

Quantization of conductance across phase transition in CDW phase in NbSe₂

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Competition between two many-body states can have interesting consequences in condensed matter physics. Recent STM experiments¹ on NbSe₂ have shown that in the presence of strain, striped charge density wave (CDW) phases (1Q) can appear along with the better known triangular 3Q CDW phase. We have probed the quantum phase transition between these two phases of NbSe₂ through the conductance fluctuation spectroscopy. We show that, in the presence of dynamic strain, electrical conductance of few-layer suspended NbSe₂ devices fluctuate between two well defined levels. This two-level fluctuation could be quenched by damping out the dynamic strain or by introducing disorder in the device. We also showed that this phase transition could be induced by controlling the strain by fabricating the few-layer NbSe₂ devices on piezoelectric substrates. Theoretical calculations show conclusively that our observation is consistent with a dynamic strain induced quantum phase transition between two CDW phase of different symmetry in NbSe₂.

References

- [1] A. Soumyanarayanan, M. M. Yee, Y. He, J. van Wezel, D. J. Rahn, K. Rossnagel, E. W. Hudson, M. R. Norman, and J. E. Hoffman, PNAS 110, 1623 (2013)
- [2] F. Flicker and J. van Wezel, Phys. Rev. B 92, 201103(R) (2015).

Figures

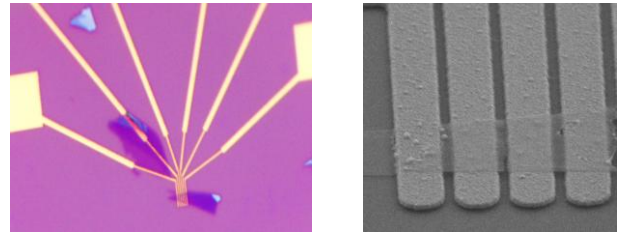


Figure 1: Optical Image and SEM image of a typical suspended device studied.

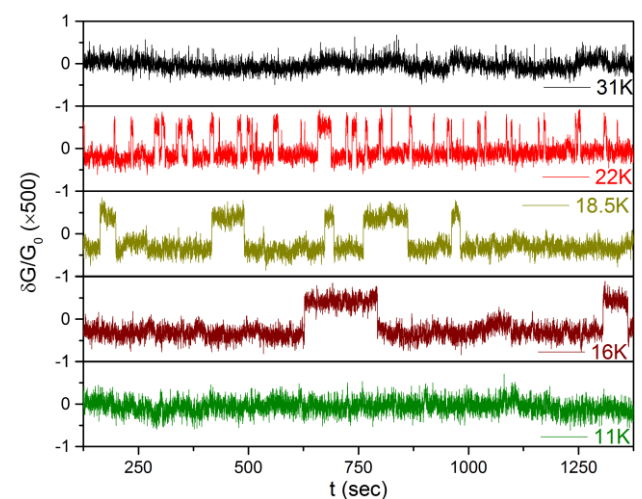


Figure 2: Quantized conductance fluctuation in typical clean suspended NbSe₂ device.