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Direct Probe of Interplay between Local Structure and Superconductivity in FeTe0.55Se0.45 WENZHI LIN, QING LI, BRIAN SALES, STEPHEN JESSE, ATHENA SAFA-SEFAT, SERGEI KALININ, MINGHU PAN, Oak Ridge National Laboratory, Oak Ridge, TN 37831,USA — We explore the interplay between local crystallographic structure, composition and local electronic and superconductive properties. Direct structural analysis of scanning tunneling microscopy (STM) data allows local lattice distortions and structural defects across a FeTe0.55Se0.45 surface to be explored on a single unit-cell level. Concurrent superconducting gap (SG) mapping reveals suppression of the SG at well-defined structural defects, identified as a local structural distortion (Guinier-Preston zone). The strong structural distortion is related to the vanishing of the superconducting state. This study provides insight into the origins of superconductivity in iron chalcogenides by providing an example of atomic-level studies of the structure-property relationship. Research was supported (WL, BCS, AS, SVK) by the U.S. Department of Energy, Basic Energy Sciences, Materials Sciences and Engineering Division. This research was conducted (MP, QL) at the Center for Nanophase Materials Sciences, which is sponsored at Oak Ridge National Laboratory by the Scientific User Facilities Division, Office of Basic Energy Sciences, U.S. Department of Energy. (Wenzhi Lin and Qing Li, these authors contributed equally to this work)

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