



Contribution ID: 101

Type: Talk

【126】 Superconductivity in simple cubic phosphorus: The role of dynamical screening and electronic correlations

Wednesday 29 June 2022 16:00 (15 minutes)

Experimentally simple cubic phosphorus displays a peculiar pressure- T_c curve with valley- and ridge-like features between 12 and 50 GPa. From the theoretical side, a simple electron-phonon mechanism proves insufficient to describe this behaviour. To address possible effects coming from electronic correlations and plasmonic contributions we have solved the parameter free gap equation of density functional theory for superconductors. We find that an electron-electron interaction kernel obtained from a one-shot GW calculation predicts values of T_c in the correct range. Additionally including a correction of the band structure from the quasi-particle energies significantly improves T_c in the high-pressure region.

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Session Classification: Condensed Matter Physics

Track Classification: Condensed Matter Physics (KOND)