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Scalable planar fabrication processes for chalcogenide-based topological insulators PETER SHARMA, M. DAVID HENRY, ERICA DOUGLAS, MICHAEL WIWI, ANA LIMA SHARMA, RUPERT LEWIS, JOSHUA SUGAR, Sandia National Laboratories, MARYAM SALEHI, NIKESH KOIRALA, SEONG-SHIK OH, Rutgers University — Surface currents in topological insulators are expected to have long spin diffusion lengths, which could lead to numerous applications. Experiments that show promising transport properties were conducted on exfoliated flakes from bulk material, thin films on substrates of limited dimensions, or bulk material, with limited yield. A planar thin film-based technology is needed to make topological insulator devices at scale and could also lead to new device designs. We address two problems related to fabricating chalcogenide-based topological insulator devices on 3" wafers in the Sandia Microfabrication Facility using Bi2Te3 films. (2) Implantation damage and its subsequent mitigation through annealing is characterized. (2) The degradation in dielectric layers used to manipulate surface potential for elucidating topological surface state transport is characterized under different processing conditions. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under Contract No. DE-AC04-94AL85000. Funded by the Office of Naval Research (N0001416IP00098-0).

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