Analysis of superconductivity properties of PbH₄(H₂)₂ calculated by using an Eliashberg equations

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ABSTRACT

This research aims to:
• Calculate a critical temperature of PbH₄(H₂)₂
• Find a dimensionless coefficient RΔ and compare it with BCS theory
• Show normal state heat and superconducting state heat

INTRODUCTION

Our research was subjected on PbH₄(H₂)₂ system. Please note that PbH₄ is an organic compound from plumban’s homologous series, whose bonds Pb – Pb are 3.5 times weaker than C – C in alkali’s homologous series. Ya Cheng et al. in their research in 2015 stated that PbH₄(H₂)₂ under the pressure 230 GPa is metallic superconductor, which critical temperature is 107K.

METHODS

Eliashberg formalism allows to predict the critical temperature in systems with electron-phonon pairing mechanism much more accurately then the BCS theory. In the case this approach is justified by given electron-phonon pairing constant which is λ = 1.3

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FREE ENERGY

CONCLUSIONS

Calculations were made under the Eliashberg’s formalism and allow to determine value of Tc, which is equal 121 K, 99 K and 81 K for Coulomb’s pseudopotential 0.1, 0.2 and 0.3. In addition, determining the value of factor RΔ returned results 4.22, 4.04 and 3.96, which significantly exceed the value predicted by BCS theory.

REFERENCES