Title:	Ultrathin Free-Standing Nanosheets of Bi2O2Se: Room Temperature Ferroelectricity in Self-Assembled Charged Layered Heterostructure
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Abstract:	Ultrathin ferroelectric semiconductors with high charge carrier mobility are much coveted systems for the advancement of various electronic and optoelectronic devices. However, in traditional oxide ferroelectric insulators, the ferroelectric transition temperature decreases drastically with decreasing material thickness and ceases to exist below certain critical thickness owing to depolarizing fields. Herein, we show the emergence of an ordered ferroelectric ground state in ultrathin (~2 nm) single crystalline nanosheets of Bi2O2Se at room temperature. Free-standing ferroelectric nanosheets, in which oppositely charged alternating layers are self-assembled together by electrostatic interactions, are synthesized by a simple, rapid, and scalable wet chemical procedure at room temperature. The existence of ferroelectricity in Bi2O2Se nanosheets is confirmed by dielectric measurements and piezoresponse force spectroscopy. The spontaneous orthorhombic distortion in the ultrathin nanosheets breaks the local inversion symmetry, thereby resulting in ferroelectricity. The local structural distortion and the formation of spontaneous dipole moment were directly probed by atomic resolution scanning transmission electron microscopy and density functional theory calculations.
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