Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

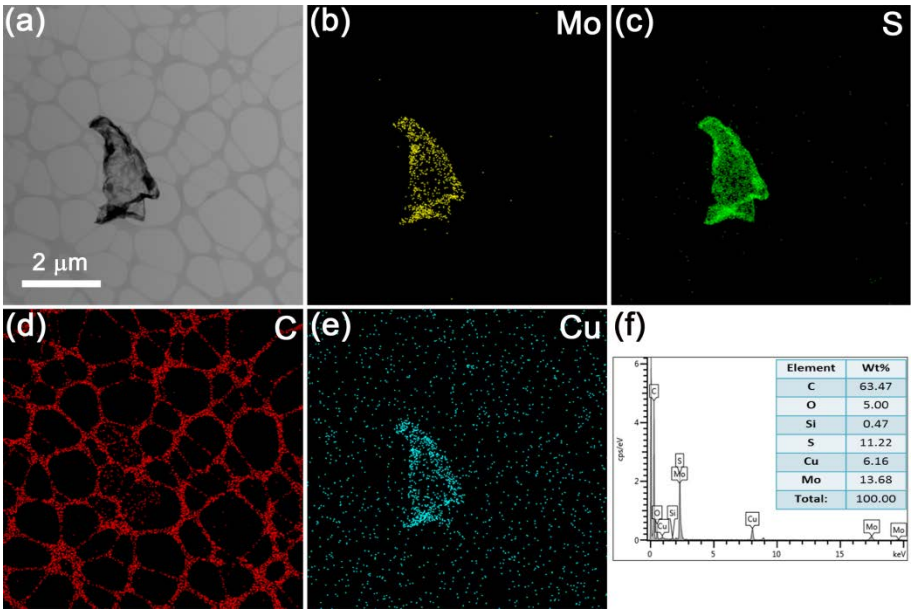

Figure S1. EDS of the MoS_2 membrane used in the experiments: (a) the SEM image; (b-e) the Mo, S, C, and Cu in the image; (f) the propagation of the elements in the image.

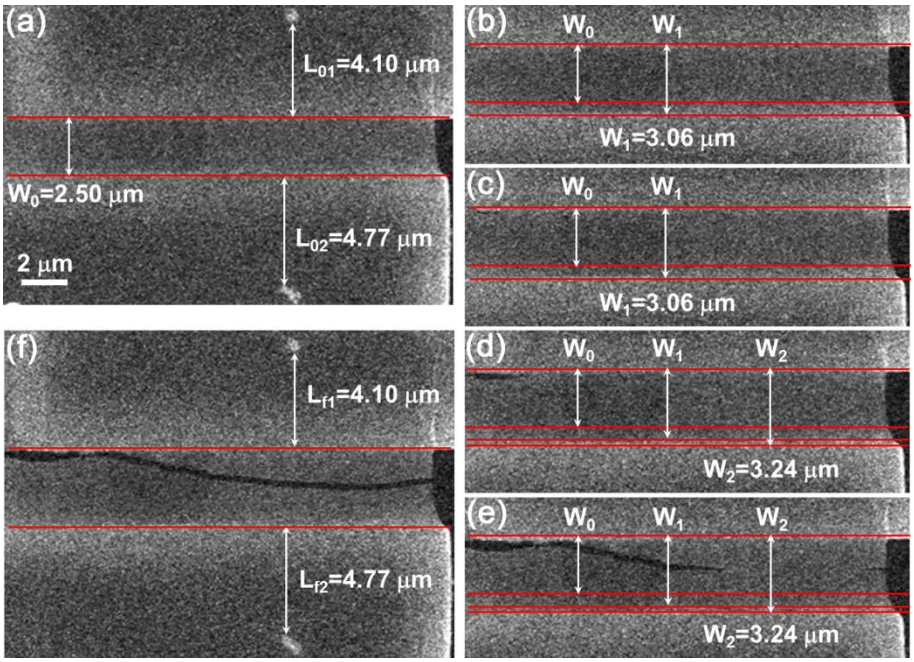

Figure S2. The whole process of the *in situ* SEM tensile test of the thicker MoS_2 membrane in Figure 2: (a) before the test, (b) before the initiation of the crack, (c) initiation of a crack, (d) before the sudden expansion of the crack, (e) before fracture, (f) after fracture.

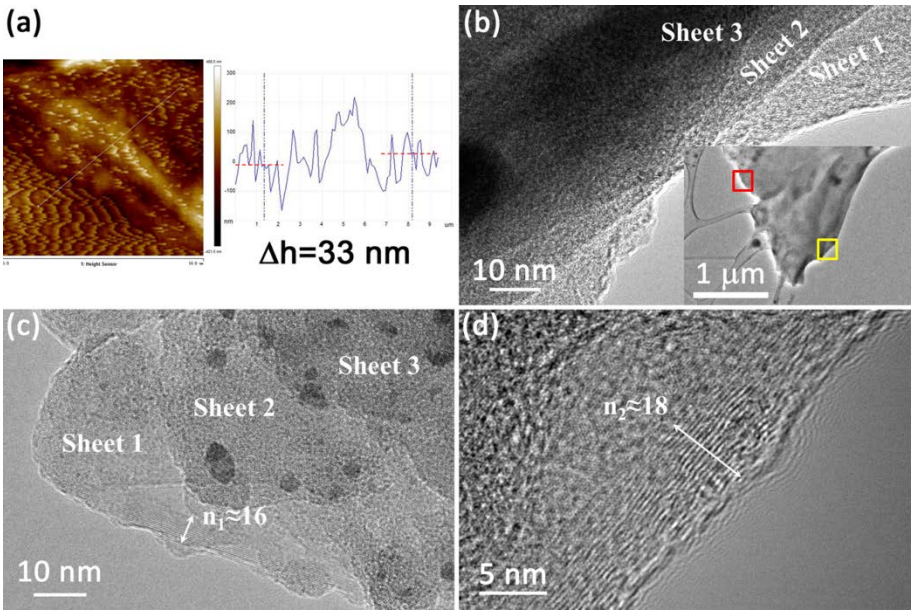

Figure S3. Thickness of the MoS_2 nanosheet in Figure 3: (a) AFM image of the nanosheet, (b-d) TEM images of the nanosheet. The inset in (b) shows the low magnification TEM image of the nanosheet, (c) is the high magnification TEM image of the red region and (b,d) are the high magnification TEM images in the yellow region.

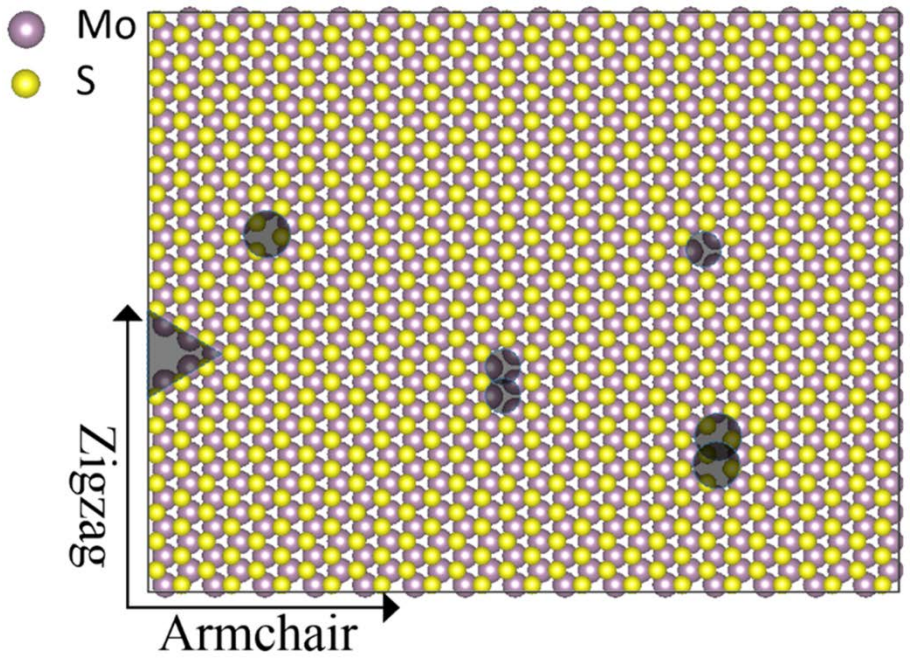

Figure S4. Defect arrangement for MoS_2 nanosheets in MD simulation.

Supplementary Video S1. Fracture of a MoS_2 nanosheet under in situ SEM tensile loading.