

having common vibrational levels and also from the combination differences calculated using microwave data⁶. The agreement between the combination differences from the (2,0) and (0,0) bands; and (0,0) and (0,1) bands (see Table I) confirms the correctness of our analysis. Our combination differences thus obtained are much different from Rai *et al.*³ indicating their analysis to be incorrect.

The constants were finally determined using usual graphical method⁷. Our constants for the ground state agree well with the constants reported by microwave study⁶. The constants reported by Rai *et al.*³ for the ground state differs considerably from the microwave value. Our excited state constants also differs from Rai *et al.*'s³ value. The constants thus obtained are given in Table II.

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THE DISAPPEARANCE OF CESR AND MECHANISM OF SUPERCONDUCTIVITY

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In the earlier papers¹⁻³ we had reported our results of CESR and spin wave resonance in A-15 superconductors in the normal and superconducting states. It was concluded that the disappearance of CESR and spin wave resonance in the superconducting state was indicative of nonphononic mechanism of superconductivity. In this note we discuss this important conclusion further to point out that our model is in accord with various other findings, inexplicable in terms of the BCS theory⁴.

We first analyse the findings of Schultz *et al.*⁵ on CESR studies of Al carried out in the normal and forced normal state⁷. Almost immediately after

Kaplan's calculations⁶, when it became apparent that the CESR studies in the superconducting state could give an insight into the relaxation mechanism of the Cooper pairs, Schultz *et al.* carried out CESR studies on Al in the temperature range of 77 K to 1.4 K. It is worth pointing out that although T_c of Al is 1.7 K⁷, the CESR observations at 1.4 K correspond to the situation where the metal is in the forced normal state as the applied magnetic field is in excess of the critical magnetic field of Al⁷.

Figure 1 depicts our results for Nb₃Ge and those of Schultz *et al.* for Al at different temperatures. It is interesting to note that in the case of Nb₃Ge ($T_c = 22.65$ K) the CESR line has completely disappeared at 4.2 K while for Al in the forced normal state, the CESR line is markedly reduced in intensity. According to Kaplan⁶ and Aoi and Swihart⁸, if the BCS mechanism were operating, the CESR should not have vanished (for Nb₃Ge at 4.2 K) or nearly vanished (for Al at 1.4 K).

The disappearance of CESR and side absorptions in Nb₃Ge, we explained^{2,3} on the basis of antiferromagnetic coupling resulting in an ordered magnetic state. Both CESR and spin waves in such a state are not expected unless fluctuations are imposed by applying higher magnetic fields and microwave frequencies which would necessarily revert the material normal.

Results of Schultz *et al.* immediately follow the above contention. The near vanishing of CESR in the forced normal state is most likely to be the direct consequence of a phenomenon analogous to the occurrence of the spin flop region involving canting of spins due to the application of the magnetic field in antiferromagnetic materials⁹. A small canting is

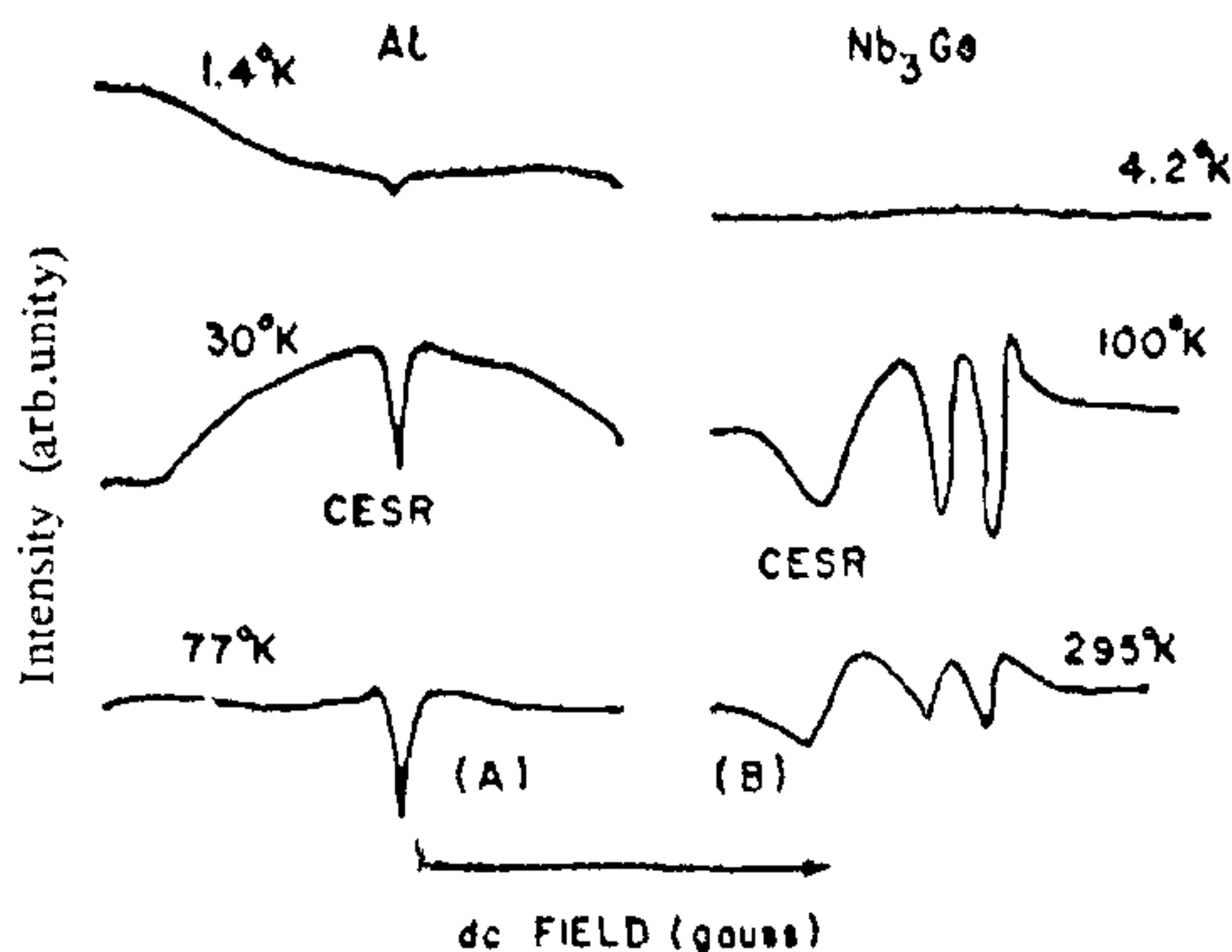


FIG. 1. CESR spectra at various temperatures for (A) Al and (B) Nb₃Ge g -value for Al = 1.997 g -value for Nb₃Ge = 2.022.

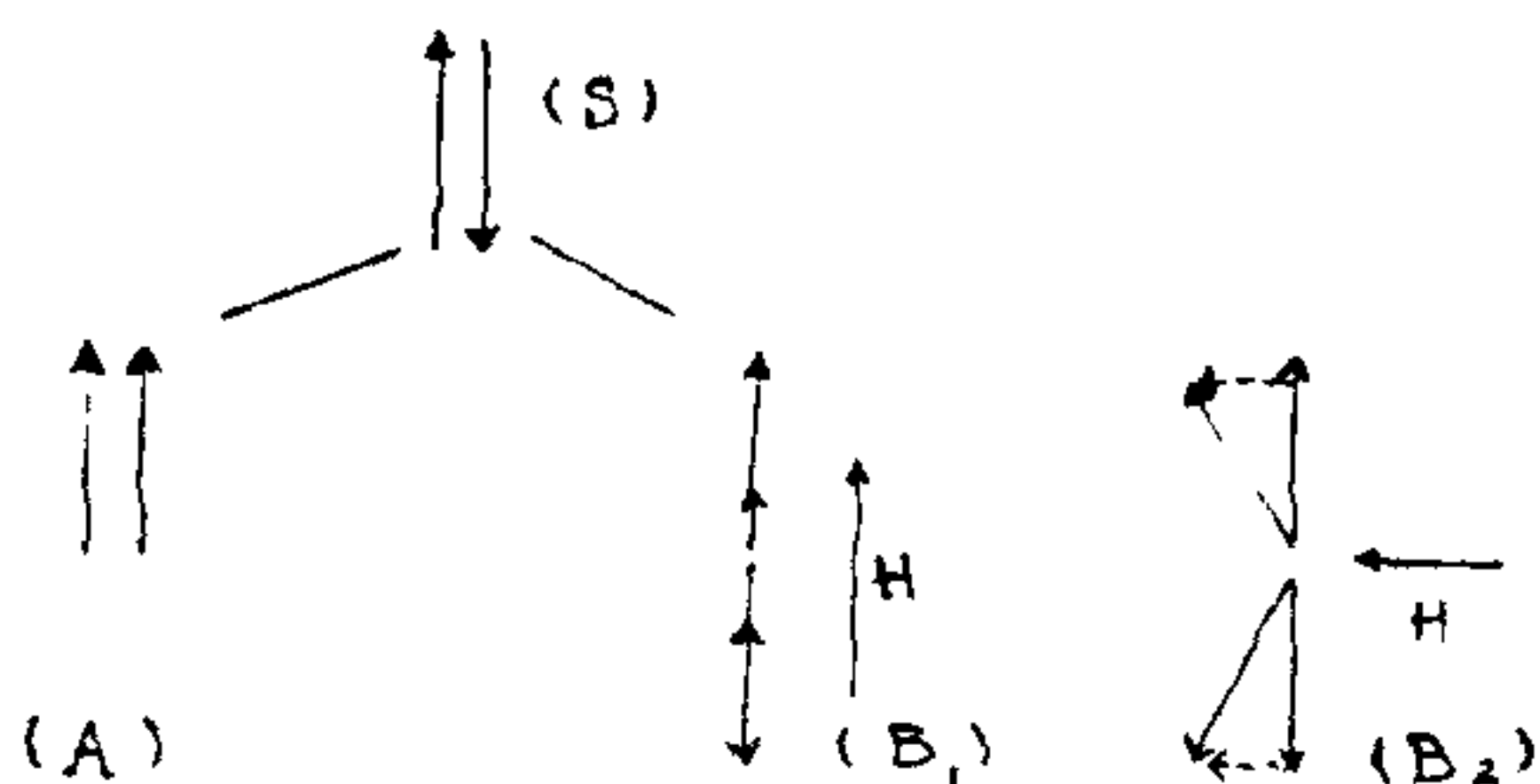


FIG. 2. Spin arrangements (S) = electron pairs in superconducting state, (A) = forced normal state in the BCS-CESR expected (B₁), (B₂) = A spin-flip region in antiferromagnetic materials when $H \geq H_c$. Canting of spins and a reduced CESR is expected. Analogous situation in superconductors.

expected to give rise to a spin polarization and thereby one should observe a reduced resonance absorption which would have completely vanished in the ordered magnetic state. The near vanishing of the line cannot at all be expected in the BCS mechanism where forced normal state is not any different from the normal state, as phonon-mediated coupling is broken and the spins are completely polarized (Fig. 2). Because of this, the question of different relaxation mechanism does not arise. It is worth pointing out that even in the superconducting state the relaxation time does not change appreciably¹⁰. The absence of s_f in waves in the normal state of Al is not surprising as the exchange interactions are expected to be weak. Moreover the thickness of the Al films is comparatively very larger, i.e., about 28 to 250 microns as compared to 2000 to 3000 Å for Nb₃Ge films. Larger thickness would make the resolution of the side bands in Al to be difficult, if not impossible.

Interestingly, both magnetic susceptibility and NMR measurements of Al below T_c are more readily explained in terms of the collective electron antiferromagnetism envisaged by us and they do not straight-away follow from the BCS mechanism. Indeed, such a possibility of the collective electron antiferromagnetic state in superconductor has been suggested recently by Fradin *et al.*¹¹ using the spin echo technique for YRh₂B₄.

It may be stressed that presently there exists no direct experimental support for the electron-phonon coupling in superconductors¹². The quasi particle tunnelling studies^{13,14} carried out in conjunction with the inelastic neutron scattering experiments¹⁵, where $G(\omega) = a^2 F(\omega)$ holds, provide no direct support, but have to be stretched appreciably to justify the phonon mediation. Indeed, Peter *et al.*¹⁶ have questioned the validity of the assumptions implicit in McMillan's theory¹⁷ when applied to A-15 and

Cheval phases. The results pertaining to $G(\omega) = a^2 F(\omega)$, in fact, simply indicate that the phonon energy is affected in superconducting transition, though the former need not necessarily be the cause of the latter. The recent work of Kim¹⁸ has shown that the phonon energy can considerably be affected by exchange enhancement in A-15s as the ion-ion interaction is screened by conduction electrons. A change in phonon energy therefore could be a property of the superconducting state which might as well result from exchange interactions. In fact the failure of McMillan's equation has led to other possible superconductivity mechanisms in A-15s¹⁹. The above discussion tends to reveal that the mechanism in question is most likely to be through the exchange interactions of antiferromagnetic type between the itinerant electrons within conduction band.

What we have discussed above is not to be confused with the recent computations of Rietschel and Winter²⁰ who showed that if the BCS mechanism were to hold, the ferromagnetic paramagnons would depress the transition temperature. Such type of paramagnons would also lower T_c in our model as the ferromagnetic polarization of itinerant electrons would necessarily result in the breaking of the ordered antiferromagnetic state in the conduction band.

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SYNTHESIS OF α -BENZAMIDO- β -(2-METHOXYNAPHTHYL)-ACRYLIC ACID

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In connection with our studies on α - β -substituted acrylic acid (I), α -benzamido- β -(2-methoxynaphthyl)-acrylic acid (I) was required in quantity. Literature survey indicated that the compound was still unreported. This communication reports the synthesis of the new compound starting with 2-methoxy-1-naphthaldehyde (III) obtained from 2-methoxynaphthalene by formylation using phosphorus oxychloride and dimethylformamide according to the procedure of Vincent *et al.*². The aldehyde was converted into 2-phenyl-4-(2-methoxynaphthalidene)-5-oxazolone(II), which on partial hydrolysis with baryta water afforded the compound (I) the structure of which was confirmed by analytical and spectroscopic methods.

The u.v. spectrum of the compound (I) showed a high intensity band with λ_{\max} at 225 nm and a broad low intensity band with λ_{\max} at 342 nm indicating the presence of the chromophore $-\text{CH}=\text{CH}-\text{CO}-$. The i.r. spectrum showed absorptions in the regions 815-650, 1275-1250, 3550-3250 cm^{-1} and at 2950, 1925, 1640, 1600, 1525, 1350 cm^{-1} revealing the presence of $=\text{N}-\text{H}$, $-\text{CH}_3$, $-\text{C}=\text{C}-\text{COCH}$, substituted amide and $-\text{C}=\text{C}-$ structural groupings in conformity with the structure of the compound.

The nmr spectrum displayed a three proton singlet at δ 4.05 ($-\text{OCH}_3$) and a broad singlet at δ 4.8 measuring one proton ($=\text{N}-\text{H}$). The vinylic proton was seen at δ 8.6 as an ill-defined singlet measuring one proton. The aromatic protons were as a haystack multiplet measuring eleven protons in the range δ 7.2-8.2 ppm. The mass spectrum displayed molecular ion at m/e 347 (1%). The base peak was seen at m/e 105 ($\text{C}_6\text{H}_5\text{CO}^{2+}$). Significant ions occurred

at m/e 77 ($\text{C}_6\text{H}_5^{7+}$); at m/e 197 (M-COOH and $-\text{C}_6\text{H}_5\text{CO}$); at m/e 182 (M-COOH and $-\text{C}_6\text{H}_5\text{CONH}$) and at m/e 167 ($\text{C}_{12}\text{H}_7\text{O}^{7+}$). The compound gave positive response to Lassaigne's test for nitrogen and reformed the azlactone(II) on heating with acetic anhydride.

Experimentals

All melting points were uncorrected. UV spectrum was taken on Varian Tectron u.v. vis spectrophotometer model 635; IR spectra were recorded on S.P. 1000 i.r. spectrophotometer. NMR spectra were recorded on Varian-EM-360, 60 MHz nmr spectrometer with TMS as internal reference. Mass spectrum was taken on Hitachi RMU-6E mass spectrometer.

2-Methoxy-1-naphthaldehyde(III) : β -naphthyl methyl ether (5.3 g) was treated with dimethylformamide (3 g) and phosphorus oxychloride (3.4 ml) in ice cold and anhydrous condition. The reaction mixture was then heated over a water bath for 16 hours,

