Supporting Information

Self-Limiting Opto-Electrochemical Thinning of Transition Metal Dichalcogenides

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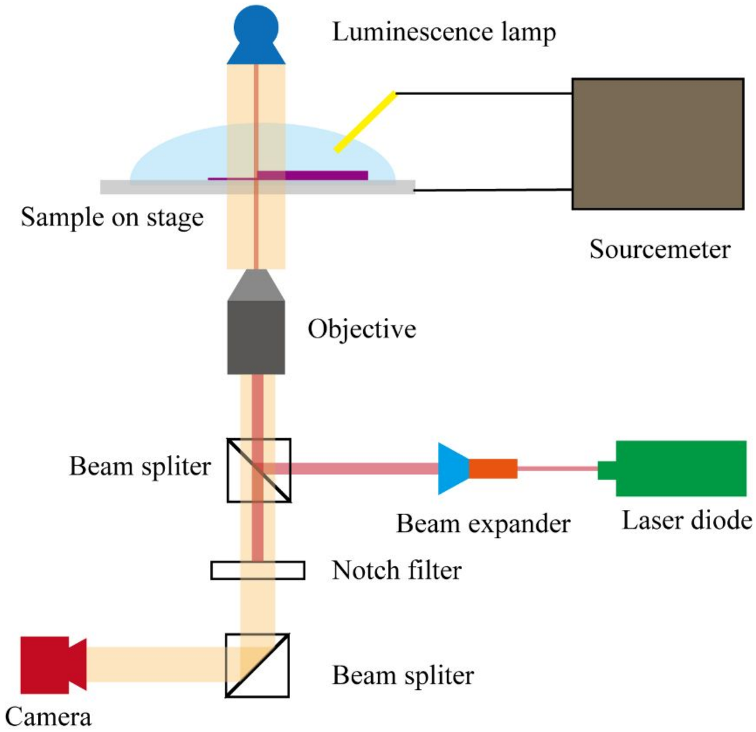

Figure S1. Schematic showing the experimental setup of sOET.

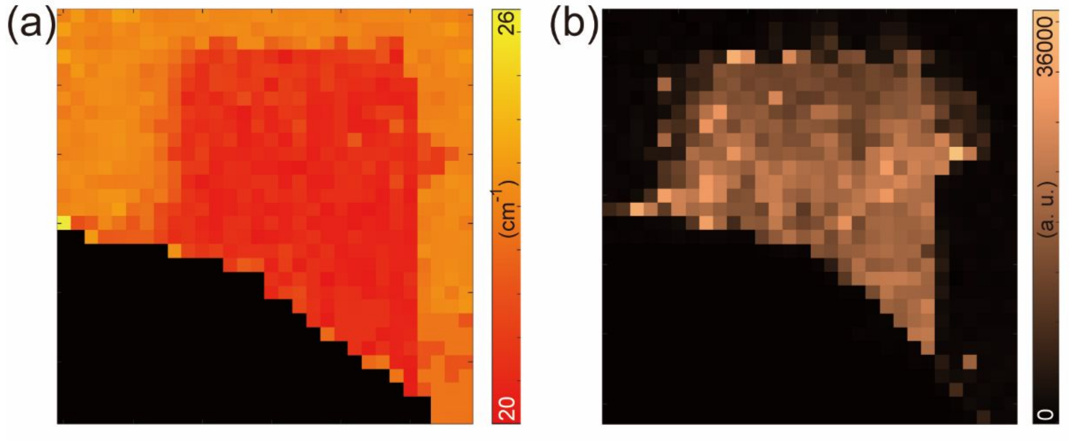

Figure S2. Raman scattering and PL mapping of the thinned MoS_2 in Figure 1. (a) Spatial mapping of the Raman frequency distance between E^1_{2g} mode and A_{1g} mode of MoS_2. (b) Spatial mapping of the integrated PL intensity from 600 nm to 750 nm. Both the reduced Raman frequency distance of ~ 20.5 cm^{-1} and enhanced PL intensity indicate the monolayer feature in the laser scanned area.

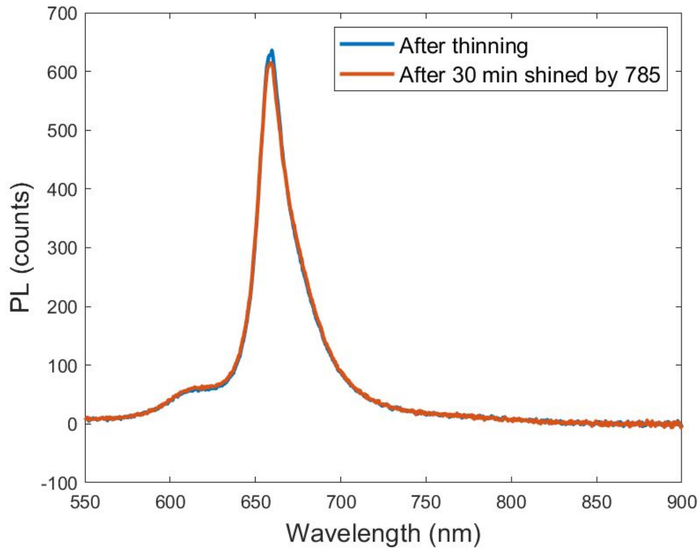

Figure S3. PL spectra of the thinned MoS_2 before and after laser excitation of 30 min. No obvious difference in the PL intensity was observed.

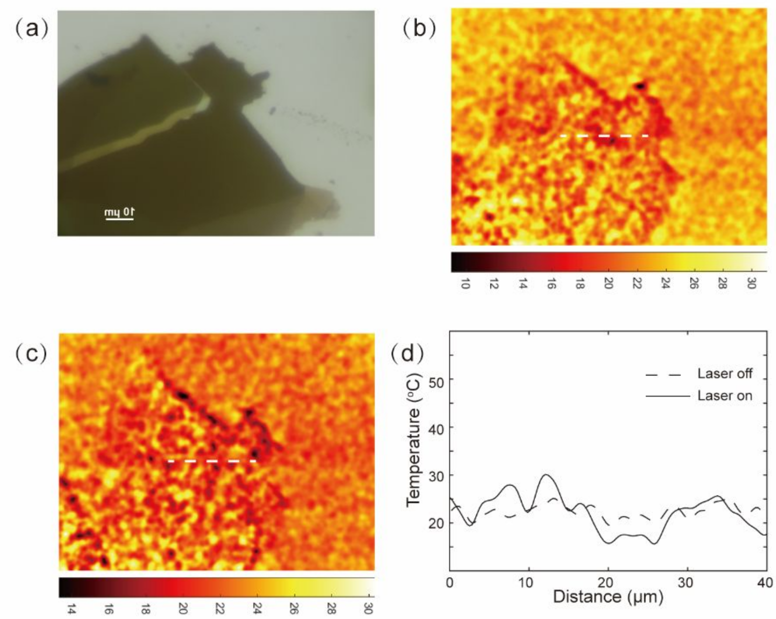

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Figure S4. Temperature increase induced by a 0.102 mW μm^2 785 nm lasers irradiation on a MoS_2 flake in DI water. (a) Optical image of the MoS_2 flake; (b) Background temperature distribution when the laser was off, the ambient temperature was ~22 ^oC; (c) Temperature distribution when a 785 nm laser was directed on the MoS_2 flake.(d) Cross-sections of the temperature distribution with the laser off/on made at the white dashed line in (b) and (c). Scale bar: 10 μm.

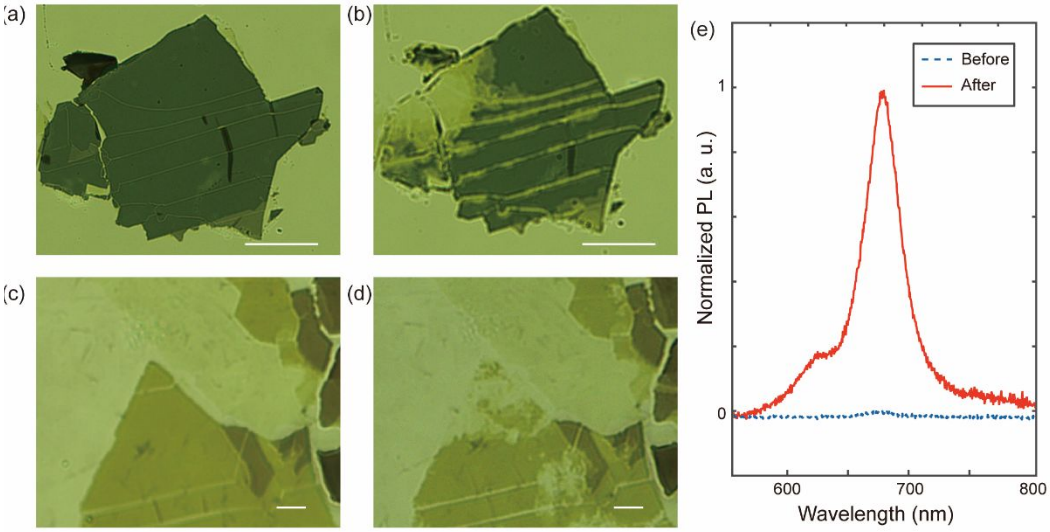

Figure S5. Thinning of MoS_2 on thin gold film and graphene with no bias. a-b) Optical images of a MoS_2 flake on 5 nm gold film before (a) and after (b) illuminated by a 0.256 mW μm^{-2} 785 nm laser for 30 s in DI water. c-d) Optical images of a MoS_2 flake on monolayer graphene (glass substrate) before (c) and after (d) illuminated by a 0.257 mW μm^{-2} 785 nm laser for 30 s DI water. Even without applying bias, the thickness of the multilayer MoS_2 was reduced. (e) PL spectra before (blue dashed) and after thinning. Scale bars are 25 µm.

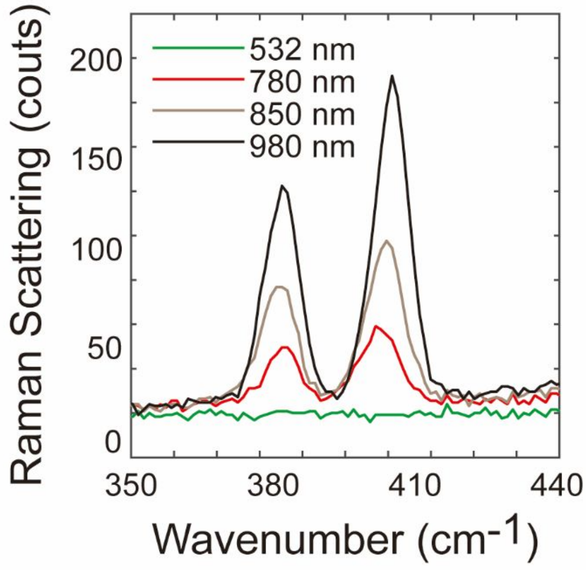

Figure S6. Raman spectra of MoS_2 flakes after scanning by different lasers.

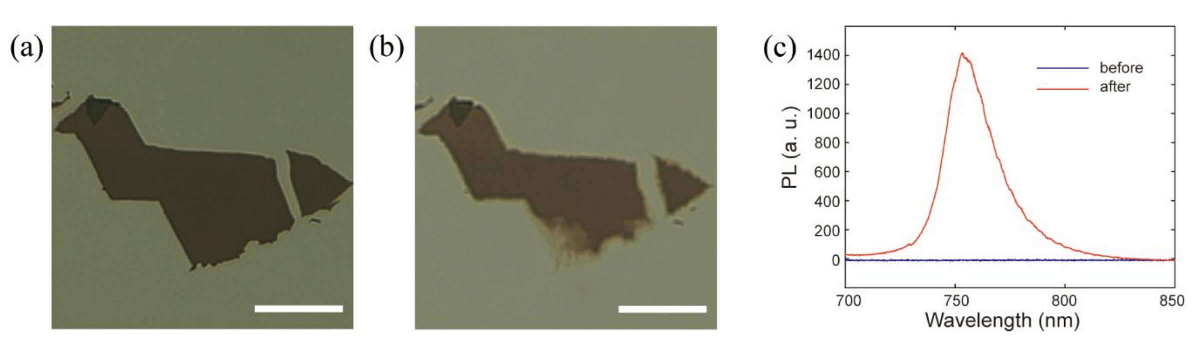

Figure S7. sOET of WSe_2. (a) Optical image of the WSe_2 flake before thinning. (b) Optical image of the WSe_2 flake after thinning. (c) PL spectra before and after thinning. Scale bars are 10 μm.