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Supplementary Information

Electrical, Thermal and Thermoelectric Properties of $Ti_3C_2T_x$ Film: Uncovering the Significant Role of Water Molecules

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Fig. S1. TEM images of (a) $Ti_3C_2T_x$ nanosheets on 100 nm scale and (b) on a 20 nm scale. (c) High Resolution TEM image of $Ti_3C_2T_x$. The inset is the corresponding SAED pattern.

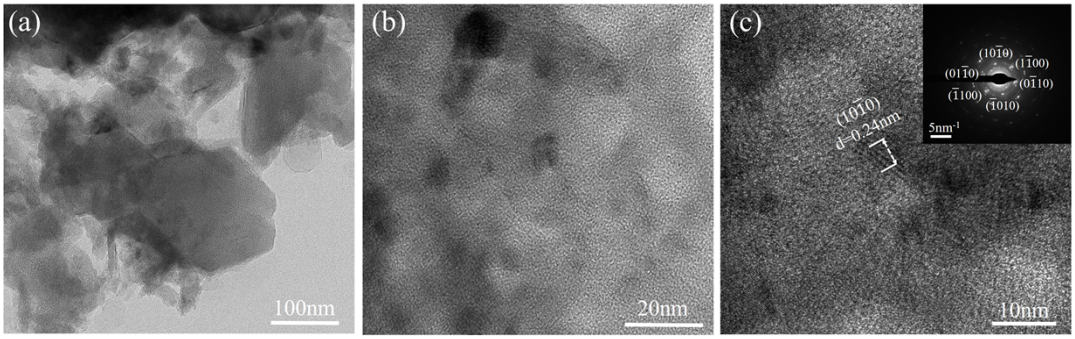

Fig. S2. (a) The resistance change of an unannealed sample under a 2 mA current during vacuum pumping and deflating. (b) Resistance change under a 7 mA current in vacuum for unannealed and annealed films. (c) Change in resistance of unannealed and annealed films at a small current (2 mA) after injecting dry nitrogen into the chamber. (d) Resistance change of unannealed and annealed films with 10 mA current after the cavity is filled with dry nitrogen gas.

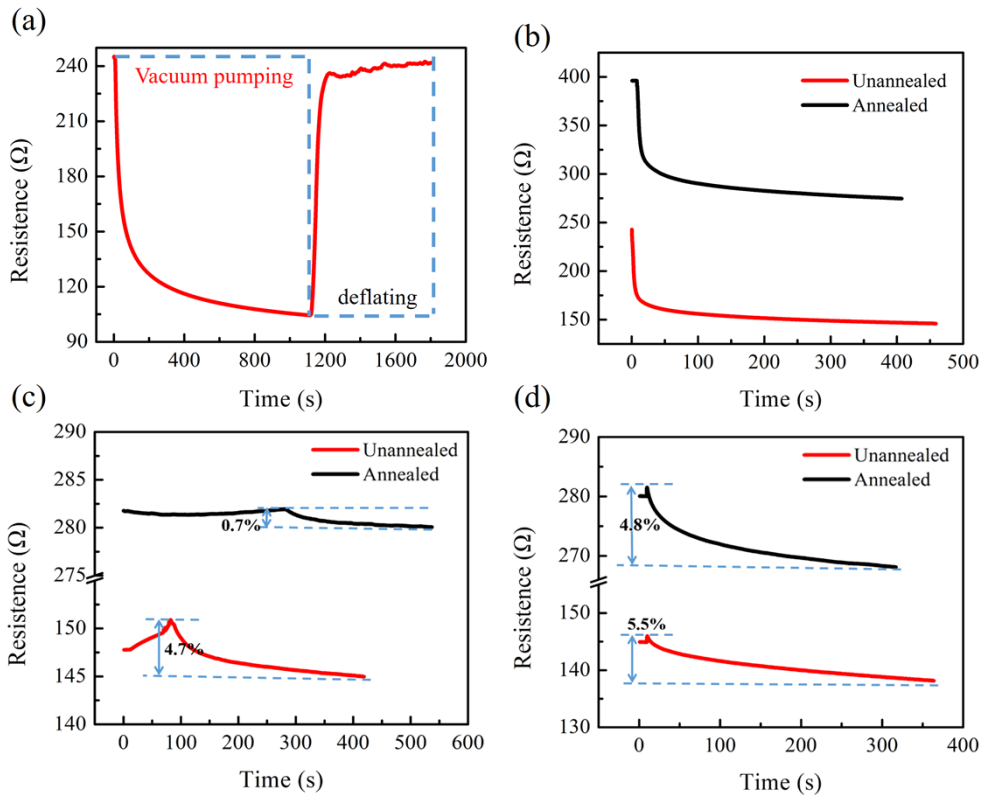

Fig. S3. (a) Full range XPS spectra and (b) the corresponding atomic ratio of Ti/O of two annealed films (Annealed-I, Annealed-II) before and after being oxidized in air at 473 K for 1 hour.

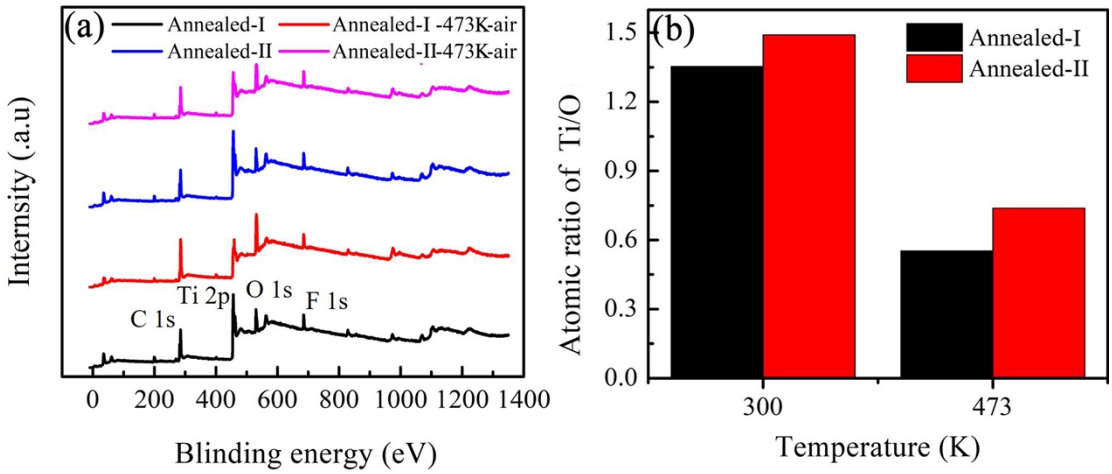

Fig. S4. Electrical resistance-temperature curves of 5 $Ti_3C_2T_x$ films.

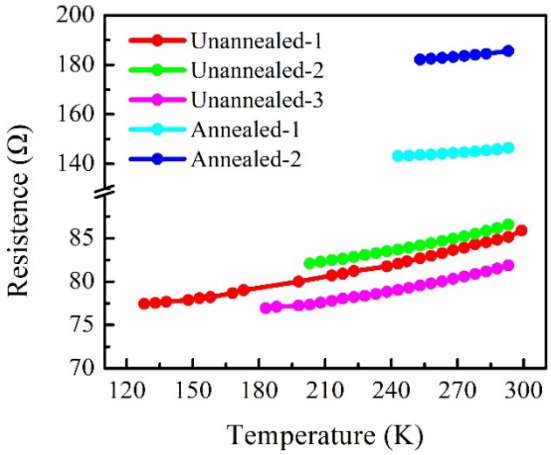

Fig. S5. (a) Photograph of a $Ti_3C_2T_x$ film sample for measuring the heat convection coefficient and (b) its infrared image upon Joule heating.