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Ferroelectricity and magnetoelectric coupling in underdoped La_2CuO_{4+x} Z. VISKADOURAKIS, I. RADULOV, IESL-FORTH, A.P. PETROVIC, Division of Physics and Applied Physics, Nanyang Technological University, Singapore, S. MUKHERJEE, B. ANDERSEN, Niels Bohr Institute, University of Copenhagen, Denmark, G. JELBERT, Cavendish Laboratory, University of Cambridge, U.K., N.S. HEADINGS, S.M. HAYDEN, H. H. Wills Physics Laboratory, University of Bristol, U.K., K. KIEFER, S. LANDSGESELL, Helmholtz-Zentrum-Berlin für Materialien und Energie, Germany, D.N. ARGYRIOU, European Spallation Source ESS AB, Sweeden, C. PANAGOPOULOS, IESL-FORTH and Department of Physics, University of Crete, Greece — La_2CuO_4 is an archetypal antiferromagnetic Mott insulator. Upon oxygen doping, a wide range groundstates may be accessed, including glassy magnetic phases and high-T_c superconductivity. However, determining the nature of the charge correlations coexistent with magnetic order has remained elusive, particularly in the highly underdoped limit. In this study, we show that the first holes added to La_2CuO_4 drive the formation of a ferroelectric phase below 4.5K, with slow charge fluctuations developing below 40K. We invoke the formation of polar nanoregions – which are a natural consequence of non-stoichiometric oxygen doping – to explain the emergent ferroelectricity. An anisotropic magnetoelectric coupling is observed and attributed to the Dzyaloshinskii-Moriya interaction. Although this interaction is not responsible for the electronic ordering (unlike in other multiferroic perovskites), the presence of weak magnetoelectricity allows us to confirm charge carrier doping as the cause of ferroelectricity in La_2CuO_{4+x}.

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