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Growth and electronic structure charaterization of 2D germanene/Pt(111)

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In the last decade, a new class of solids known as "2D Dirac materials" has led to an outburst of research activities in condensed matter physics and materials science. The low-energy quasiparticles in these materials are described by the relativistic (2+1) Dirac equation rather than Schrodinger's equation. The relativistic effect in these systems confers to them some unusual properties not observed in the usual Schrodinger-type systems. This makes them very attractive for fundamental research as well as for technological applications. Recently, germanene has been predicted not only to be a 2D Dirac material but also to show some behavior beyond those of other 2D Dirac materials (such as graphene and silicene). In particular Its predicted quantum spin Hall effect makes germanene appealing to semiconductor and spintronics industries. We report on the fabrication of germanene on Pt(111), its characterization by combined X-ray photoemission spectroscopy (XPS) and low energy electron diffraction (LEED) and its Dirac cone structure by use of angle-resolved photoemission spectroscopy (ARPES). LEED and XPS analysis suggest that germanene forms a (2 x 2) superstructure on Pt(111) and shows strong interaction with Pt substrate. The germanene-substrate interaction is seen to play an important role in the electronic structure revealed by ARPES. This result confirms this interaction to be an important parameter to be exploited in the synthesis of germanene on suitable substrates.

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