## **Supporting Information**

## Janus MXene Nanosheets for Macroscopic Assemblies

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Figure S1. (a,b) SEM images of PS microspheres under different magnifications; Inset in

(a) is DLS result showing the sizes of PS microspheres.



Figure S2. SEM image of MXene nanosheets on anodic aluminum oxide substrate.







Figure S4. Illustration of the interaction between AFM probe tip and the surface of MXene

(a) or JMN (b,c) when the probe tip scan across the sheets.



Figure S5. (a) FT-IR spectra and (b) TGA curves of positively charged PS microspheres,



MXene, and JMN.

**Figure S6**. (a) XPS survey spectra of positively charged PS, MXene and JMN. (b) N 1s high resolution spectra of positively charged PS, positively charged PS /MXene, and JMN. Ti 2p spectra of (c) MXene and (d) JMN.



Figure S7. (a) The elasticity of the Janus film derived from the assembly of JMN at the

water-oil interface; (b) deformation of bare water-oil interface without JMN.



Figure S8. Contact angle of pristine MXene.



Figure S9. Corresponding height profile along the line makred in Figure 4a.



Figure S10. TEM image of Janus MXene nanofilm.



Figure S11. Photograph of Janus MXene nanofilm floating on water surface.



Figure S12. Optical image of w/o emulsion droplets after being settled for 7 days; the JMN

content is 0.02 wt%.



**Figure S13.** (a, b) SEM images of MXene aerogel prepared by Pickering emulsion with

0.04 wt% of JNS.