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Growth of superconducting FeSe films MICHIO NAITO, SHINYA AGATSUMA, SHINYA UEDA, Tokyo University of Agriculture and Technology, TAT TEAM — The recently discovered Fe arsenide and chalcogenide superconductors have provided the superconducting community with a great surprise that Fe-based compounds are not ferromagnetic but superconducting with high Tc. The superconducting Fe arsenides and chalcogenides are also interested from the viewpoint of superconducting electronics. One can see good lattice compatibility between the superconducting Fe family and the existing III-V and II-VI semiconducting family (GaAs, ZnSe). All-epitaxial super-semiconductor multilayer structures may be ideal for superconducting electronics and spintronics. Toward this goal, we have attempted to grow epitaxial thin films of the superconducting Fe family. Of this family, tetragonal α-FeSe seems to be the easiest to grow thin films. We employed two approaches for FeSe film growth: post-annealing and MBE growth. In the post-annealing, precursor films of Fe are annealed at 500 - 600 ^{o}C with Se vapor in an evacuated quartz tube. Annealing with elemental Se produced semiconducting $FeSe_2$ whereas annealing with FeSe polycrystalline pellets produced superconducting FeSe with T_c(onset) $\sim$ 10 K. In the MBE growth, we attempted the growth similar to GaAs growth, namely with the vapor rich in Se, expecting self-limiting adsorption of Se. MBE films so far obtained with the growth temperature of 330 ^{o}C are nonsuperconducting hexagonal β-FeSe.

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