Electronic Supplementary Material (ESI) for Nanoscale Advances.

Supporting Information

Modulation of electrical properties in $MoTe_2$ by XeF_2-mediated surface oxidation

Eunji Ji,[1,*] Jong Hun Kim,[1,4,5,*] Wanggon Lee,[2] June-Chul Shin,[4] Hyungtak Seo,[3] Kyuwook Ihm,[6] Jin-Woo Park,[1] Gwan-Hyoung Lee[4,5,7,8]

[1] Department of Material Science and Engineering, Yonsei University, Seoul, 03722, Korea

[2] Department of Energy Systems Research, Ajou University, Suwon 16499, Republic of Korea

[3] Department of Materials Science and Engineering, Ajou University, Suwon 16499, Republic of Korea

[4] Department of Materials Science and Engineering, Seoul National University, Seoul 08826, Korea

[5] Research Institute of Advanced Materials (RIAM), Seoul National University, Seoul 08826, Korea

[6] Department of Physics and Pohang Accelerator Laboratory, Pohang University of Science and Technology, 37673, Pohang, Korea

[7] Institute of Engineering Research, Seoul National University, Seoul 08826, Korea

[8] Institute of Applied Physics, Seoul National University, Seoul 08826, Korea

[*] These authors contributed equally: Eunji Ji, Jong Hun Kim

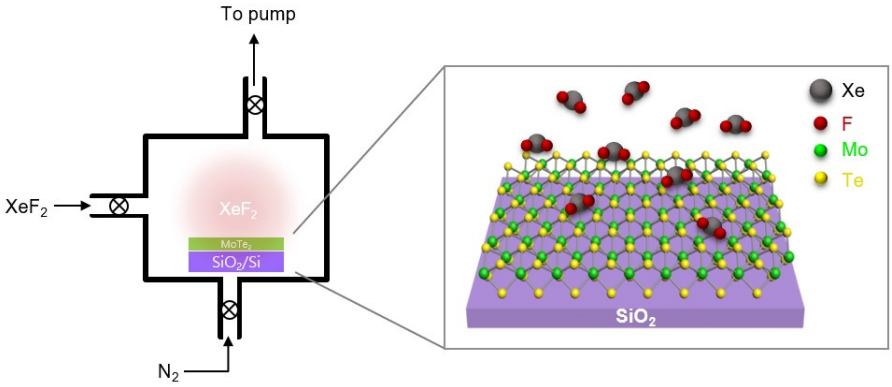

Fig. S1 The schematic image of MoTe2 etching process in the chamber

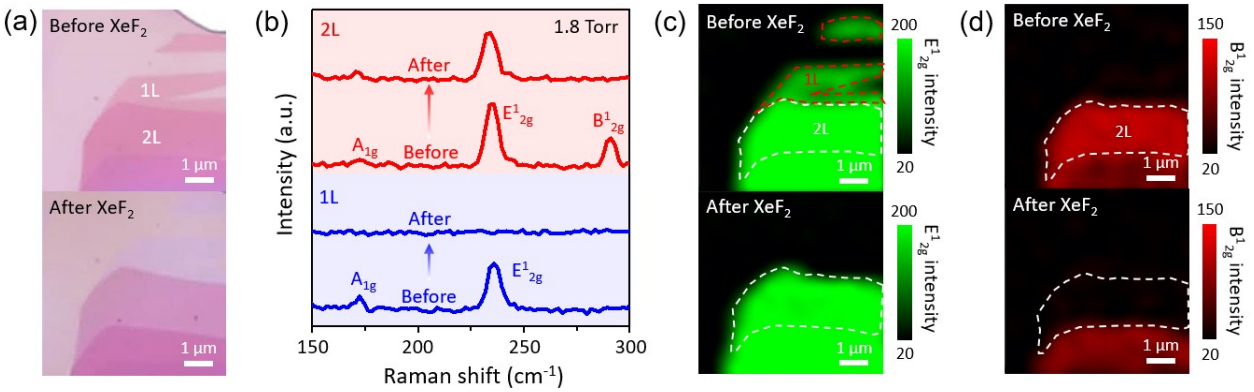

Fig. S2 (a) The optical microscopic images of $MoTe_2$ before and after XeF_2 exposure under 1.8 Torr for 60 s (b) The Raman spectra of $MoTe_2$ in mono- (blue colored region) and bi- (red colored region) layer before and after XeF_2 exposure (c) The intensity mapping of E^1_{2g} before and after XeF_2 exposure (d) The intensity mapping of B^1_{2g} before and after XeF_2 exposure

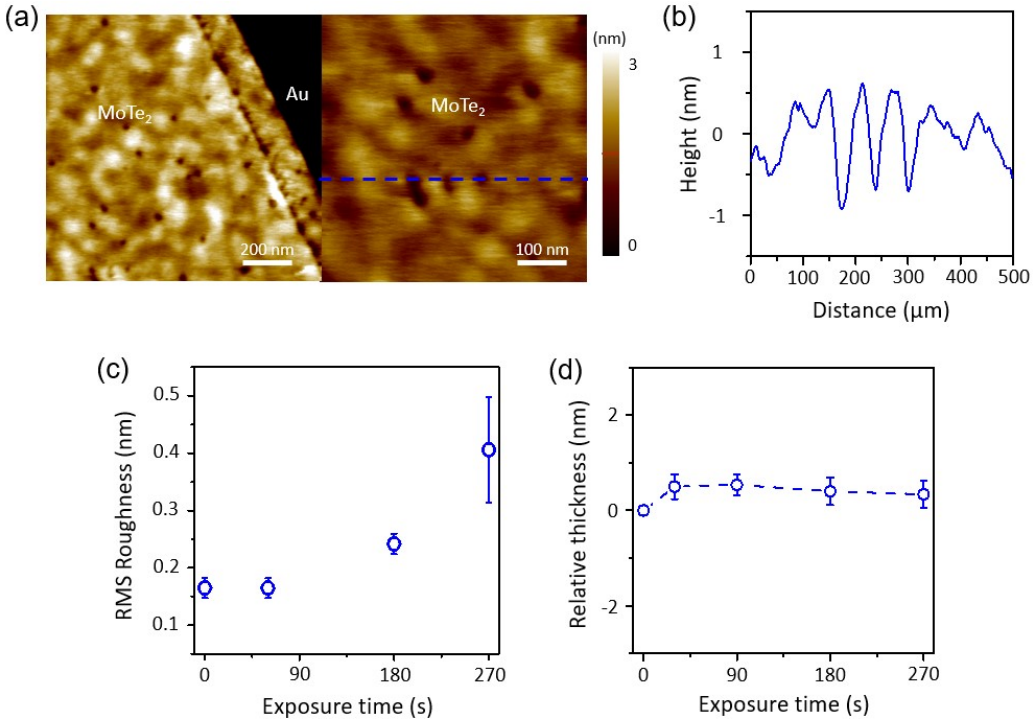

Fig. S3 (a) The AFM topology images of $MoTe_2$ after XeF_2 treatment under 1.0 Torr for 60 s (b) Height profile of XeF_2 treated $MoTe_2$ after XeF_2 treatment under 1.0 Torr for 60 s (blue dashed line in Fig. S3a) (c) The root-mean-square (RMS) roughness of XeF_2 treated $MoTe_2$ under 1.0 Torr according to XeF_2 exposure time (d) the etching depth rate as a function of increasing XeF_2 treatment under 1.0 Torr

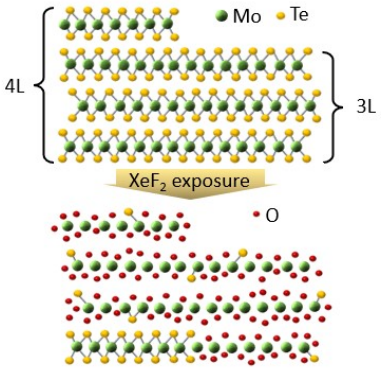

Fig. S4 Schematic image of $MoTe_2$ before and after XeF_2 exposure

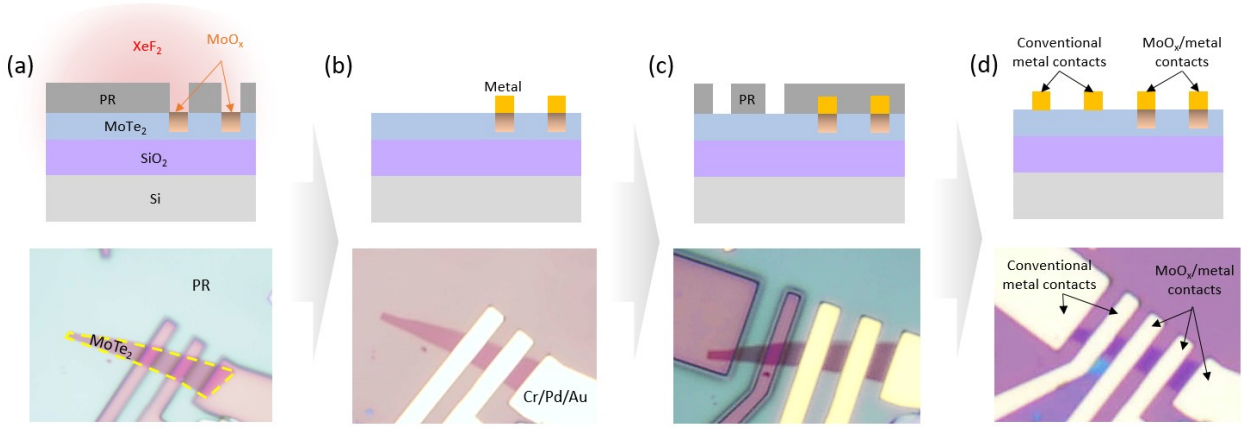

Fig. S5 Optical microscope image of $MoTe_2$ FETs and fabrication steps in order: (a) the PR-exposed $MoTe_2$ area was removed to fabricate thin oxidation layer by XeF_2 exposure for 60 s. (b) Metal (Cr/Pd/Au) was deposited on $MoO_x/MoTe_2$ as a contact. (c) the PR-exposed $MoTe_2$ area was removed and there was no any XeF_2 treatment at all. (d) Different metal contacts in same $MoTe_2$ flake