

Upper critical field analysis of NbN superconductor

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Abstract

Thin film Niobium Nitrides(NbN) deposited by reactive sputtering have been characterized. The NbN films with cubic fcc B1 structure has a maximum T_c of 13.4K. The upper critical field $B_{c2}(0)$ for of these set of thin films has been calculated using GLAG theory with a maximum of 72T for one of the films, while other films show $B_{c2}(0)$ greater than 40T[1]. In the present work, these results have been analysed using Werthamer Helfand and Hohenberg (WHH) theory for disordered metals in the dirty limit. The variation of $B_{c2}(T)$ with T has been fitted to the WHH equation with paramagnetic limiting parameter α and spin-orbit parameter λ_{so} . The results indicate the importance of both α and λ_{so} in understanding the Upper critical field and will be presented.

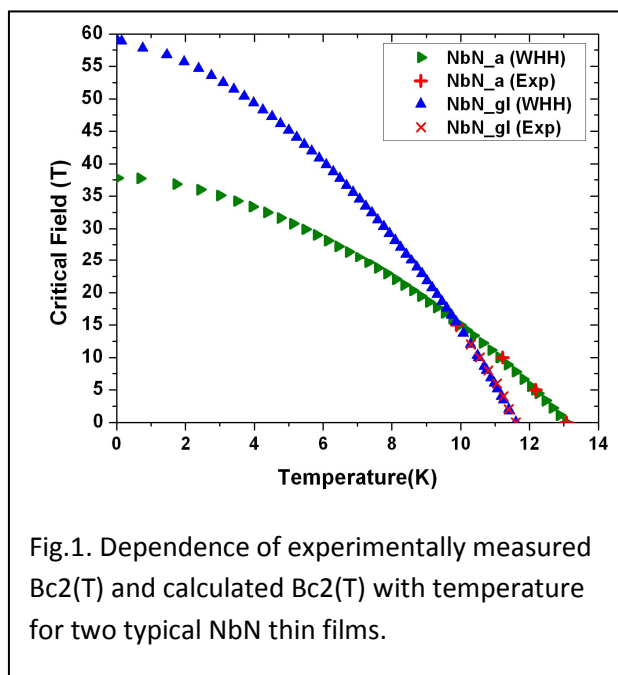


Fig.1. Dependence of experimentally measured $B_{c2}(T)$ and calculated $B_{c2}(T)$ with temperature for two typical NbN thin films.

Key words: DC sputtering, Niobium Nitride, Superconductivity, Upper critical field, Werthamer, Helfand and Hohenberg theory.

References

[1] R. Baskaran, A. V. Thanikai Arasu, E. P. Amaladass, and M. P. Janawadkar, J. Appl. Phys. **116** (2014) 163908