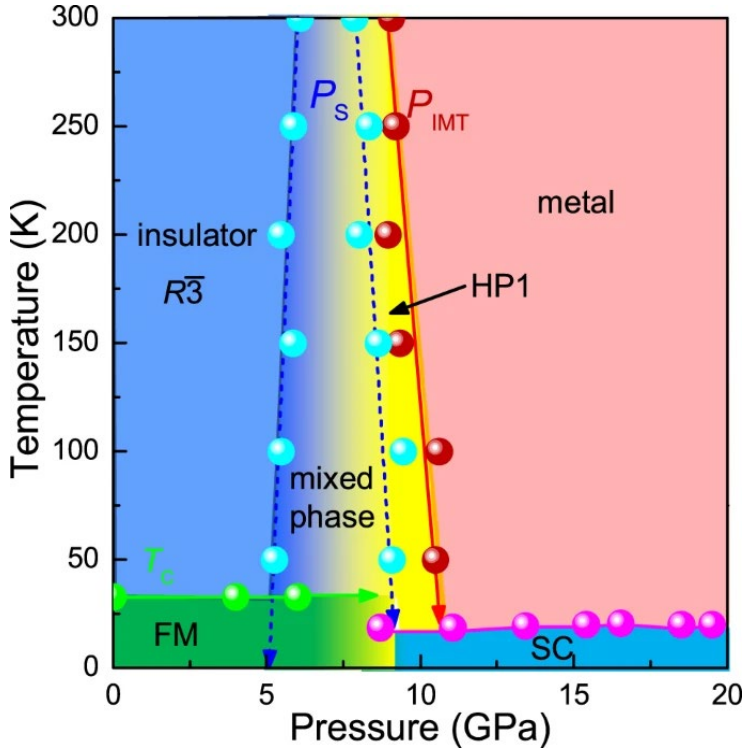
Revealing the Phases of $CrSiTe_3$ Under Extreme Conditions



Temperature-pressure (T - P) phase diagram depicting structural, magnetic, and electronic properties of $CrSiTe_3$.

J.L. Musfeldt, D.G. Mandrus, and Z, Liu. npj 2D Materials and Applications, **7** 28 (2023)

Work was performed at NSLS-II

National Synchrotron Light Source II

Scientific Achievement

By measuring the far infrared response of $CrSiTe_3$ under extreme temperature-pressure conditions, scientists completely revise the *T-P* phase diagram of this van der Waals solid.

Significance and Impact

This work helps uncover the mechanism of pressure-driven superconductivity in $CrSiTe_3$, which is of great interest to scientists due to the intriguing and often competing electronic and magnetic states in this class of materials.

Research Details

- At the NSLS-II FIS infrared beamline, scientists placed a $CrSiTe_3$ crystal into a diamond anvil cell to reach high pressures while lowering the temperature and measured the crystal's spectral response.
- They analyzed optical phonons (vibrations) during closure of the indirect band gap, which separates the valence and conducting bands.
- The new phase diagram revealed that the insulator-metal transition is triggered by a structural distortion and that a quantum critical point may be hiding at the nexus of these phase boundaries near the onset of superconductivity.

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