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Synthesis of Large-area Crystalline MoTe₂ Atomic layer from Chemical Vapor Deposition LIN ZHOU, AHMAD ZUBAIR, KAI XU, JING KONG, MILDRED DRESSELHAUS, Massachusetts Inst of Tech-MIT — The controlled synthesis of highly crystalline large-area molybdenum ditelluride MoTe₂ atomic layers is crucial for the practical applications of this emerging material. Here we develop a novel approach for the growth of large-area, uniform and highly crystalline few-layer MoTe₂ film via chemical vapour deposition (CVD). Large-area atomically thin MoTe₂ film has been successfully synthesized by tellurization of a MoO₃ film. The as-grown MoTe₂ film is uniform, stoichiometric, and highly crystalline. As a result of the high crystallinity, the electronic properties of MoTe₂ film are comparable with that of mechanically exfoliated MoTe₂ flakes. Moreover, we found that two different phases of MoTe₂ (2H and 1T') can be grown depending on the choice of Mo precursor. Since the MoTe₂ film is highly homogenous, and the size of the film is only limited by the substrate and CVD system size, our growth method paves the way for large-scale application of MoTe₂ in high performance nanoelectronics and optoelectronics.

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