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Synthesis and superconducting properties of FeTe1-xSe Single Crystals under high magnetic fields TESFAYE GEBRE, G. LI, J. WHALEN, National High Magnetic Field Laboratory, Tallahassee, FL 32310, B. CONNER, National High Magnetic Field Laboratory,Tallahassee, FL 32310, M. KOSTOV, Department of Chemical and Biomedical Engineering, FSU, Tallahassee, FL 32310, T. SIEGRIST, Department of Chemical and Biomedical Engineering, FSU, and National High Magnetic Field Laboratory, Tallahassee, FL 32310, L. BALICAS, National High Magnetic Field Laboratory,Tallahassee, FL 32310 — Single crystals of superconductor $FeTe_{1-x}Se_x$ ($0.1 \leq x \leq 0.5$) were synthesized using optical floating zone, Bridgeman technique, and solid stat reaction. The samples were synthesized under various temperature gradients and cooling rates. Crystals were characterized via EDX, X-ray scattering, magnetization and transport measurements. Upper critical fields Hc_2as estimated through the Werthamer-Hohenberg-Helfand (WHH) formalism indicate that these materials strongly surpass the weak coupling Pauli limiting field indicating that the shape of their phase diagram under field is essentially controlled by the Pauli effect. Annealing, leads to a metallic temperature dependence of the resistivity, and to sharper superconducting transitions. Despite the relatively small increase in single crystallinity, as quantified by single crystal x-ray diffraction measurements, we observe a different phase diagram under high magnetic fields when compared to non-annealed samples.

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