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Polarization induced optical and electrical control of 2D materials by ferroelectrics¹ ZAINAB ZAFAR, YUMENG YOU, Southeast University — Integration of 2D semiconductors with ferroelectrics can provide a route towards control of polarization-switching by piezoelectric effect, allowing the realization of exciting features of next-generation optoelectronic devices. However, a fundamental understanding of spectroscopic investigation based on ferroelectric switching in ferroelectric/2D heterostructures remains elusive. Here, we demonstrate mechanical writing of nanoscale domains in ferroelectric thin film coupled with 2D materials, facilitated by piezoresponse force microscope (PFM). We propose the use of typical Raman/PL imaging to predict the effect of phase change of ferroelectric on 2D materials. Mechanical writing not only controls the local doping region, but also tunes the transport properties of the channel, as confirmed by its electrical characterization. By Raman/PL spectroscopy, we have identified the domain pattern of different polarizations in terms of amplitude modification of thin ferroelectric and possible shifts in wavenumber/energy of the emission peaks of 2D materials. Therefore, the sensitivity of spectroscopic imaging well corroborates the efficacy of mechanical writing for synthesizing ferroelectric gated 2D devices.

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