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Non-volatile memory devices using graphene and ferroelectric thin films[1]

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The unique linear energy band dispersion and its purely 2D crystalline structure have made graphene a rising star not only for fundamental research but also for nanoscale device applications. Here we demonstrate a novel non-volatile memory device using a combination of graphene and a ferroelectric thin film. The binary information, i.e. "1" and "0", is represented by the high and low resistance states of the graphene working channels and is switched by the polarization directions of the ferroelectric thin film. A highly reproducible resistance change exceeding 300% is achieved in our graphene-ferroelectric hybrid devices under ambient conditions. The experimental observations are explained by the electrostatic doping of graphene by the remnant electrical field at the ferroelectric/graphene interface.

[1]In collaboration with Dr. Kui Yao, Institute of Material Research and Engineering, Singapore, and Dr. Barbaros Oezyilmaz, National University of Singapore.