Contribution ID: **16** Type: **Invited Oral**

Metallic and insulating domains in the CDW system 1T-TaSe2

We study the electronic structure of bulk 1T-TaSe2 in the charge density wave (CDW) phase at low temperature. Our spatially and angle resolved photoemission (ARPES) data show insulating areas coexisting with metallic regions characterised by a chiral Fermi surface and weakly correlated low energy quasiparticle bands. Additionally, high-resolution laser ARPES reveals strong variations in the metallic regions, with series of low-energy states, whose energy and number are consistent with the formation of quantum well states of different thicknesses. Dynamical mean field calculations show that the observed rich behaviour can be explained naturally by assuming occasional stacking faults of the charge density wave. Our results indicate that the diverse electronic phenomena reported previously in 1T-TaSe2 are dictated by the stacking arrangement while correlation effects play a secondary role.

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