Epitaxial Sn on h-BN terminated ZrB_2

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Stanene, the tin analogue of graphene, promises a wealth of physical phenomena and bright perspectives for electronic applications. Due to its strong spin orbit coupling (SOC), the quantum spin Hall insulator phase is expected to exist even at room temperature. Epitaxial stanene, exhibiting a buckled honeycomb Sn-lattice, has been prepared so far on only one substrate - Bi_2Te_3. Because of the interaction with the substrate, the electronic structure of the epitaxial stanene does not correspond to that of theoretically predicted free-standing stanene. This warrants studies of Sn-lattices on weakly interacting, preferably electrically insulating, substrates. We found that after depositing a sub-monolayer of Sn on a h-BN terminated ZrB_2 thin film [1-3] and subsequent annealing at 670˚C, we could observe a new surface reconstruction (see Fig. 1 and Fig. 2). The Sn LEED pattern matches the ZrB_2(4x4) and h-BN(5x5) patterns and we suspect a Sn(3x3) reconstruction. The estimated Sn lattice parameter of 4.2Å is significantly different from free-standing stanene, such that the ordered Sn phase we observe could be due to a different lattice with hexagonal symmetry. Further investigations of the structural and electronic properties of this novel Sn layer are ongoing.

References

[1] A. Fleurence et al. Phys. Rev. Lett. 108 (2012) 245501
[2] F. B. Wiggers et al. *Silicene on h-BN terminated ZrB_2 thin films* (Manuscript to be submitted)
[3] K. Aoyagi et al. *Formation of h-BN monolayers through nitridation of epitaxial silicene on diboride thin films* (Manuscript to be submitted)

Figures

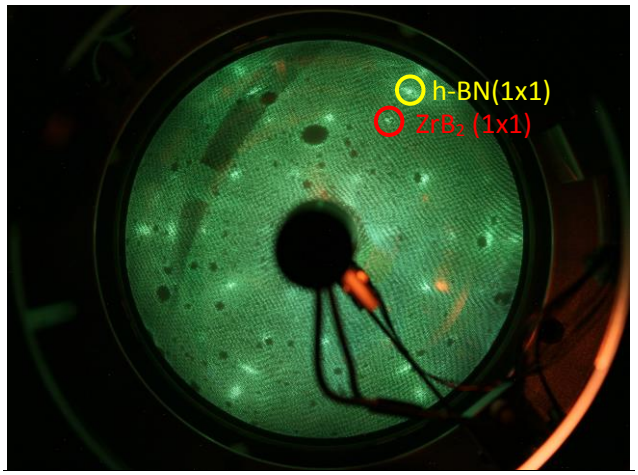

Figure 1: LEED image at 85eV of pristine h-BN/ZrB_2 sample.

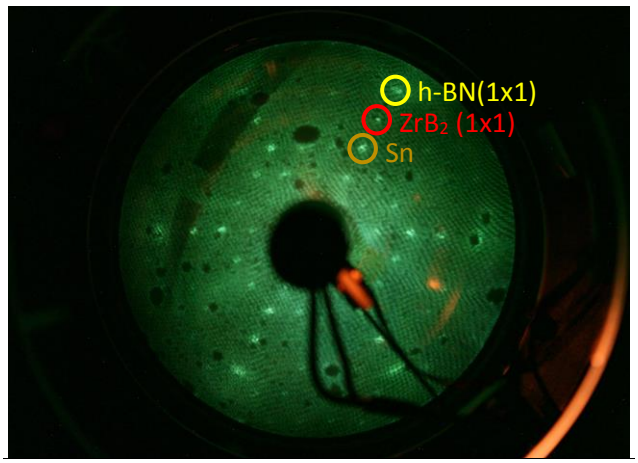

Figure 2: LEED image at 85eV of the sample after Sn deposition and annealing at 670°C. Additional LEED spots emerge.