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Ab-initio investigation of one-dimensional graphene-silicene superlattices LARS MATTHES, University of Jena, KARSTEN HANNEWALD, Humboldt University of Berlin, FRIEDHELM BECHSTEDT, University of Jena — Since the two-dimensional (2D) crystal graphene was rediscovered in 2004 by Geim et al. there has been a strong interest in tailoring its properties in order to achieve a broad usability in manifold applications. Furthermore, due to massless electrons appearing in graphene it is also a playground for theoretical physicists for testing basic physical theories of high energy physics in a solid state system. Recently, also a silicon based 2D honeycomb crystal, called silicene, was discovered. Due to the similar crystal structure, silicene shares many properties with graphene, e.g., massless fermions. Here we present first-principles studies of electronic and structural properties of graphene-silicene superlattices. Our investigations provide insights to the physics of heterostructures consisting of materials where both may contain massless fermions and a vanishing electronic gap around the Fermi-energy. Finally, we also discuss the importance of the 1D interface between those 2D crystals [2].

[1] P. Vogt et al., PRL 108, 155501 (2012)

[2] L. Matthes et. al, PRB 86, 205409 (2012)

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