Supplementary figures for: Coherent strain through quasi van der Waals Epitaxy of magnetic topological insulators Cr: $(Bi_xSb_{1-x})_2Te_3$ on a GaAs (111) substrate and the influence from growth windows

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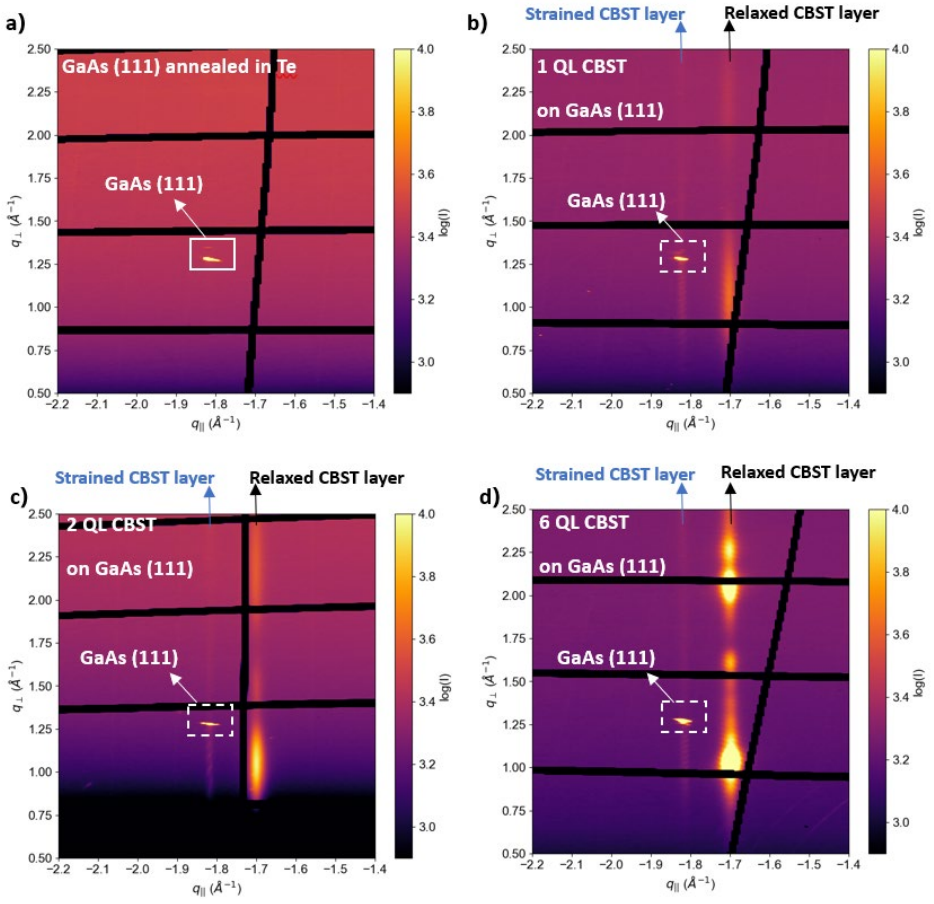

Fig. 1. Reciprocal Space Mapping (RSM) of a) GaAs (111) substrate after Te annealing; **b)** 1 QL CBST grown on GaAs (111); **c)** 2 QL CBST grown on GaAs (111); **d)** 6 QL CBST grown on GaAs (111).

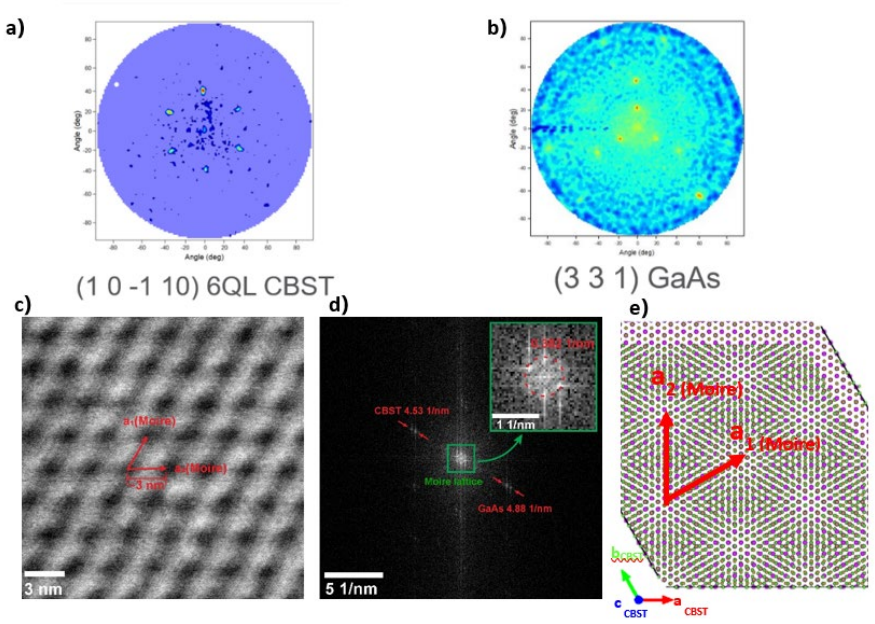

Fig. 2. Pole Figures from X-ray Reciprocal Space Mapping (RSM) and Moiré pattern from Scanning Transmission Electron Microscope (STEM) show uniform in-plane orientation of CBST on GaAs (111) with no global intrinsic twisted angle observed. a)-b) Pole figures of CBST (1 0 -1 10) plane (a)) and GaAs (3 3 1) plane (b)). The two scans are made out of the same alignment and show 0-degree twisted angle. It is also noticeable that for each peak on the pole figure of CBST, there is only one dominant peak observed, which is a sign of uniform in-plane orientation of CBST grown on GaAs (111) substrates. Despite the twinning observed, the sample shows good crystallinity quality. **c) Moiré pattern observed by STEM imaging.** The Moiré pattern shows a hexagonal symmetry system, with the local contrast pattern showing regular triangle relationship. The Moiré lattice is measured to be around 2.9-3.0 nm based on the figure. **d) A FFT of Moiré pattern observed. e) A Moiré pattern model.** (green: substrate or strained epilayer; red/yellow: relaxed epilayer) based on 0-degree twisted angle and the lattices constants of GaAs (111) and CBST (0001).

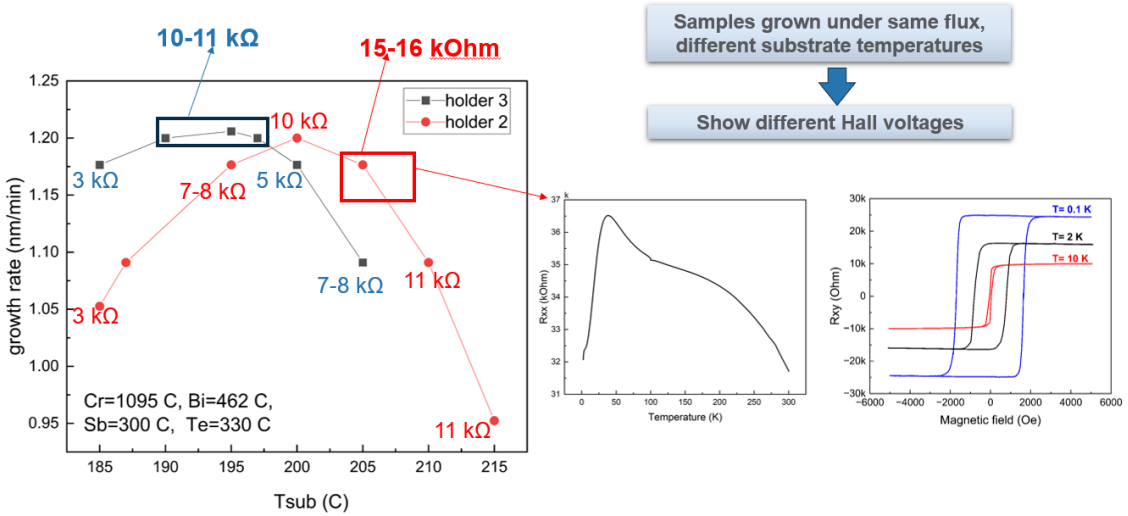

Fig. 3. Growth window and the influence on quantization quality