MAGNETIC SUSCEPTIBILITY OF THE ALLOY $Nb_3Al_{0.75}Ge_{0.25}$

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We have already reported [1] the results of measurements of the magnetic susceptibility of alloys of the system $Nb_3Al_{1-x}Ge_x$. It was of interest to measure in greater detail the temperature dependence of the susceptibility for the alloy $Nb_3Al_{0.75}Ge_{0.25}$, which corresponds to the maximum T_c on the $T_c(\chi)$ curve [2].

We measured the magnetic susceptibility of this alloy in the temperature interval from 300 to 19°K, using a magnetic balance with electromagnetic compensation. The temperature dependence of the specific susceptibility of the $Nb_3Al_{0.75}Ge_{0.25}$ sample is shown in Fig. 1. In the temperature range 300 - 50°K, the variation of χ is very close to that of T^{-1}, and below 50°K a flat maximum is observed on the $\chi(T)$ plot, beyond which a sharp decrease sets in (Fig. 2).

The change in the character of the temperature dependence below 50°K can be formally represented as a superposition of and additional diamagnetic component on the paramagnetic function $\chi(T) \sim T^{-1}$. The variation of this diamagnetic contribution with temperature is shown in Fig. 3.

This function is similar to $\chi_\perp(T)$ for tantalum chalcogenide diluted with pyridine [3]. As is well known, the $\chi_\perp(T)$ dependence for $TaS_2(pyridin)_{1/2}$ was regarded as a result of the influence of the fluctuations on the superconducting transition of this quasi-two-dimensional superconductor[1]. Since the structure A-15 (β-W) can be regarded as a system of linear Nb chains, the obtained $\chi_{dia}(T)$ dependence should possibly also be ascribed to the influence of fluctuations on the superconducting transition of $Nb_3Al_{0.75}Ge_{0.25}$.

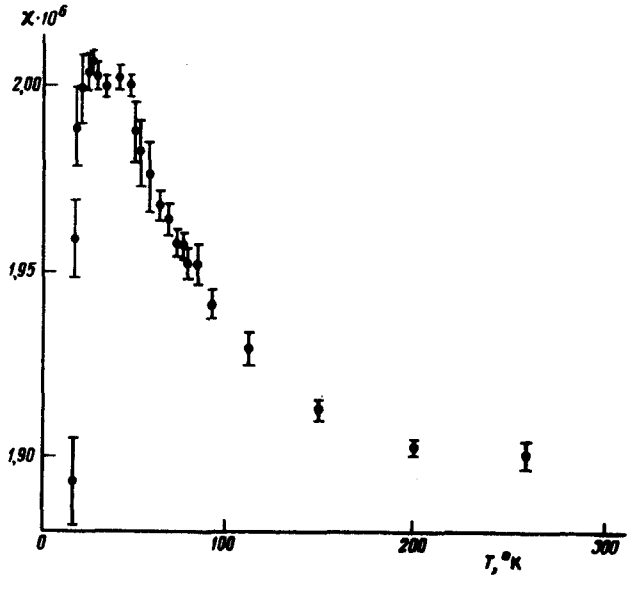

Fig. 1

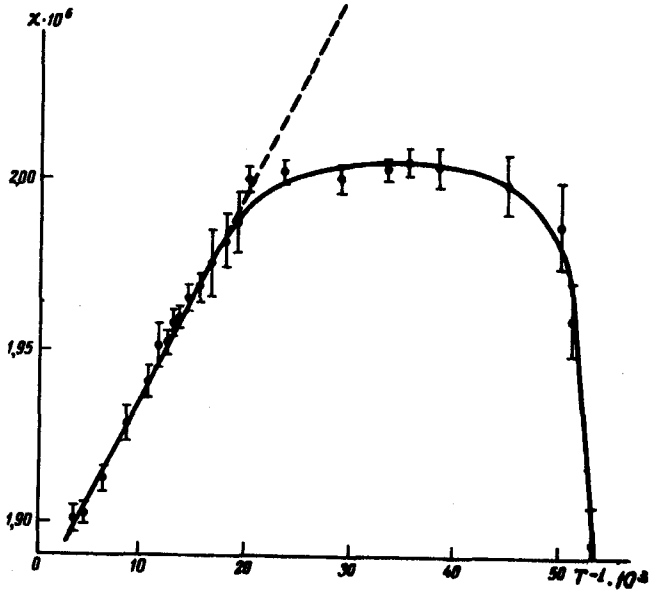

Fig. 2

[1]See [4] concerning the influence of the fluctuations on the superconducting transition.

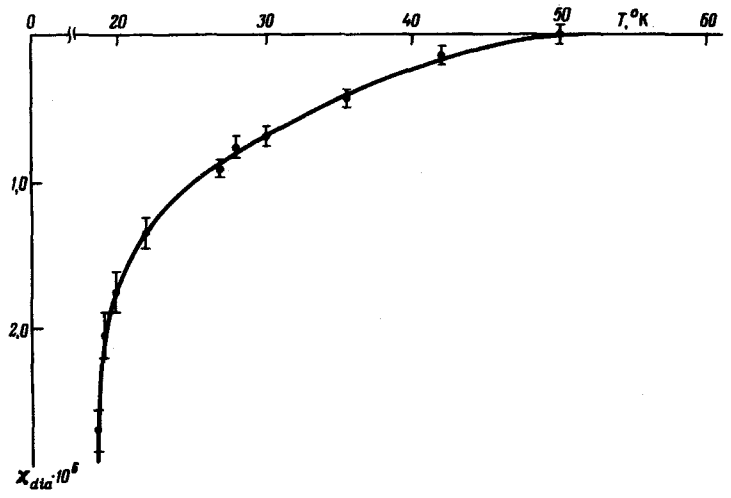

Fig. 3

A confirmation of this hypothesis is the noticeable decrease of the spin-lattice relaxation time when $T > T_c$ in Nb_3Al, which is also ascribed to fluctuations [5].

It should be noted that a temperature dependence similar to that obtained by us was observed for the susceptibility of Nb_3Sn [6]. It was assumed there that the maximum on the $\chi(T)$ curve is due to the martensitic transformation that occurs in Nb_3Sn at 40°K. One cannot exclude the possibility that in our case the deviation of χ from the T^{-1} dependence is due to a martensitic transformation. However, NMR investigations of the $Nb_3Al_{1-x}Ge_x$ system [7] show that the ^{27}Al line does not vary noticeably with the temperature, thus casting doubts on the martensitic-transition hypothesis.

In addition, as noted above, a decrease of the spin-lattice relaxation time T_1 at temperatures below critical is observed at the same time for Nb_3Al, where no martensitic transition takes place.

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FORBIDDEN ACOUSTIC NUCLEAR SOLID-STATE EFFECT IN CsI SINGLE CRYSTALS

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In [1] we obtained dynamic polarization of Li^7 nuclei in an LiF crystal by ultrasonic modulation of the internuclear dipole-dipole interaction at the sum