Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

From striped domain to single domain: Evolution of partial dislocations in epitaxial silicene ANTOINE FLEURENCE, YUKIKO YAMADA-TAKAMURA, Japan Advanced Institute of Science and Technologies — Silicene is a graphene-analogue 2D material made of Si atoms. The mixed sp^2/sp^3 hybridization of the Si atom orbitals makes its atomistic structure particularly flexible. The epitaxial form of silicene that crystallizes spontaneously on the (0001) surface of zirconium diboride (ZrB_2) thin films grown on Si(111) features a periodic one-dimensional domain structure [1] resulting from the release of the stress. The domain boundaries are partial dislocations of the silicene lattice. The domain structure can be turned into a single domain by depositing an amount of silicon compensating the difference of Si atom density between the boundaries and the domains [2]. This transformation requires the coherent motion of a large number of Si atoms to suppress the dislocations and to allow for the incorporation of Si atoms, which needs to overcome the repulsion between the boundaries. The flexibility of the silicene structure permits the monitoring of the partial dislocations disappearing upon Si deposition by room-temperature scanning tunneling microscopy. These observations give insights into how the dislocations are introduced and removed in 2D materials. [1] A. Fleurence et al., Phys. Rev. Lett. 108 245501 (2012). [2] A. Fleurence et al., Appl. Phys. Lett. 108 151902 (2016).

Antoine Fleurence
Japan Advanced Institute of Science and Technologies

Date submitted: 11 Nov 2016 Electronic form version 1.4