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Abstract for an Invited Paper
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Graphene challengers: silicene, germanene and stanene, group IV elemental synthetic electronic materials.

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Silicene, germanene and stanene, graphene's group IV elemental cousins, have attracted considerable interest since the birth of silicene in 2012 [1]. These novel synthetic two-dimensional (2D) Si, Ge and Sn allotropes are artificially created in situ under ultra high vacuum, since, at variance with graphene, which descents from graphite, they have no parent crystal in nature. They are considered as promising candidates for ultimate scaling of nanoelectronic devices [2,3]. Indeed, the recent fabrication of the first silicene field effect transistors with ambipolar characteristics operating at room temperature demonstrates their potential as emerging 2D electronic materials [4]. In this invited talk, I will present the archetype 3x3 silicene phase formed on a silver (111) substrate [1], its sister phases and the growth of multilayer silicene, which hosts Dirac fermions and which is stable in ambient air, protected by its ultra-thin native oxide [5]. The recent synthesis of single layer germanene [6,7] and stanene [8], near room temperature 2D topological insulators will be also presented, while multilayer germanene will be further addressed. Challenging graphene, silicene, germanene and stanene, which are directly compatible with the current semiconductor industry, could lead to the development of a new class of low energy consumption nanoelectronic devices. 1. P. Vogt et al., Phys. Rev. Lett., 108, 155501 (2012). 2. A. Dimoulas, Microelectronic Engineering, 131, 68 (2015). 3. G. Le Lay, Nature Nanotechnology, 10, 202 (2015). 4. Li Tao et al., Nature Nanotechnolgy, 10, 227 (2015). 5. P. De Padova et al., 2D Mater., 1, 021003 (2014). 6. M.E. Davila et al., New J. Phys., 16, 095002 (2014). 7. M. Derivaz et al. Nano Lett., 15, 2510 (2015). 8. Feng-feng Zhu et al., Nature Mater., 14, 1020 (2015).