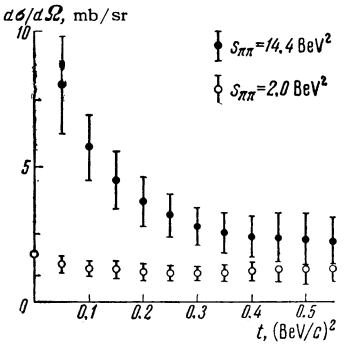
$$(s_{\pi\pi}\, s_{NN} / s_{\pi N}^2)^{2\alpha(t)-1} \left(\frac{d\sigma}{d\Omega}\right)_{\pi N}^2 = \left(\frac{d\sigma}{d\Omega}\right)_{\pi\pi} \left(\frac{d\sigma}{d\Omega}\right)_{NN}, \qquad (2)$$

where s is the square of the total energy of the corresponding process in the c.m.s., and $\alpha(t)$ is the trajectory of the Pomeranchuk pole.

The figure shows the differential cross sections of elastic $\pi\pi$ scattering calculated from formula (2) for values of $s_{\pi\pi}$ = 2.0 and 14.4 BeV^2. For the calculation we used the function $\alpha(t)$ obtained by Domokos in the two-meson approximation[4]. The experimental data on elastic πp scattering at 7.2 BeV[5] and pp scattering at 15.5 BeV[6] were approximated by series in powers of the variable $\eta = -t\,(2\mu + \sqrt{4\mu^2 - t}\,)^{-2}$ (t is the square of the transferred 4-momentum and μ is the pion mass) and reduced by the least-squares method. When using these experimental data, it was assumed that at the indicated πp and pp scattering energies the contributions to the differential cross sections from poles other than the Pomeranchuk pole can be neglected.



It is seen from the figure that when $s_{\pi\pi}$ = 2.0 BeV^2 the $\pi\pi$ scattering has an almost isotropic character.

Employing the optical theorem, we obtain for the total $\pi\pi$-interaction cross section $\sigma_{tot} \cong 15$ mb, in accordance with the estimate of Gribov and Pomeranchuk[1].

The author is grateful to B. A. Arbuzov, G. Domokos, L. I. Lapidus, and R. N. Faustov for discussions connected with the present work.

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ON THE ARTICLE "ANTIFERROMAGNETISM OF FREE RADICALS"[1]

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Submitted to JETP editor December 24, 1962

J. Exptl. Theoret. Phys. (U.S.S.R.) **44**, 1125-1126 (March, 1963)

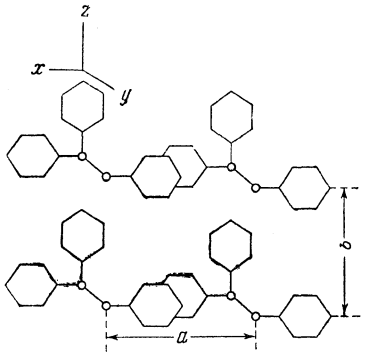
In conformance with the experimental data contained in [1-3] on the Curie temperature $\Theta = zJ/2k$ (J is the exchange integral; the spin is $S = \frac{1}{2}$) and on the electron paramagnetic resonance absorption line width ΔH for the free radical $\alpha\alpha$-diphenyl-β-picrylhydrazyl (DPPH), the following relations hold:

$$\Theta_{77°K}/\Theta_{1.0°K} = J_{77°K}/J_{1.0°K}$$

$$= \exp(-\lambda d_{77°K}/\exp(-\lambda d_{1.0K}) \cong 30, \qquad (1)$$

$$\Delta H_{1.0°K}/\Delta H_{77°K} = (J_{77°K}(J_{1.0°K})\,(d_{77°K}/d_{1.0°K})^6 \cong 4.5. \qquad (2)$$

It is assumed that each unpaired electron has two nearest neighbors (z = 2) the spacing between which is d. In order to satisfy both relations, it must be assumed that $d_{1.0°K}/d_{77°K} = 1.37$. Let us note that $z \neq 6$, since in this case an increase in the volume of the crystalline cell during cooling in the range T ~ 77—1°K would have to be assumed. Substituting this ratio into (1) we find $d_{77°K} \sim 4.6 \times 10^{-8}$ cm for $\lambda \sim 2 \times 10^8$ cm^{-1} [3]. This value is in good agreement with the rough model of the crystal lattice (see sketch) constructed by a "close packing" of the molecules (the lengths of the characteristic chemical bonds are taken from [4,5]). It is seen from the lattice model that the ratio $a/d \approx b/d \gtrsim 2$, where d is the cell dimension along the N-N bond. Taking account of the mean dimension of the cell (obtained by dividing the crystal volume by the number of unpaired electrons), which equals 8×10^{-8} cm[3], we find $a \cong b \approx 10^{-7}$ cm; $d_{77°K} \sim 5 \times 10^{-8}$ cm. The magnitude of the ratio $a/d \approx b/d \gtrsim 2$ also confirms the validity of the assumption z = 2.



Model of the crystal lattice of the free radical $\alpha\alpha$-diphenyl-β-picrylhydrazyl. The lattice consists of layers of this kind, somewhat displaced relative to each other, O – N atoms.

Finally, from $\Delta H_{1.0°K}/\Delta H_{4.2°K} = 1.5$ and from relations analogous to (1) and (2), we find $d_{4.2°K}/d_{1.0°K} = 0.94$ and $J_{4.2°K}/k = \Theta_{4.2°K} = 0.75°K$, which is in good agreement with the value $J_{4.2-2.0°K} = 0.78°K$.[6] The variation of J in the T = 4.2—1.0°K range does not contradict the plot of $\chi(T)$ in Fig. 1 of [1]. In light of the above, the value of $J_{4.2°K}$ in Fig. 3 of [1] is reduced ~ 1.3 times.

Hence, an analysis of the temperature variation of the absorption line width and the Curie temperature, and also the discussed model of the crystal lattice, indicate that at helium temperatures and below DPPH is a system of magnetic moments similar to a set of parallel, linear chains.

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