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Ferroelectric-Gated Terahertz Plasmonics on Graphene[1] DAFEI JIN, ANSHUMAN KUMAR, KIN HUNG FUNG, JUN XU, NICHOLAS FANG, Massachusetts Institute of Technology — Inspired by recent advancement of low-power ferroelectic-gated memories and transistors, we propose a design of ferroelectic-gated nanoplasmonic devices based on graphene sheets clamped in ferroelectric crystals. We show that the two-dimensional plasmons in graphene strongly couple with the phonon-polaritons in ferroelectrics at terahertz frequencies, leading to characteristic modal wavelength of the order of 100–200 nm at only 3–4 THz. By patterning the ferroelectrics into different domains, one can produce compact on-chip plasmonic waveguides, which exhibit negligible crosstalk even at 50 nm separation distance. Harnessing the memory effect of ferroelectrics, low-power electro-optical switching can be achieved on these plasmonic waveguides.

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Dafei Jin
Massachusetts Institute of Technology

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