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Superconductivity in ultra-thin FeSe films L.Z. DENG, Y.Y. XUE, B. LV, Z. WU, Texas Center for Superconductivity and department of Physics, University of Houston, Houston, TX 77204-5002, L.L. WANG, X.C. MA, Q.K. XUE, Tsinghua University, Beijing, China, C.W. CHU[1], Texas Center for Superconductivity and department of Physics, University of Houston, Houston, TX 77204-5002
— The recent discovery of a high Tc above 50 K in FeSe unit-cell film in comparison with the 8 K in bulk FeSe has attracted much attention, which is proposed to be related to interface superconductivity. Meissner effect and zero resistivity are two critical evidence for the existence of superconductivity. Unfortunately, the Tc has mostly indirectly obtained from the energy gap measurements, and preliminary resistive and magnetic measurements. There has not been report of the observation of Meissner effect to provide the sufficient proof of superconductivity to date. This motivates our systematic magnetic investigation here. We have observed in the 1-4 unit-cell FeSe-films: 1) Meissner effect with extensive weak-links up to $\sim$ 20 K; 2) unconnected small superconducting patches up to $\sim$ 40 K; and 3) an unusual relaxation of the diamagnetic signal of unknown nature up to 80 K, all are consistent with our resistance results. Their implications on the high Tc superconductivity and the film growth will be discussed.

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