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Formation of hBN monolayers by nitridation of ZrB_2 thin films with epitaxial silicene KOHEI AOYAGI, ANTOINE FLEURENCE, RAINER FRIEDLEIN, YUKIKO YAMADA-TAKAMURA, Japan Adv Inst of Sci and Tech — Among the two-dimensional materials that recently received increased attention are atomically thin honeycomb layers called silicene and hexagonal boron nitride (hBN) monolayers. The combination of both types of layers may allow for either the electrical insulation of silicene from metallic substrates or the protection of silicene from atmospheric conditions, as required for the use of silicene in any electronic device application. In this study is reported the formation of hBN monolayers by nitridation of ZrB_2 thin films grown on Si(111) substrates, which have epitaxial silicene on the surface.[1] As revealed by XPS, following the formation of silicon nitride by treatment of the surface with an rf nitrogen plasma, nitrogen atoms released from the silicon nitride layer react with B atoms released from ZrB_2 upon annealing under ultra-high vacuum conditions to form a hBN monolayer in direct contact and in an epitaxial relation with the diboride. As such, the ratio of 5 unit cells of hBN to 4 unit cells of ZrB_2 is found to cause a distinct moiré pattern observed by STM. The electronic structure of the surface is dominated by an intense and well-defined BN πband as expected for high-quality hBN sheets covering large areas of the surface.

[1]A. Fleurence, *et al.*, Phys. Rev. Lett. 108, 245501 (2012).

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