Three-dimensional charge density wave phase of VSe_2 revisited

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VSe_2 is a layered two-dimensional material that has gained much interest due to anomalies in its electronic and transport properties. It transitions to a three-dimensional charge density wave (3D-CDW) state at 80 K with the formation of 4a x 4a x 3c superstructure periodicity [1-3]. Various angle-resolved photoemission spectroscopy (ARPES) experiments have been conducted to understand the underlying mechanism behind this unique 3D-CDW phase. Despite the these efforts, this nature of this phase remains an open question in the field. In this work, a complete band structure is constructed by performing a detailed ARPES experiment under variable geometry. Additional states are revealed in the surface electronic structure of VSe_2 that have not been observed or predicted before. These new findings answer many of the previous ambiguous observations. Furthermore, the evolution of the electron pocket on the surface with temperature is found to be consistent with transport measurements, suggesting that it is correlated with the CDW phase.

References

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