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Intrinsic low thermal conductivity and optimization of the thermoelectric figure of merit in epitaxial thin films of CrN[1] FRANCISCO RIVADULLA, CIQUS, Universidad de Santiago de Compostela, 15782-Santiago de Compostela, CAMILO GONZALEZ-QUINTELA, JACKOB P. PODKAMINER, Department of Materials Science and Engineering, University of Wisconsin-Madison, Madison, WI 53706, USA., MARIA N. LUCKYANOVA, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, USA., TULA R. PAUDEL, Department of Physics and Astronomy, University of Nebraska-Lincoln, Lincoln, NE 68588, USA., ERIC L. THIES, DANIEL A. HILLSBERRY, DMITRI A. TENNE, Department of Physics, Boise State University, 1910 University Drive, Boise, ID 83725, USA., EVGENY Y. TSYMBAL, Department of Physics and Astronomy, University of Nebraska-Lincoln, Lincoln, NE 68588, USA., GANG CHEN, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, USA., CHANG-BEOM EOM, Department of Materials Science and Engineering, University of Wisconsin-Madison, Madison, WI 53706, USA. — Thermoelectric properties have been measured in single crystal epitaxial thin films of CrN. Combined with ab-initio calculations, we demonstrate that the rock-salt structure of this system has an intrinsic lattice instability similar to the resonant bond state in classic thermoelectric and phase change materials. The optimized figure of merit of CrN reaches zT$\approx$ 0.12 at 300 K, increasing rapidly with temperature. This results are promising for high temperature applications.

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Francisco Rivadulla
CIQUS, Universidad de Santiago de Compostela,
15782-Santiago de Compostela

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