

# Supporting Information

## Temperature-dependent Raman scattering investigation on vdW epitaxial PbI<sub>2</sub>/CrOCl heterostructure

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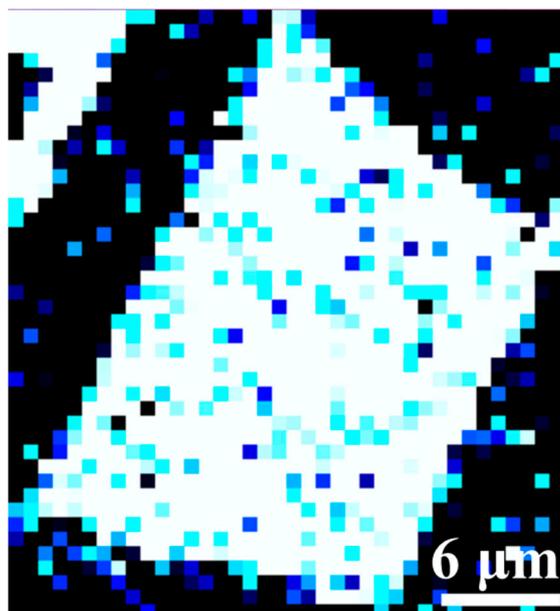


Figure S1 Raman intensity mapping image of  $A_g^1$  mode of exfoliated CrOCl nanoflake.

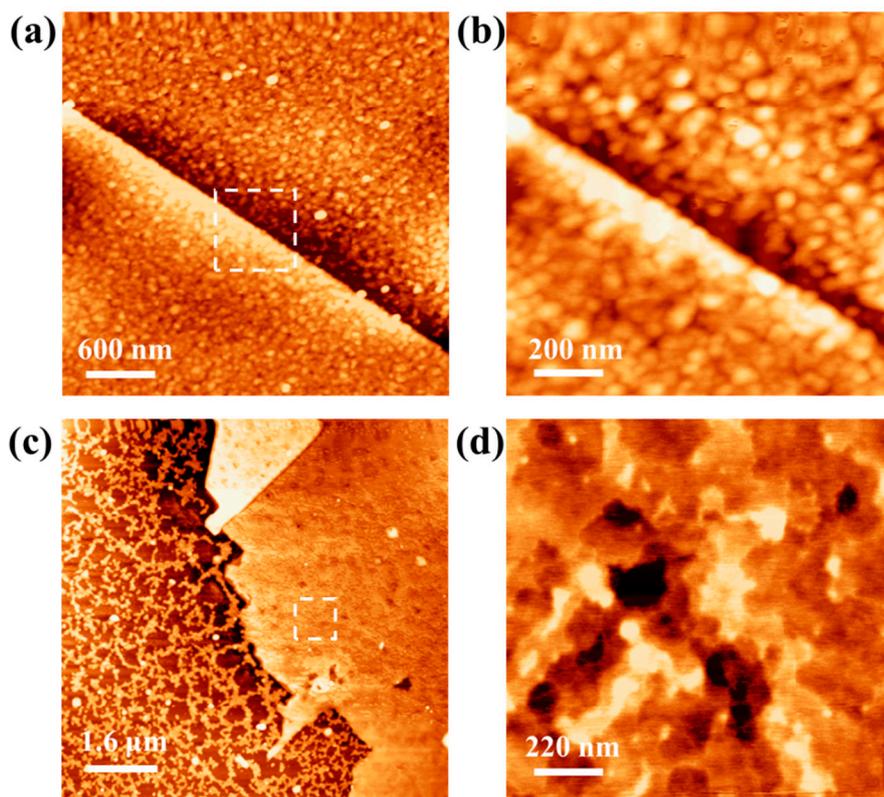
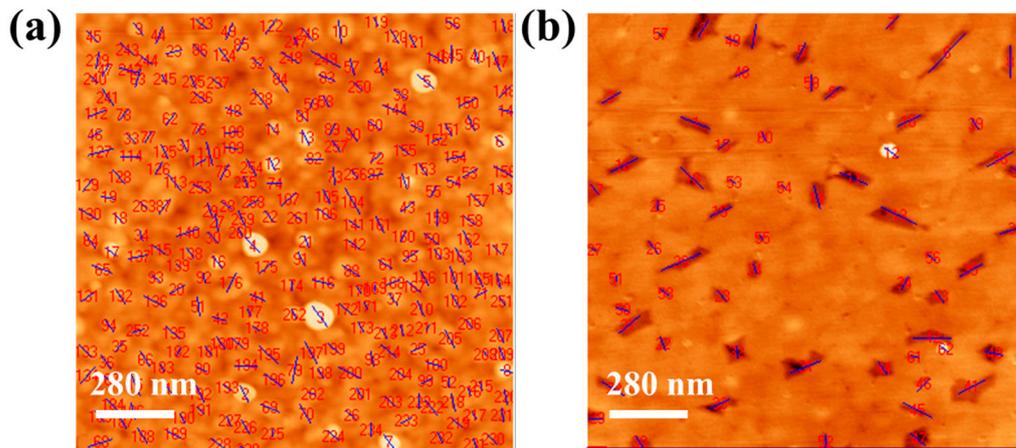


Figure S2 AFM images of  $PbI_2$  films annealed at 373 K (a) and 473 K (c) after deposited at room temperature. (b, d) The corresponding high-resolution images from the white square area inside the figure (a, c), respectively.



**Number of grains: 263**

**Number of defects: 62**

Figure S3 AFM image of PbI<sub>2</sub>/CrOCl heterostructure which deposited at room temperature (a) and annealed after deposited (b), the number of grain and defects are highlighted inside either.

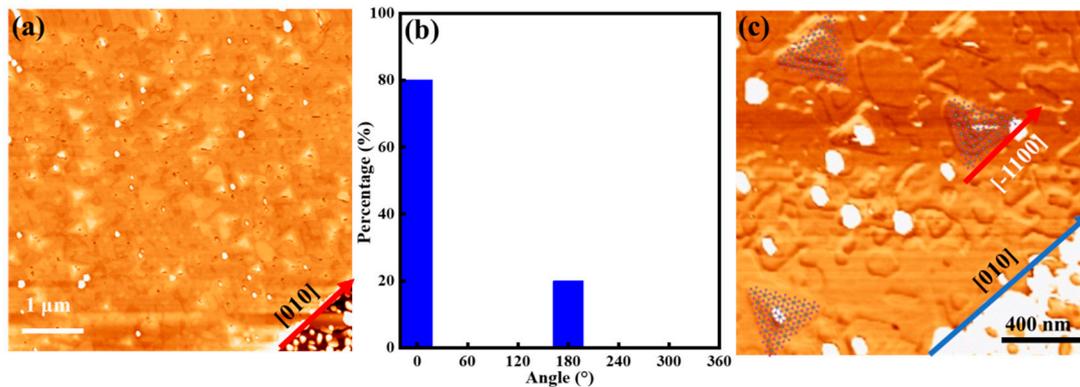


Figure S4 (a) AFM image of PbI<sub>2</sub>/CrOCl heterostructure deposited at 423 K, the triangular islands show the same orientation. (b) Statistical diagram of the orientation of PbI<sub>2</sub> triangular islands. (c) Phase image of PbI<sub>2</sub>/CrOCl heterostructure showing triangular islands, the  $[\bar{1}100]$  direction of PbI<sub>2</sub> mostly along the  $[010]$  direction of CrOCl nanoflake.

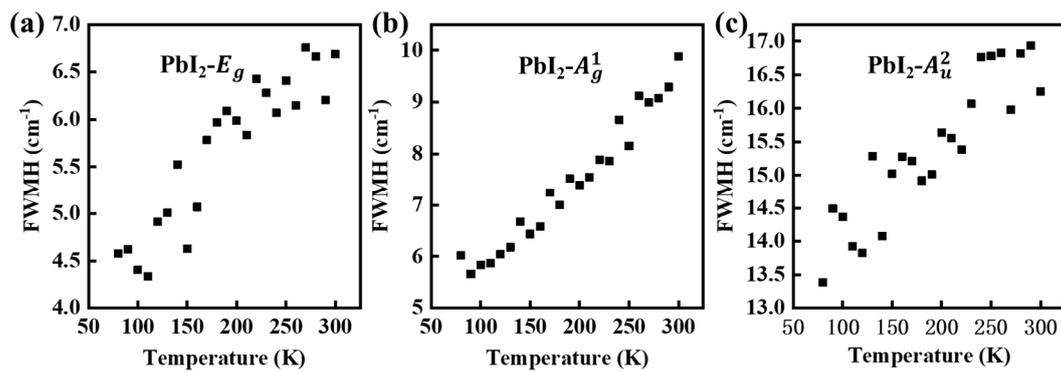


Figure S5 FWHM of  $E_g$  (a),  $A_g^1$  (b) and  $A_u^2$  (c) modes at temperature dependent Raman spectra. Each FWHM is linearly broadened as the temperature increasing.