Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Interface-induced superconductivity at ∼25 K at ambient pressure in undoped CaFe2As2 single crystals C. W. CHU[1], K. ZHAO, L. Z. DENG, B. LV[2], S. Y. HUYAN, Z. WU, Y. Y. XUE, M. GOOCH, B. LORENZ, Texas Center for Superconductivity, University of Houston — Superconductivity has been reversibly induced/suppressed in undoped CaFe2As2 (Ca122) single crystals with Tc at ∼25 K at ambient pressure and up to 30 K at 1.7 GPa. We found that Ca122 can be stabilized in two distinct tetragonal (T) phases: PI with a nonmagnetic collapsed tetragonal (cT) phase at low temperature and PII with an antiferromagnetic orthorhombic (O) phase at low temperature. Neither phase at ambient pressure is superconducting down to 2 K. However, systematic annealing for different time periods at 350 C on the as-synthesized crystals reveals the emergence of superconductivity over a narrow time window. Detailed X-ray diffraction profile analyses further reveal mesoscopically stacked layers of the PI and the PII phases. The deduced interface density correlates well with the superconducting volume measured. The transport anomalies of the T–cT transition and the T–O transition are gradually suppressed over the superconductive region, presumably due to the interface interactions between the nonmagnetic metallic cT phase and the antiferromagnetic O phase. The results provide the most direct evidence to date for interface-enhanced superconductivity in undoped Ca122, consistent with the recent theoretical prediction. Reference: K. Zhao et al., doi: 10.1073/pnas.1616264113, PNAS (2016).

[1]Lawrence Berkeley National Laboratory
[2]Present at Department of Physics, UTD

C. W. Chu
Texas Center for Superconductivity, University of Houston

Date submitted: 10 Nov 2016 Electronic form version 1.4