Abstract Submitted
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Fully and partially iodinated germanane as a platform for the observation of the quantum spin Hall effect. JOSE EDUARDO PADILHA, Universidade Federal do Parana, ADALBERTO FAZZIO, LEONARDO ABDALLA, ANTONIO JOSE ROQUE DA SILVA, Universidade de Sao Paulo — The Quantum Spin Hall Effect (QSHE) proposed in 2005 by Kane and Mele for graphene and by S.-C. Zhang et al. in 2006 for the HgTe/CdTe, became a very exciting area of condensed matter physics. Several materials have been proposed to overcome the issue of the small SOC band gap presented by the graphene and HgTe/CdTe structures, such the elemental materials germanene, stanene and others binary compounds with band gaps that goes to several meV to few eV. Motivated by the recent isolation of the trivial insulator germanane, a fully hydrogenated germanene, we show that a partially substitution of the hydrogen atoms in only one side of the material by iodine, creates a two dimensional topological insulator with a large band gap of 0.49 eV. This functionalization opens up new routes for the observation of the quantum spin Hall effect in a fully two-dimensional material. We also show that creating nanoroads or nanoribbons with the pattern functionalization of germanane by iodine in a ordered or disordered way, topologically protected interfaces states arises at the boundary of germanane/iodinated germanane.

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