Revealing a new charge density wave order in $TbTe_3$ by optical conductivity and ultrafast pump-probe experiments

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Abstract:

Rare-earth tri-tellurium RTe_3 is a typical quasi-two dimensional system which exhibits obvious charge density wave (CDW) orders. So far, RTe_3 with heavier R ions (Dy, Ho, Er and Tm) are believed to experience two CDW phase transitions, while the lighter ones only hold one. $TbTe_3$ is claimed to belong to the latter. However in this work we demonstrate that $TbTe_3$ also possesses more than one CDW order. Aside from the one at 336 K, which was extensively studied and reported to be driven by imperfect Fermi surface nesting with a wave vector $q = (2/7c^*)$, a new CDW energy gap (260 meV) develops at around 165 K, revealed by both infrared reflectivity spectroscopy and ultrafast pump-probe spectroscopy. More intriguingly, the origin of this energy gap is different from the second CDW order in the heavier R ions-based compounds RTe_3.

References:

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