Title: Two-dimensional semiconductor towards inter-tier interconnection integrated circuits

Abstract: Semiconductor electronic technology in the post-Moore era continues to look for technology solutions to reduce the size of devices to the atomic level, while at the same time new architectures to add more functionalities to the semiconductor devices. Due to its atomic thickness and stackability, two-dimensional (2D) semiconductor materials are expected to get rid of the micro-nano processing procedures of traditional silicon-based semiconductors and realize new semiconductor chip manufacturing technologies. By understanding the solid-to-solid phase transition mechanism from 1T' to 2H MoTe2, we have achieved the controllable preparation of 2H MoTe2 single crystal wafers through a seeded 2D epitaxy process. Moreover, the doping of the 2D semiconductor 2H MoTe2 wafers can be precisely controlled. The doped wafers can be heterogeneously integrated on arbitrary single crystal substrates through direct growth, which is not limited by lattice matching. The precise pn doping and heterogeneous integration move the inter-tier interconnection integrated circuits one step closer to realize.

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