

QB05

### Effect of Nb deficiency on $T_c$ enhancement in $NbB_2$ : $^{11}B$ and $^{93}Nb$ NMR investigations

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Observations of the Nb-deficiency enhanced superconducting temperature ( $T_c$ ) in  $NbB_2$  have been reported. In order to elucidate the possible origins for the phenomenon, we have carried out the nuclear magnetic resonance (NMR) study on the  $Nb_{1-x}B_2$  ( $x = 0, 0.13, 0.20, \text{ and } 0.26$ ) alloys. From both  $^{11}B$  and  $^{93}Nb$  NMR spin-lattice relaxation rates, we can deduce the B-2p and Nb-3d partial Fermi-level density of states (DOS) for each individual composition. The results indicate that the B-2p and Nb-3d partial Fermi-level DOS increase with Nb deficient level. Such a tendency is consistent with the trend of the superconducting temperature, revealing that the observed  $T_c$  enhancement is correlated to the increase of the Fermi-level DOS induced by the Nb deficiency.

QB06

### Superconductivity of Metal Oxides doped Ceramics

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Magnetic flux measurements of a toroidal magnet revealed a concave shaped field distribution with a single minimum value and a null field along the axis of the torus at the point where the field was reversed. The non-linear magnetic field of the toroidal magnet perpendicular to the  $Ag_2O$  doped superconducting disk sample with the trapped magnetic flux distorted the field line distribution. As a result, the interaction force between the magnet and sample exhibited regions of repulsive, null, attractive, null, and finally repulsive force. The asymmetrical concave shaped force pattern along the axis with two null force points indicates that the magnetic force exerted form the sample changed direction which resulted in the transition from repulsive force to attractive force at the null force point, and the force becomes repulsive again beyond the second null force point as the distance along the axis increases. The lateral stability of the suspended sample under the toroidal magnet is provided by the characteristics of the asymmetrical nature of the field line with respect to the axis of the magnet. The magnetic moment of an undoped and 2 %  $Ag_2O$  doped sample was shown to be  $m = 0.043$  emu and 0.06 emu, respectively. The measured suspension force exerted from the doped sample agreed well with the suspension force calculated from magnetostatic force distribution. This work was carried out with help of National Research Lab.(NRL) program of Korea Science and Engineering Foundation (KOSEF) and Ministry of Science and Technology, Korean government.

#### REFERENCES

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