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Robustness of topological insulators and the fragility of trivial insulators

Adalberto Fazzio[1]

[1]*Ilum School of Science, Brazilian Center for Research in Energy and Materials (CNPEM), Campinas, SP, 13083-970, Brazil*

adalberto.fazzio@ilum.cnpem.br

Abstract

Vacancies in materials structure, lowering its atomic density, take the system closer to the atomic limit, to which all systems are topologically trivial. Here we show a mechanism of mediated interaction between vacancies inducing a topologically nontrivial phase. We explore topological transition dependence with the vacancy density in transition metal dichalcogenides. As a case of study, we focus on the PtSe2. On the other side, the topological properties of materials are, until now, associated with the features of their crystalline structure, although translational symmetry is not an explicit requirement of the topological phases. We show that two-dimensional amorphous materials can also display topological insulator properties. More specifically, we present a realistic state-of-the-art study of the electronic and transport properties of amorphous bismuthene systems, showing that these materials are topological insulators. All calculation were done using ab initio DFT calculations.

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