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Field effect vs. Hall mobility in back-gated multilayered InSe FETs[1] SUKRIT SUCHARITAKUL, NICHOLAS GOBLE, Case Western Reserve University, U. RAJESH KUMAR, RAMAN SANKAR, FANG CHENG CHOU, YIT-TSONG CHEN, National Taiwan University, XUAN GAO, Case Western Reserve University — 2D graphene-like materials, not only are interesting for their exotic transport behavior but also, hold promises for their mechanical robustness and many possibilities in miniaturization. As one material belonging to this category, InSe is not only a promising candidate for optoelectronic devices [1] but also has potential for ultrathin field effect transistor (FET) with high mobility transport [2]. Recent investigation [2] showed that exfoliated InSe FET device on PMMA substrate can yield field effect mobility as high as 1000 cm^2/Vs at room temperature. In this work, various substrates such as PMMA, bare SiO2, passivated SiO2, and Si3N4 were used to fabricate InSe FET devices. Through back gating and Hall measurement, the devices' field effect mobility and intrinsic Hall mobility were extracted at various temperatures to study the dielectric effect on the material's intrinsic transport behavior. Overall trend of the devices' mobility was found to increase as the temperature is reduced due to reduced phonon scattering. The sample's field effect and Hall mobilities over the range of 77-300K fall in the range of 0.5-2.0 $\times$ 10^3 cm^2/Vs, better than the transition metal-dichalcogenides.

[1] Tamalampudi, S. R. *et al. Nano Lett.* **14,** 2800–2806 (2014).
[2] Feng, W. *et al*, P. DOI:10.1002/adma.201402427. *Adv. Mater.* (2014).

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