

## Electronic Supplementary Information

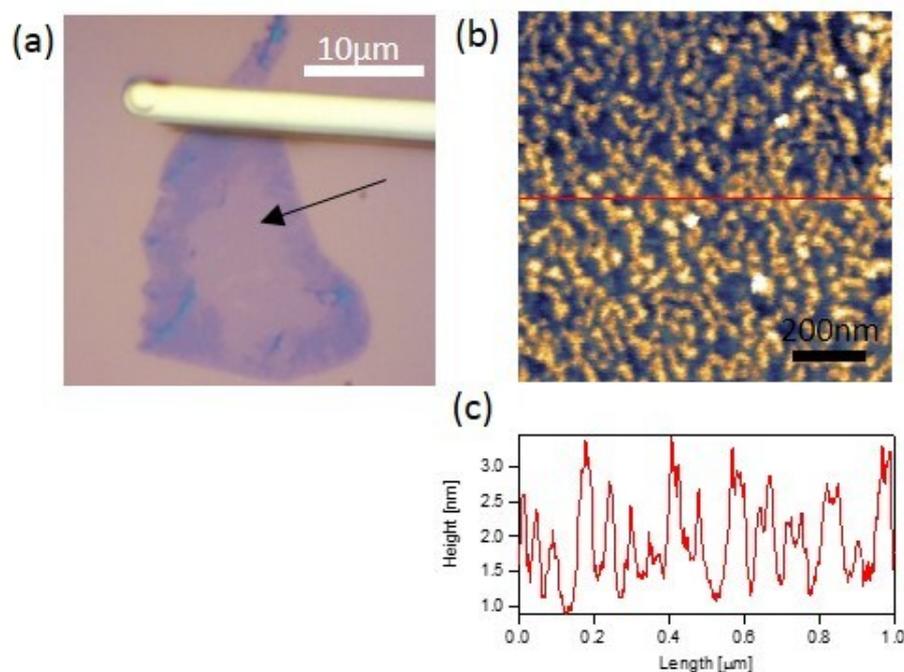
### Laser-induced electrochemical thinning of MoS<sub>2</sub>

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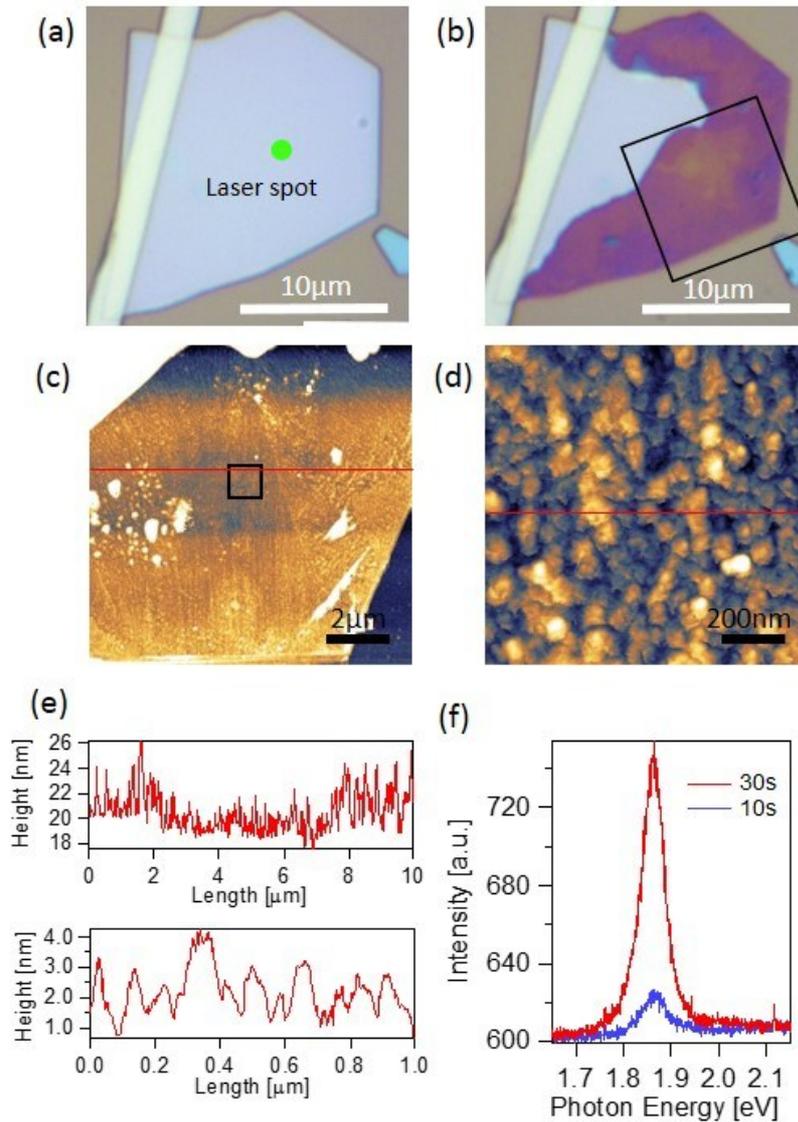
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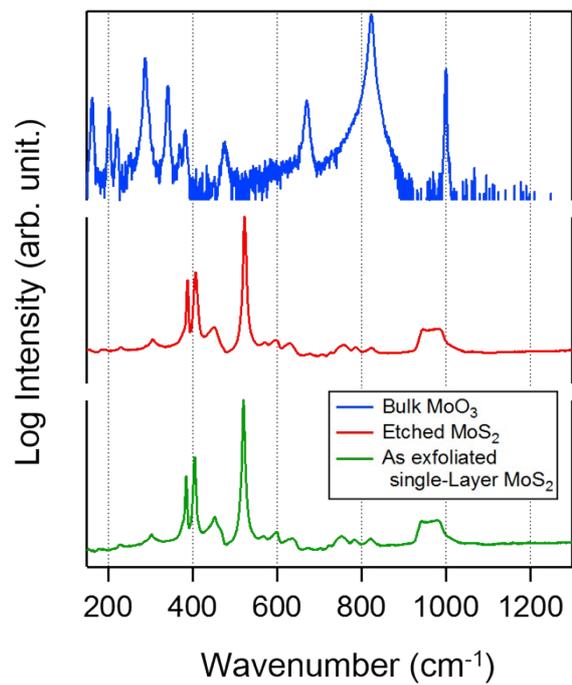
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**Fig. S1** (a) An optical image of MoS<sub>2</sub> flake after laser thinning. (b) An AFM image of etched MoS<sub>2</sub> surface. The location of this image is indicated in (a) by an arrow. (c) A cross-sectional line profile of the AFM image (b). The location is indicated by the red line in (b).



**Fig. S2** (a) and (b) Optical images of MoS<sub>2</sub> flakes before and after the laser thinning, respectively. The etching time was 30 seconds. (c) An AFM image of the etched surface. The location is indicated as a square in (b). (d) A magnified AFM image indicated as a square in (c). (e) Cross-sectional line profiles of (c) and (d), respectively. Their locations are indicated by red lines. (f) PL spectra of the MoS<sub>2</sub> during the laser thinning process. Blue and red curves shows PL spectra at 10 and 30 second exposure time, respectively. This result shows the etched surface made with relatively short exposure time of 30 seconds. While the region of single layer in (b) is limited at the vicinity of the laser spot, the etched surface after 30-minute exposure time shown in the main text exhibits a large area of single layer MoS<sub>2</sub>. It indicates that the horizontal etching process takes long time to spread from the laser spot, while the vertical etching under the laser spot is carried out in a short time.



**Fig. S3** Raman spectra of bulk MoO<sub>3</sub> (blue), etched MoS<sub>2</sub> (red) and as exfoliated single-layer MoS<sub>2</sub> (green).