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High-quality Bi_2Se_3 MBE grown films from a cracked selenium source[1] BRIAN MULCAHY, GUSTAF OLSON, VICTOR CHUA, EDMOND CHOW, JAMES N. ECKSTEIN, University of Illinois at Urbana-Champaign — Over the past several years, the topological insulator Bi_2Se_3 has become a favorite among experimentalists due to its relatively large bulk band gap and simple electronic structure near the Fermi energy. However, the energy cost for an anti-site defect or selenium vacancy is not large compared to growth temperature. These defects dope the material and lead to bulk conductance which masks the role of the metallic surface states in transport. We report on Bi_2Se_3 thin films grown using a thermally cracked selenium source by MBE. Cracked selenium molecules are more reactive and this reduces the defect density and the bulk carrier density. Transport measurements show an asymptotic sheet resistance at T=0 more than an order of magnitude larger than what is obtained from films grown with a standard selenium source.

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