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## **【167】 Temperature-driven Topological Phase Transition and Intermediate Dirac Semimetal Phase in $ZrTe_5$**

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We present an infrared spectroscopy study of  $ZrTe_5$ , which realizes a recent theoretical proposal that this material exhibits a temperature-driven topological quantum phase transition from a weak to a strong topological insulating state through an intermediate Dirac semimetal state around  $T_p \simeq 138K$ . Our study details the temperature evolution of the energy gap in the bulk electronic structure. We found that the energy gap closes around  $T_p$  where the optical response exhibits characteristic signature of a Dirac semimetal state. A comparison with previous studies suggests that the divergent results and conclusions about the topological nature of  $ZrTe_5$  can be reconciled by a variation of  $T_p$ , depending on the crystal growth conditions.

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