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Tuning Field-Induced Energy Gap of Bilayer Graphene via Interlayer Spacing[1] YUFENG GUO, Department of Physics and High Pressure Science and Engineering Center, University of Nevada, Las Vegas, Nevada 89154, WANLIN GUO, Institute of Nanoscience, Nanjing University of Aeronautics and Astronautics, Nanjing, 210016, China, CHANGFENG CHEN, Department of Physics and High Pressure Science and Engineering Center, University of Nevada, Las Vegas, Nevada 89154 — Using first-principles calculations, we demonstrate a sensitive dependence of the electric-field-induced energy gap of bilayer graphene on its interlayer spacing. The calculated results reveal surprisingly large (±50%) changes in the energy gap by relatively small (±10%) adjustments in the interlayer spacing near the equilibrium structure when the electric field is sufficiently high (above 3 V/nm). We elucidate the underlying mechanism by examining the response of the interlayer charge distribution to the interlayer spacing variation at different electric fields. The present results suggest an effective way for reversible tuning of the field- induced energy gap of bilayer-graphene-based nanoelectronic devices through nanomechanical control.

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