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Brave New World : When electron devices meet two dimensional materials

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•报告人简介：Peng Zhou received his bachelor and Ph.D. degree in physics from Fudan University in 2000 and 2005, respectively. He is currently a full professor on novel electronic devices and process in school of microelectronics, Fudan University. He has authored or co-authored more than 100 journal papers on Nano Letter, Advanced Functional Materials, ACS Nano，Small, Applied Physics Letters, and IEEE Electron Device Letters. He also has more than 30 international conference presentations till now.

•摘要：Field-effect transistors (FETs) in today's integrated circuits are facing the problem of lowering power dissipation when scaling down the supply voltage further. Tunneling FETs (TFETs) are one of the solutions as quantum-mechanical band-to-band tunneling avoids the thermal injection limit. The booming two dimensional materials can maintain excellent device electrostatics, rich in species and have atomic thickness without dangling bonds, high mobility and high ON currents. Combination of two dimensional (2D) materials and TFETs technology can be a new revolution for high performance. In this paper, we will discuss the principle of TFETs, the feasibility of TFETs using layered 2D materials and the current status in this research field.

•Facing the growing data storage and computing demands, a high accessing speed memory with low power and non-volatile character is urgent needs. Resistive access random memory with 4F^2 cell size, switching in sub-nanosecond, cycling endurance of over 10^{12} cycles, and information retention exceeding 10 years, is considered as promising next generation non-volatile memory. However, the energy per bit is still too high to compete against static random access memory and dynamic random access memory. The sneak leakage path and metal film sheet resistance issues hinder the further scaling down. The variation of resistance between different devices and even various cycles in the same device, hold resistive access random memory back from commercialization. The emerging of atomic crystals, possessing fine interface without dangling bonds in low dimension, can provide atomic level solutions for the obsessional issues. Moreover, the unique properties of atomic crystals also enable new type resistive switching

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