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Suppression of Phase Separation and Enhanced Superconducting Transition Temperature of $FeSe_{1-x}Te_x$ Thin Films[1] FUYUKI NABESHIMA, YUICHI SAWADA, YOSHINORI IMAI, ATSUTAKA MAEDA, The University of Tokyo — To clarify the mechanism of superconductivity of Fe-based superconductors, it is crucial to investigate superconductivity of $FeSe_{1-x}Te_x$, which has the simplest crystal structure. There is, however, a serious obstacle to the understanding of its superconductivity; phase separation by spinodal decomposition occurs in the region of $0.1 < x < 0.4$ and thus a whole phase diagram has not been available. A useful method to fabricate metastable materials is thin-film deposition because of its thermodynamically non-equilibrium growth. In the presentation we will report the first demonstration of the suppression of the phase separation of $FeSe_{1-x}Te_x$ thin films on CaF_2 substrates[1]. Surprisingly the optimal composition to achieve the highest superconducting transition temperature, T_c, was found in this phase separation region; T_c^{onset} reaches ∼23 K. A whole phase diagram we will present provides a new perspective for the superconductivity of this material. [1] F. Nabeshima *et al.*, Appl. Phys. Lett. **103** (2013) 172602.

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