

Prediction of new 2D materials: after graphene and silicene, now a hint of germanene synthesis

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Abstract: Theoretical calculations by Kyozauro Takeda and Kenji Shiraishi [1] predicted 20 years ago the possible existence and properties of 2D- new materials, later called : graphene, silicene and germanene. For the experimental discovery of graphene in 2004, Andrei Geim and Konstantin Novoselov were awarded the Nobel Prize in Physics; since then, many experiments by the international community developed different forms of preparation and isolation of this material and their use in nanoelectronic devices. Later, the discovery of silicene by a team of researchers from Germany, Italy and France, with Drs Patrick Vogt, Paola de Padova and Prof. Guy Le Lay occurred in 2012 [3]. In the last two years, scientists around the world have demonstrated that this material can be obtained on a few substrates. Now, we will show evidence of the two-dimensional epitaxial growth of germanium in a honeycomb arrangement, most likely, single layer germanene, a novel synthetic germanium allotrope that does not exist in nature [4]. If true, this will complete the theoretical predictions presented years ago, offering 2D-new materials with exciting properties, with the potential to replace the silicon based traditional CMOS for a number of electronic applications. GLL gratefully acknowledge financial support from the "2D-NANOLATTICES" project of the Future and Emerging Technologies (FET) program within the 7th framework program for research of the European Commission under FET Grant No. 270749. L.X., S.V. and A.R. acknowledge financial support from the European Research Council Advanced Grant DYNamo (ERC-2010- AdG-267374), Spanish Grant (FIS2010-21282-C02-01), Grupos Consolidados UPV/EHU del Gobierno Vasco (IT578-13), Ikerbasque and the European Commission projects CRONOS (Grant number 280879-2 CRONOS CP-FP7). [1] K. Takeda and K. Shiraishi, Phys. Rev. B 50, 14 916 (1994) [2] K.S. Novoselov, A.K. Geim ,S.V. Morozov, D. Jiang , Y. Zhang, S.V. Dubonos, I.V. Grigorieva, A.A. Firsov, Science 306, 666 (2004) [3] P. Vogt,, P. De Padova, C. Quaresima, J. Avila, E. Frantzeskakis, M.C. Asensio, A. Resta, B. Ealet and G. Le Lay PRL 108, 155501 (2012) [4] G. Le Lay et al., to be published