recombination of the atoms and radicals leads to $E^{v}_{AB} \simeq D_{AB}$ (E^{v}_{AB} is the vibrational energy of the level v and D is the dissociation energy), but in reactions in which the molecules take part we have $E^{v}_{AB} << D_{AB}$, inasmuch as at such high temperature there are no noticeable amounts of compounds with binding energies $E \lesssim 80$ kcal/mole, so that the thermal effect of such reactions is given by $Q \simeq D_{AB} - E << D_{AB}$.

2. The anharmonicity of the vibrations causes the filling of the mean levels to proceed much more slowly than the relaxation of the lower levels (there is no fast v-v exchange[2]).

3. The rather rapid non-equilibrium depletion of these levels via radiative vibrational transitions in the IR region, up to very large Pd (d is the linear dimension of the vessel) is not hindered by self-absorption, in view of the low concentration of the particles at these levels and the considerable spectral shift of these levels, which is due to the anharmonicity.

It can be shown that in this case the degree of non-equilibrium for levels $v_1 < v < v_2$ ($E^{v_1} \simeq D - E$, $E^{v_2} \simeq D - E^*$) is described by the expression

$$N_v/\hat{N}_v = \exp(-S_v) + \exp\left(-\frac{E^{v_2} - E}{RT}\right)\left[1 - \exp(-S_v)\right]\gamma_v ,$$

where $\hat{N}_v$ is the population of the level v in thermodynamic equilibrium,

$$S_v = \sum_{u=v_1}^{v-1} \ln\{1 + [\tau_{u+1} k_{u+1} M]^{-1}\},$$

M is the total concentration, k_v is the rate constant of the v-T exchange, and τ_v is the radiative lifetime of the vibrational level v; we have $0 < \gamma_v < 1$ ($\gamma_{v_1} = 1$; $\gamma_{v_2} = 0$).

This yields a degree of non-equilibrium $N_v/N_v \simeq 0.1 - 0.01$. at $k_v \simeq 10^{-15}$ cm^3/sec, $\tau_v^2 \simeq 10^{-4}$ sec, and $P \simeq 1$ atm for vibrational levels $v - v_1 = 10 - 30$.

Thus, the existence of irreversible IR emission from mean medium levels can make it possible to maintain in quasistationary fashion the non-equilibrium character of the phototransition $AB^* \to AB(v) + h\nu_{UV}$. This leads to a brightly pronounced anomalous emissivity of these systems. The question of the accompanying inverted population of the electron-vibrational transitions called for a special study.

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1) The value of I_λ measured by us corresponds to an effective temperature $T_{eff} = 4400$°K.

2) In our experiments the rate of the v-T processes exceeded the rate of filling of the medium v in UV transitions: $I \simeq 10^{20}$ quanta/cm sec and $W_{v-T} \gtrsim 10^{21}$ cm^{-3}sec^{-1}.

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TEMPERATURE DEPENDENCE OF THE RELAXATION RATE OF THE π^+-MESON SPIN IN FERROMAGNETS

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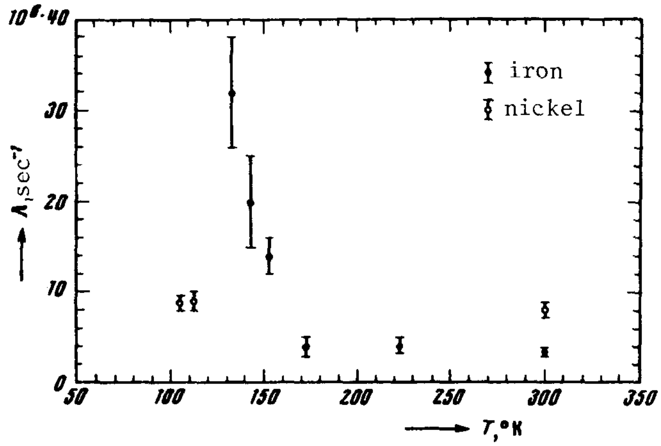
Relaxation of the π^+-meson spin in iron and nickel was revealed by the attenuation of the muon precession in a transverse magnetic field. This precession can be the result of a number of processes, such as spin exchange between the muon and an electron of the metal in contact interaction, or the change in the spin-precession frequency of individual muon because of differences in the local magnetic fields at the muon locations (e.g., in the octa- and tetrapore of the unit cell). Another possible cause is the muon diffusion over the crystal. Of all the indicated processes, only the diffusion can depend on the temperature. When the temperature is increased, the rate at which the muon diffuses over the crystal increases, and an increase in the muon velocity can decrease the depolarizing action of the local magnetic fields, since these fields begin to vary with time when the muon moves. A decrease in the rate of depolarization of the muon with increasing temperature was indeed observed in magnetized iron.

The experiment was performed with the beam of polarized μ^+ mesons of the JINR synchrocyclotron (Dubna). The figure shows the attenuation rates λ_{Fe} and λ_{Ni} of the muon precession amplitudes in magnetized samples of iron and nickel. The samples were flats ellipsoids of revolution of 60 mm diameter and maximum thickness 10 mm. The external field H = 750 Oe was parallel to the major axis of the ellipsoid. It is seen from the figure that at T < 170°K the attenuation rate λ_{Fe} in iron increases rapidly with decreasing temperature, while λ_{Ni} remains constant in the temperature range T = 100 - 300°K.



Temperature dependence of the damping rate λ of positive-muon spin-precession amplitude in magnetized iron and nickel sample. $\lambda = 1/t_e$, where t_e is the time required for the amplitude to decrease by a factor e.

The independence of λ_{Ni} of the temperature can be explained by assuming that the μ^+ meson, like hydrogen [1] is in the center of the unit cell, which is a face-centered cube in the case of nickel. It is easy to show that in the center of such a cell (in the octapore) the magnetic field produced by the symmetrically disposed magnetized nickel atoms is equal to zero. The diffusion of the muons therefore does not affect the rate of relaxation of their spins in nickel. In the iron unic cell (body-centered cube), the dipole magnetic **fields** produced by the magnetized iron atoms amount to several kilogauss in both the octapore and the tetrapore. It is therefore intuitively clear that the decrease of the muon diffusion rate in iron with decreasing temperature causes the muon spin relaxation rate to increase.

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SINGULARITIES OF MAGNETO-OPTICAL EFFECTS IN INHOMOGENEOUSLY MAGNETIZED MEDIA

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An anomaly of the magneto-optical effect was observed following the reversal of the magnetization of single-crystal iron borate crystals. This anomaly is attributed to the onset of an inhomogeneous magnetic structure that contributes to the increase of the magneto-optical rotation

This paper deals with singularities in the propagation of electromagnetic waves in a transparent magnetically-ordered medium with inhomogeneous magnetization.

We chose for the investigations iron borate $FeBO_3$, which has high transparency in visible light and magnetic anisotropy of the easy-plane type. The investigated samples were single-crystal plates measuring 3 x 5 x 0.05 mm, the large surface being perpendicular to the principal axis of the crystal.

Reversal of the magnetization of weak ferromagnets with easy-plane anisotropy can give rise to a regular magnetic structure with periodicity along an axis perpendicular to the easy plane of magnetization [2]. A number of experiments have shown that a layered domain structure similar to that predicted in [2] is observed in local sections of the indicated samples during