

Is Ta₂NiSe₅ an excitonic insulator?

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Excitonic insulator is a coherent electronic phase that results from the formation of a macroscopic population of bound particle-hole pairs – excitons. With only a few candidate materials known, the collective excitonic behavior is challenging to observe in solids, being obscured by crystalline lattice effects. Here we use polarization-resolved Raman spectroscopy to reveal the quadrupolar excitonic mode in the candidate zero-gap semiconductor Ta₂NiSe₅ disentangling it from the lattice phonons. The excitonic mode pronouncedly softens close to the phase transition, showing its electronic character, while its coupling to noncritical lattice modes is shown to enhance the transition temperature.

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[1] Mai Ye et.al., [PRB 104, 045102 \(2021\)](#)

[2] P. Volkov et.al., [PRB 104, L241103 \(2021\)](#)

[3] P. Volkov et.al., [npj Quantum Materials v. 6, 52 \(2021\)](#)