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SUPPORTING INFORMATION

Synthesis of large area crystalline MoS₂ by sputter deposition and pulsed laser annealing

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• AFM – Si substrate:

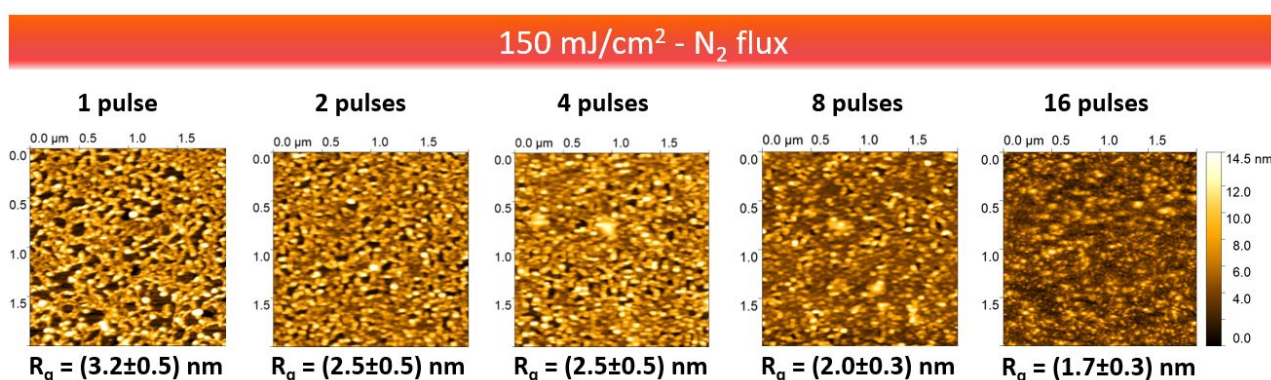


Figure S1: AFM maps of the MoS₂ films after performing laser annealing with energy density fixed at 150 mJ/cm² and varying the number of laser pulses from 1 to 16 (processes performed under N₂ flux). The images size is 2×2 μm². The surface roughness R_q is reported below each image.

- Optical microscope image – 90 nm thick SiO_2 substrate:

As-deposited



ED = 100 mJ/cm²



ED = 150 mJ/cm²



ED = 200 mJ/cm²



ED = 250 mJ/cm²



Figure S2: Optical images of a sample deposited on 90 nm thick SiO₂-on-Si substrate and processed with a single laser pulse varying the laser energy density. All the samples were processed by applying N₂ flux over the sample surface. The images were acquired using a Thermo Fisher DXR2 confocal Raman microscope operated with a 100× objective. The image size is 53 × 71 μm².

- Raman spectra after device processing:

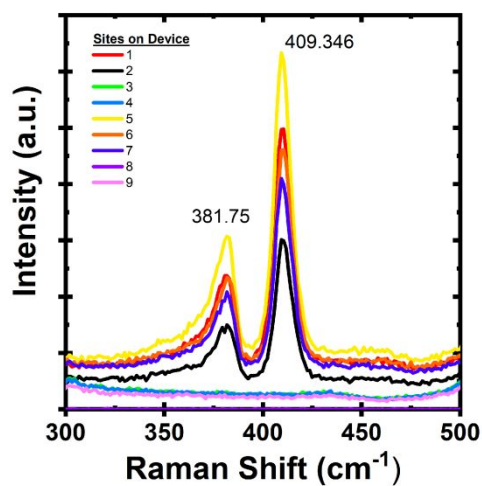
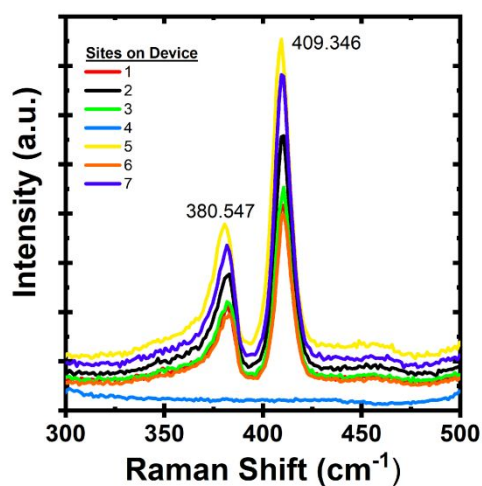


Figure S3: Representative Raman spectra from the MoS₂ films deposited on SiO₂/Si after device processing: laser annealing of (a) 1 and (b) 4 pulses at 100 mJ/cm². On each sample, a number of tests were done on different sites around a device, MoS₂ in the middle of the channel to the MoS₂ around the metal contacts.

- FET leakage currents:

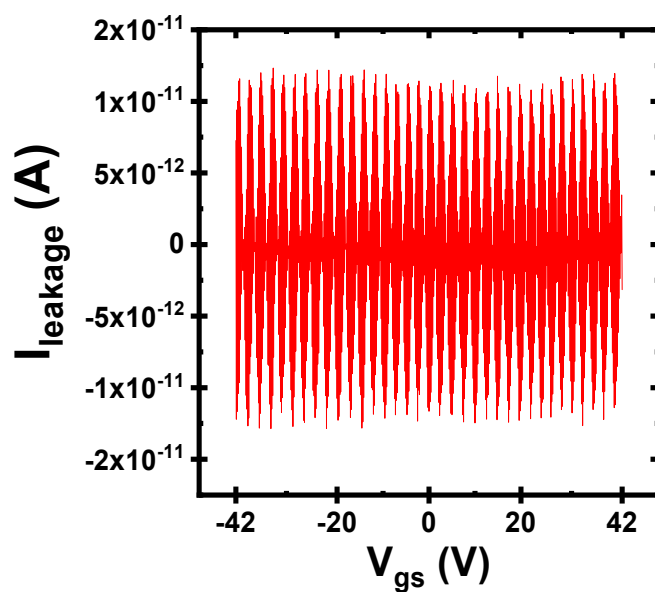


Figure S4: Representative I_{gs} plots from the back-gate contact.