Title:	Direct evidence of strong local ferroelectric ordering in a thermoelectric semiconductor
Authors:	Aggarwal, L. (/jspui/browse?type=author&value=Aggarwal%2C+L.) Sekhon, J.S. (/jspui/browse?type=author&value=Sekhon%2C+J.S.) Arora, A. (/jspui/browse?type=author&value=Arora%2C+A.) Sheet, G. (/jspui/browse?type=author&value=Sheet%2C+G.)
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Abstract:	It is thought that the proposed new family of multi-functional materials, namely, the ferroelectric thermoelectrics may exhibit enhanced functionalities due to the coupling of the thermoelectric parameters with ferroelectric polarization in solids. Therefore, the ferroelectric thermoelectrics are expected to be of immense technological and fundamental significance. As a first step towards this direction, it is most important to identify the existing high performance thermoelectric materials exhibiting ferroelectricity. Herein, through the direct measurement of local polarization switching, we show that the recently discovered thermoelectric semiconductor AgSbSe2has local ferroelectric ordering. Using piezo-response force microscopy, we demonstrate the existence of nanometer scale ferroelectric domains that can be switched by external electric field. These observations are intriguing as AgSbSe2crystalizes in cubic rock-salt structure with centro-symmetric space group (Fm-3m), and therefore, no ferroelectricity is expected. However, from high resolution transmission electron microscopy measurement, we found the evidence of local superstructure formation which, we believe, leads to local distortion of the centro-symmetric arrangement in AgSbSe2and gives rise to the observed ferroelectricity. Stereochemically active 5S2lone-pair of Sb may also give rise to local structural distortion thereby creating ferroelectricity in AgSbSe2.
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