Abstract Submitted
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Polar metals as electrodes to suppress the critical-thickness limit in ferroelectric nanocapacitors[1] DANILO PUGGIONI, Northwestern University, GIANLUCA GIOVANNETTI, International School for Advanced Studies (SISSA), JAMES RONDINELLI, Northwestern University — Ferroelectric perovskites oxides have potential applications in nonvolatile random access memories and high-density data storage devices. Following consumer demands for higher density data storage technologies, a continuing miniaturization of electronic components has been the major focus of researchers in academia and industry. To realize such scaling for devices which integrate ferroelectric oxides, one of the most important issues is how to maintain ferroelectricity when the component size reduces to the nanometer scale. Using first-principles calculations we investigate the critical thickness for ferroelectricity in a symmetric capacitor structure consisting of ultrathin ferroelectric $NaNbO_3$ confined between the polar-noncentrosymmetric metal $LiOsO_3$. We find that the polar displacements in the metallic electrodes induce an interfacial ferroelectricity, which strongly supports the polar instability in the ferroelectric film even in subnanometer thick dielectric layers. Our results support the use of noncentrosymmetric metals as electrodes in ferroelectric nanocapacitors and related device structures as they maintain the functionality of the ferroelectric layer independently of the level of miniaturization.

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