Abstract Submitted
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In situ monitoring of resistivity and carrier concentration during molecular beam epitaxy of topological insulator $\mathbf{Bi_2Se_3}$[1] J. HELLERSTEDT, Monash University and University of Maryland, J.H. CHEN, D. KIM, W.G. CULLEN, Department of Physics, University of Maryland, C.X. ZHENG, School of Physics, Monash University, M.S. FUHRER, Monash University and University of Maryland — Bismuth selenide (Bi_2Se_3) is a three-dimensional strong topological insulator of particular interest due to its relatively large bulk band gap (300 meV) and single set of topologically non-trivial surface states. However, there are outstanding problems in isolating the surface state from the bulk (trivial) conduction: this problem is frequently attributed to doping from selenium vacancies and atmospheric exposure. To address this question of doping, we have constructed a molecular beam epitaxy system with the additional capability of doing real time, in situ measurement of resistivity and Hall carrier density. Bismuth selenide has a micaceous crystal structure of quintuple layer units weakly bonded to one another making it well suited to this growth (van der Waals epitaxy) and measurement technique. Cooling to 15 K and controlled exposure to atmospheric dopants is additionally possible without breaking vacuum. We have been able to achieve direct measurement of mobilities on the order of 300 cm^2/Vs and carrier densities of $3\times10^{13}cm^{-2}$ measured at growth temperatures of 200 to 300 °C. The latest results of carrier density and mobility as a function of film thickness and growth parameters will be reported.

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Jack Hellerstedt
Monash University and University of Maryland

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