

Putting superconductors under Pressure...

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The report of a record critical temperature (T_c) of 203 K in ultra-dense sulphur hydride (SH_3) at a pressure of 200 GPa has stimulated an intense activity aimed understanding new high- T_c superconductors at high pressures.[1]

SH_3 is a conventional (phonon-mediated) superconductor. Its record T_c stems from a unique combination of high vibrational frequencies, large electron-phonon matrix elements and electronic van-Hove singularities close to the Fermi level. Other hydrides have been predicted to display similar properties at high pressures.

In this talk I will give a short overview of the current theoretical understanding of superconductivity in SH_3 , and discuss the similarities and differences with the case of phosphorous hydride, which displays a T_c of 100 K at 200 GPa.[2][3] I will then propose possible strategies to attain high-temperature superconductivity in related systems: chalcogen hydrides and lithium-rich systems.[4]

[1] A.P. Drozdov, M.I. Erements and I.A. Troyan, *Nature* 525, 73 (2015).

[2] A.P. Drozdov, M.I. Erements and I.A. Troyan, arXiv:1508.06224.

[3] J. A. Flores-Livas, M. Amsler, C. Heil, A. Sanna, L. Boeri, G. Profeta, C. Wolverton, S. Goedecker and E.K. U. Gross, *Phys. Rev. B* 93, 020508(R) (2016).

[4] C. Heil and L. Boeri, *Phys. Rev. B* 92, 060508(R) (2015); C. Kokail, C. Heil and L. Boeri, *Phys. Rev. B* 94 060502(R) (2016).