

Supporting Information

Anomalous oxidation and its effect on electrical transport originating from surface chemical instability in large area, few-layer 1T'-MoTe₂ film

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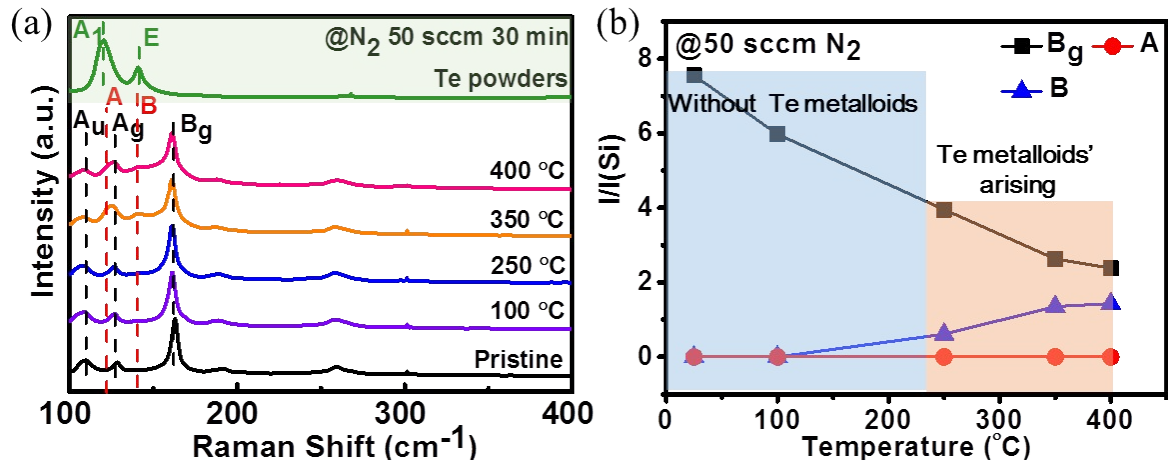


Figure S1. (a) Raman spectral evolution of the pristine and thermally processed few-layer 1T'-MoTe₂ films at the different elevated temperatures with the constant N₂ flow rate (50 sccm) for 30 min, respectively. (b) the corresponding intensity ratio of peak A (~123 cm⁻¹), B (~143 cm⁻¹) and B_g (~161 cm⁻¹) to the silicon Raman mode plotted as a function of process temperature.

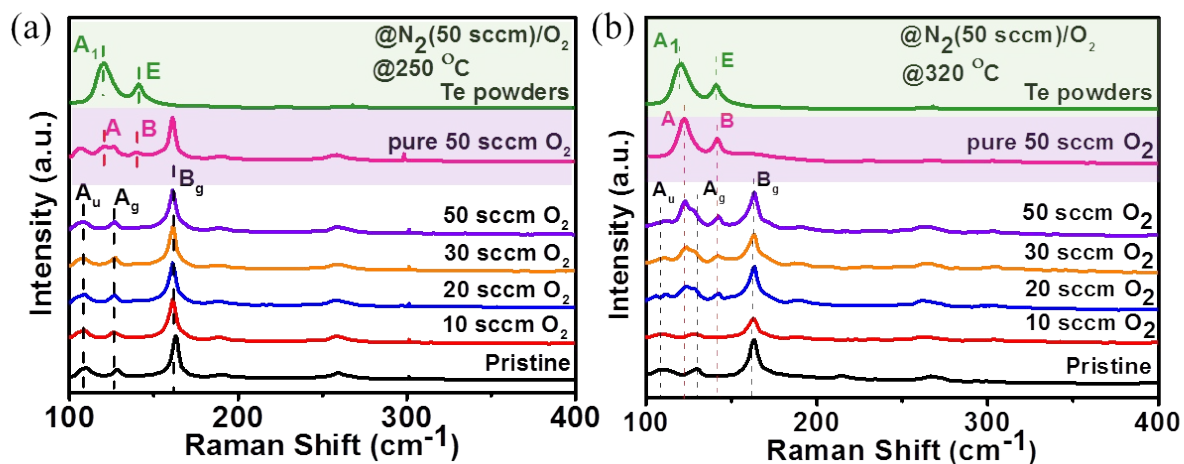


Figure S2. Raman spectral evolution of the pristine and thermal processed few-layer 1T'-MoTe₂ films at the different elevated temperatures by using the different O₂ gas flow rates (varying between 0, 10, 20, 30, and 50 sccm) diluted with a constant flow rates (50 sccm) of N₂ gas for 30 min at 250 °C (a) and 320 °C (b), respectively.

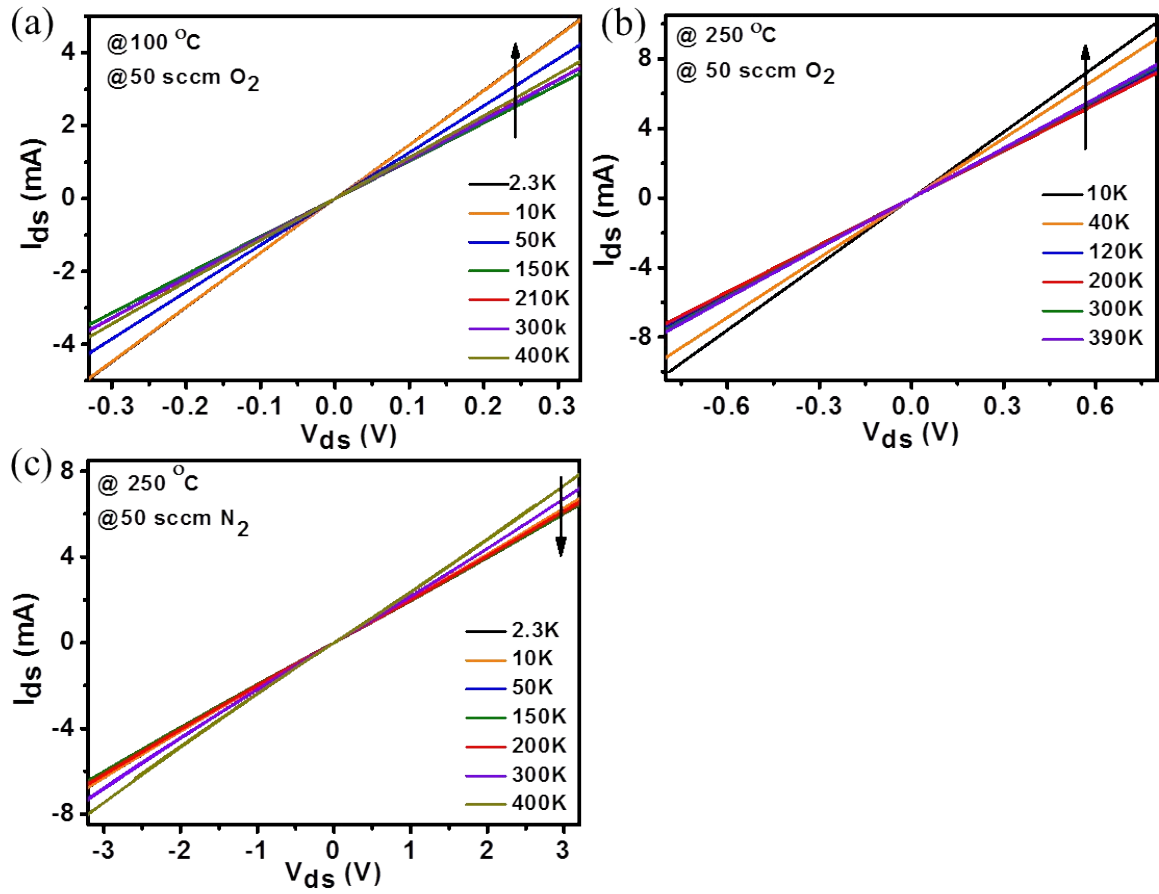


Figure S3. Typical temperature-dependent transport measurements of few-layer 1T'-MoTe₂ films after the different thermal treatments. (a) O₂ treatment with a constant flow rate (50 sccm) at 100 °C for 30 minutes. (b) O₂ treatment with a constant flow rate (50 sccm) at 250 °C for 30 minutes. (c) N₂ treatment with a constant flow rate (50 sccm) at 250 °C for 30 min.

Table S1. The full width at half maximum (FWHM) for Bg peak at $\sim 161\text{ cm}^{-1}$ of few-layer 1T'-MoTe₂ before and after the different thermal treatments from the Raman phonon band analysis.

Different thermal treatments	Pristine 1T'-MoTe ₂	Ambient conditions (several days)	100 °C 50 sccm O ₂ (30 min)	250 °C 50 sccm O ₂ (30 min)
FWHM (cm⁻¹)	4.226	4.398	4.413	4.404