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Tuning phase transitions of FeSe thin flakes by field effect transistor with solid ion conductor as gate dielectric[1] XIANHUI CHEN, Unversity of Science and Technology of China — We develop a novel field effect transistor (FET) device using solid ion conductor (SIC) as a gate dielectric, and we can tune the carrier density of FeSe by driving lithium ions in and out of the FeSe thin flakes, and consequently control the material properties and its phase transitions. A dome-shaped superconducting phase diagram was mapped out with increasing Li content, with Tc ˜46.6 K for the optimal doping, and an insulating phase was reached at the extremely overdoped regime. Our study suggests that, using solid ion conductor as a gate dielectric, the SIC-FET device can achieve much higher carrier doping in the bulk, and suit many surface sensitive experimental probes, and can stabilize novel structural phases that are inaccessible in ordinary conditions.

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