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Phase change memory devices formed by using 2 dimensional layered Graphene-In2Se3 van der Waals heterostructure.[1] MIN SUP CHOI, CHENXI YANG, CHANG HO RA, WON JONG YOO[2], Sungkyunkwan Univ., SKKU Advanced Institute of Nano-Technology — Indium selenide (In2Se3) is one of the unique materials which have both a layered structure and phase change property. One of the advantages of using 2 dimensional (2D) materials is their potential to form van der Waals heterostructures which enable unique physical properties and novel quantum device functions, which cannot be achieved in 2D material alone. In this study, we fabricated vertically stacked graphene-In2Se3 heterostructured memory devices. The fabricated devices showed a rapid increase of current conduction, which is attributed to the phase transition of In2Se3. The TEM images demonstrated that In2Se3 transformed from polycrystalline to layered structure thanks to the effective thermal confinement effect between graphene and In2Se3, attributed to the low thermal conductivity of layered materials in vertical direction. In addition, the current conduction could be controlled effectively by applying different pulse voltages, showing stable retention and endurance characteristics. It is thought that the differently bonded states contribute to this control process. This study demonstrates the possibility of Graphene-In2Se3 van der Waals heterostructure as 2D based future memory electronics.

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