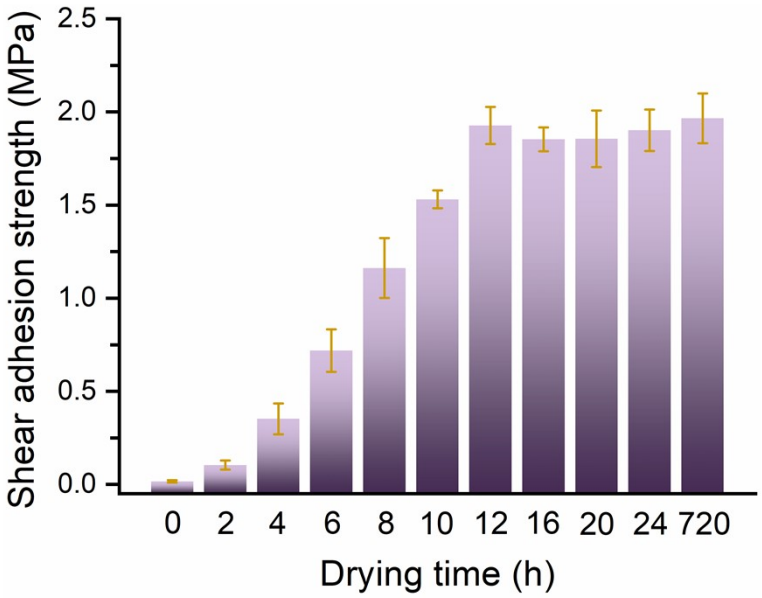

Fig. S9 Time course shear adhesion strength change during natural drying of the dough sample. The initial samples are dough state samples. The evaporation condition is at ambient condition (25 ^{o}C, 40% RH) in a constant chamber.

Fig. S10

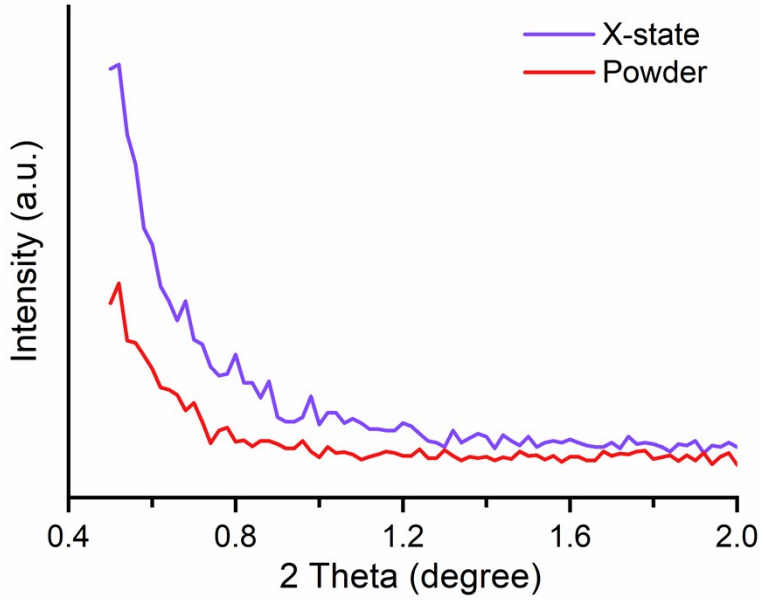

Fig. S10 Small-angle X-ray diffraction profiles of the X-state and powder samples.

Fig. S11

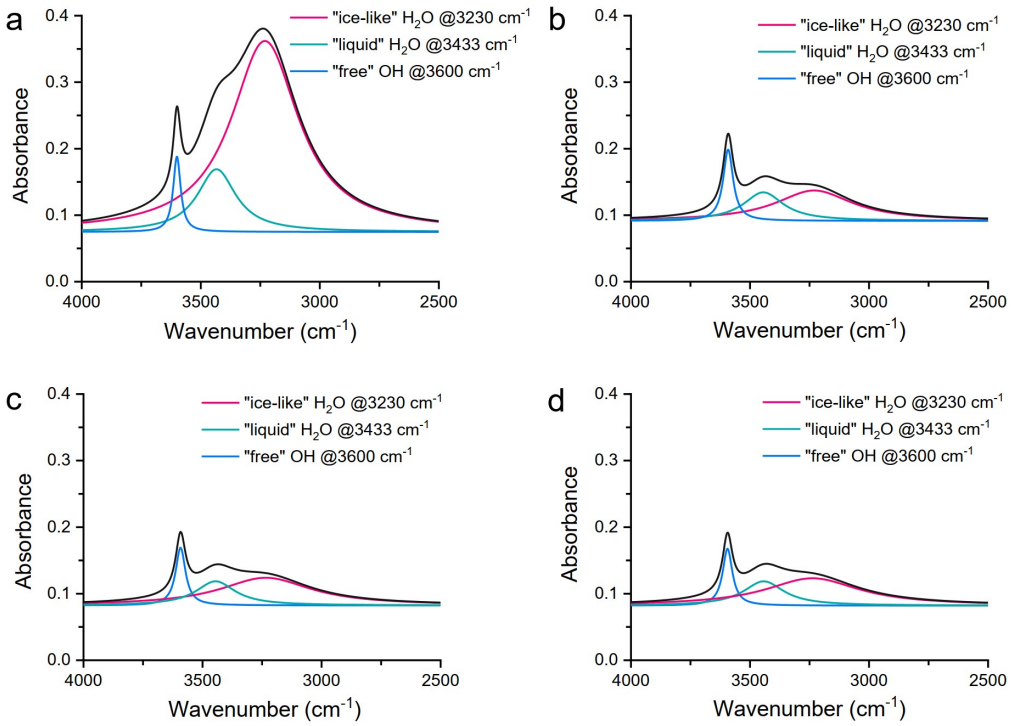

Fig. S11 IR spectra of the samples during the evaporation process (from the dough-state to X-state). (a) 0 h. (b) 4 h. (c) 8 h. (d) 12 h.

Fig. S12

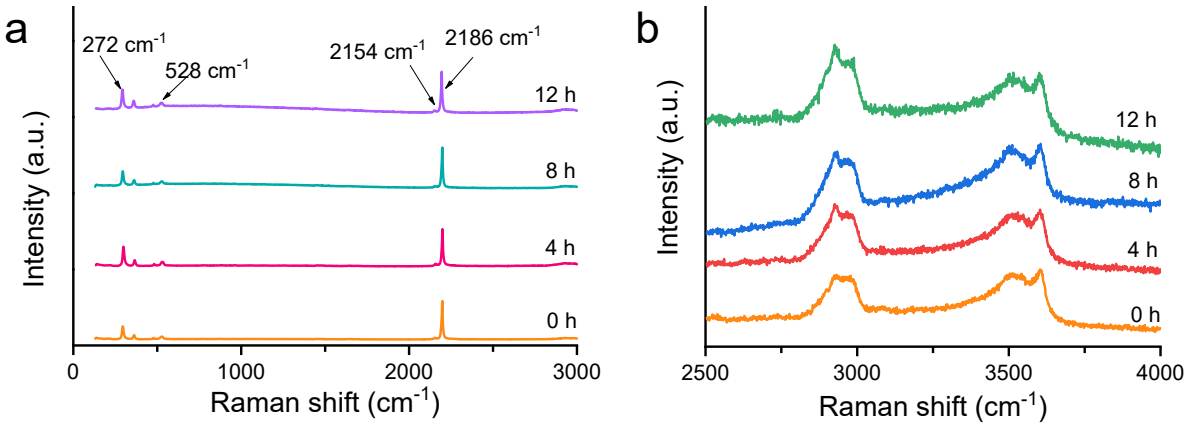

Fig. S12 Raman spectra of the samples during the evaporation process (from the dough-state to X-state). (a) 0~3000 cm^{-1}. (b) 2500~4000 cm^{-1}.

Fig. S13

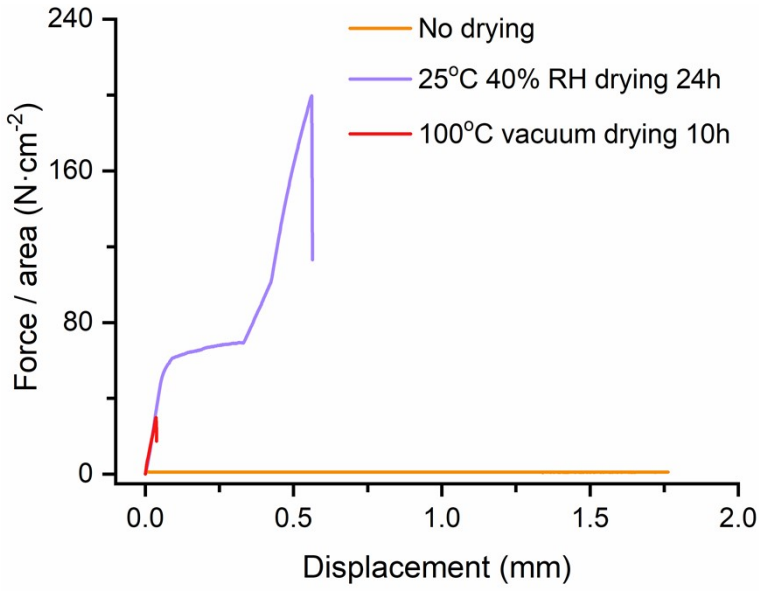

Fig. S13 Comparison of the force−displacement curves of dough state sample, and the other samples dried under different conditions.

Fig. S14

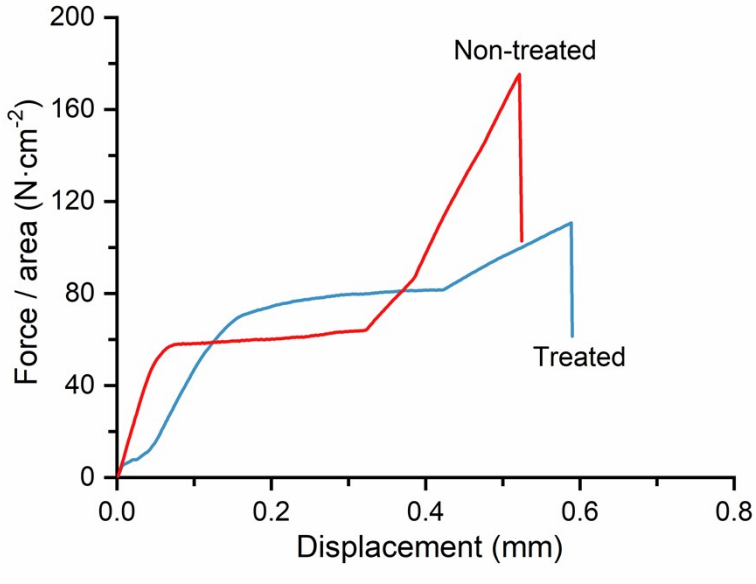

Fig. S14 Force−displacement curves of the X-state sample sandwiched between Si plates with and without HF treatment.

Fig. S15

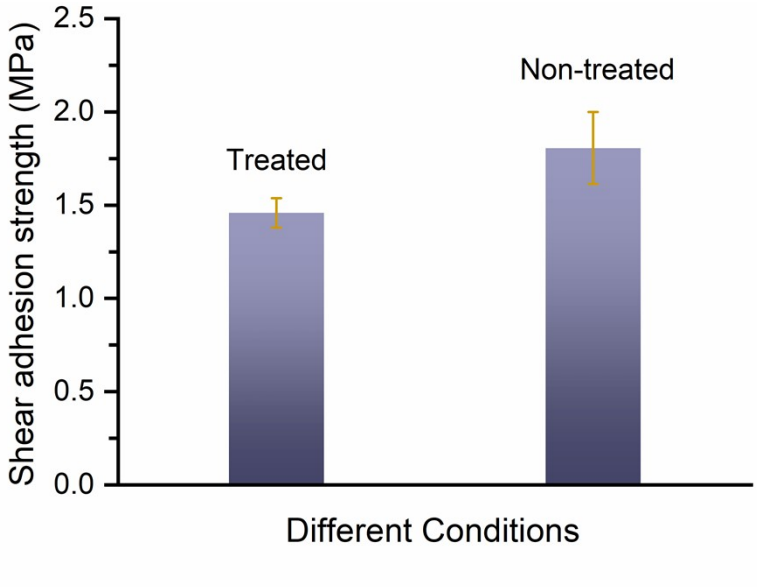

Fig. S15 Shear adhesion strength of the X-state samples sandwiched between Si plates with and without HF treatment.

Fig. S16

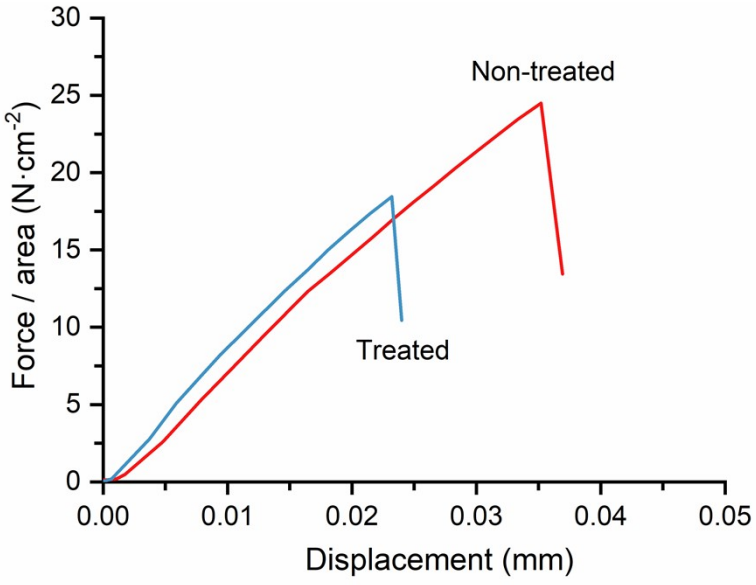

Fig. S16 Force−displacement curves of the samples sandwiched between Si plates with and without HF treatment. The samples are dried from the X-state.

Fig. S17

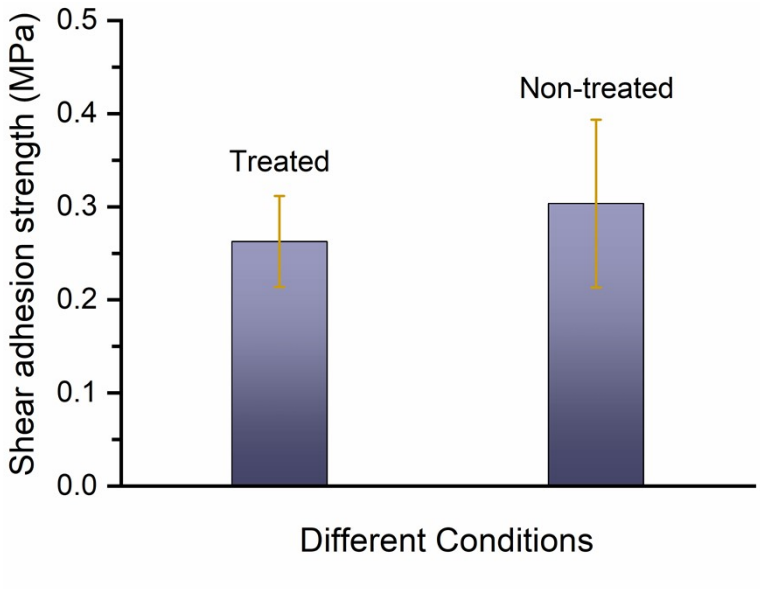

Fig. S17 Adhesion strength measured for solid using substrate with treatment and without HF treatment. The samples are dried from the X-state.

Fig. S18

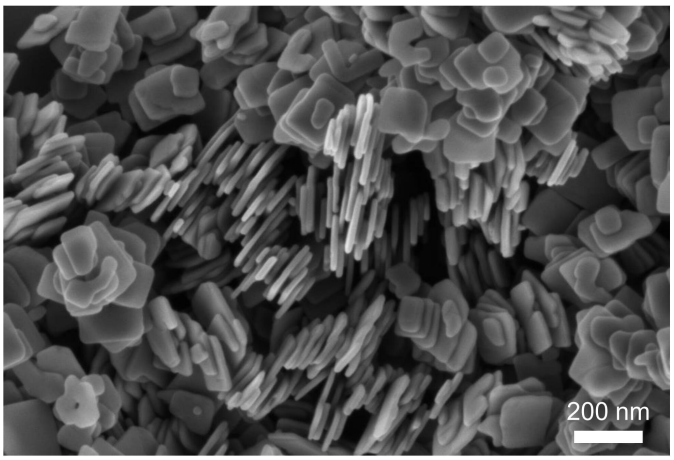

Fig. S18 SEM image of the TiO_2 nanosheets.

Fig. S19

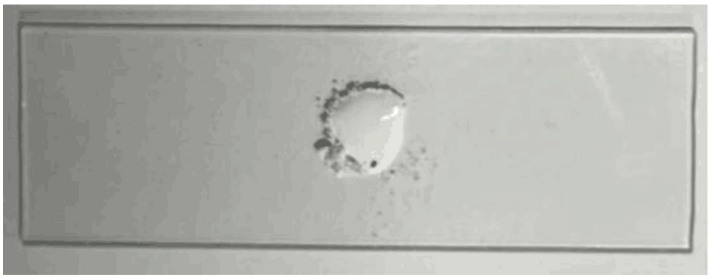

Fig. S19 Photo of the wet TiO_2 nanosheets.

Fig. S20

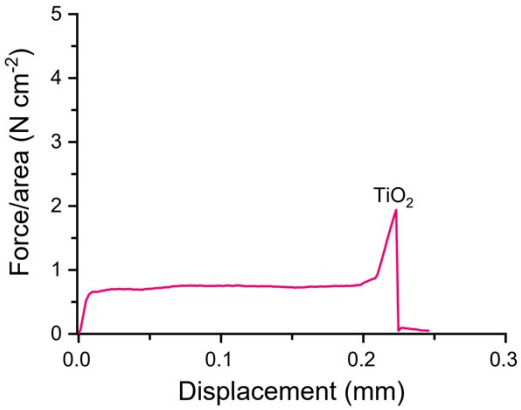

Fig. S20 Shear force vs displacement curve of the TiO_2 sample.

Fig. S21

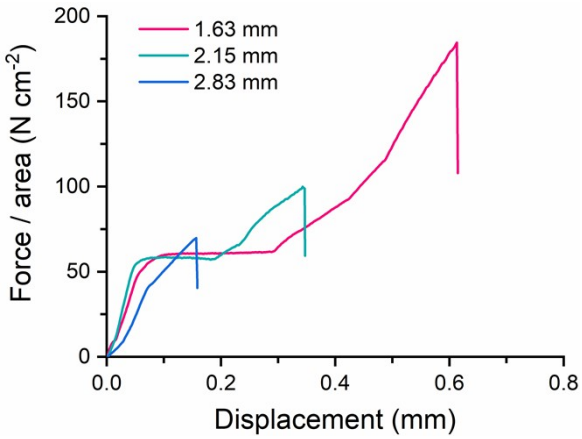

Fig. S21 Shear force vs displacement curves of the X-state samples with different thicknesses.

Fig. S22

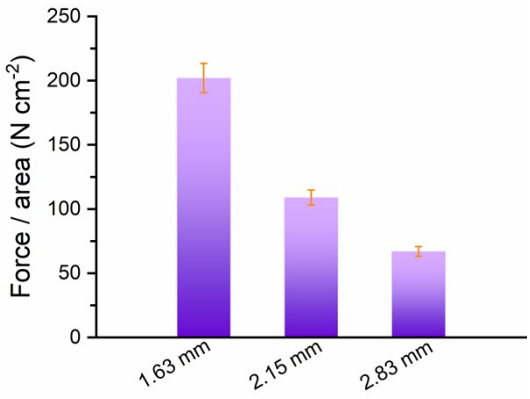

Fig. S22 Shear adhesion strength of the X-state samples with different thicknesses.