Variation of transition temperatures and residual resistivity ratio in vapor-grown FeSe and Fe(Se,S)\(^1\) A. E. BÖHMER, Ames Laboratory/Iowa State University, V. TAUFOUR, UC Davis, L. XIANG, U. S. KALUARACHCHI, M. A. TANATAR, B. G. UELAND, A. KREYSSIG, W. E. STRASZHEIM, Ames Laboratory/Iowa State University, T. WOLF, IFP, Karlsruhe Institute of Technology, R. PROZOROV, A. I. GOLDMAN, S. L. BUD’KO, P. C. CANFIELD, Ames Laboratory/Iowa State University — We report on the vapor growth and physical properties of single-crystalline FeSe and Fe(Se,S). Significant variations of sample morphology resulting from slight modifications of the growth conditions are observed. The superconducting transition temperature, \(T_c\), of different FeSe samples varies between 8.8 K and 3 K, and the structural transition temperature, \(T_s\), varies between 90 K and 72 K, respectively. We find that those variations cannot be correlated with the sample composition, measured by WDS. Instead, we point out a clear correlation between \(T_s\), \(T_c\) and disorder, as measured by the residual resistivity ratio. Notably, \(T_s\) and \(T_c\) are linearly correlated with each other\(^2\). On the other hand, a small amount of sulfur-substitution suppresses \(T_s\) but enhances \(T_c\). We will compare and discuss the effects of various perturbations—disorder, chemical substitution and hydrostatic pressure—on the transition temperatures and properties of FeSe.

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\(^2\)Böhmer et al., PRB 94, 024526 (2016).