Pr solid solution when the Ga content rises. We observed similar dissipation processes in \(Y_3Al_{5-x}Ga_xO_{12}\) solid solutions doped with a different RE ion with a comparatively low energy of the allowed interconfiguration transitions, namely, Ce\(^{3+}\) [4]. The assumption about the causes of the dissipation is supported by the correlation between the decrease in the thermal quenching activation energy of the impurity and the narrowing of the interband interval from \(\sim 8.0\) eV to \(\sim 5.6\) eV in the transition from \(Y_3Al_5O_{12}\) to \(Y_3Ga_5O_{12}\).

Moreover, the specific mechanisms of excitation energy dissipation in \(Y_3Al_{5-x}Ga_xO_{12}\) solid solutions doped with Ce\(^{3+}\) ions and those doped with Pr\(^{3+}\) ions evidently are not identical. In the first case, according to [4], electron transitions occur between the top of the valence band and the ground state of the excited Ce\(^{3+}\) ion. In \(Y_3Al_{5-x}Ga_xO_{12}:Pr^{3+}\) solid solutions the decrease in the UV luminescence quantum yield is attributable to the thermal ejection of electrons from excited 4f5d states of the activator ion to the conduction band. The assumption is supported by the variation of the intensity of the f-f luminescence bands of Pr\(^{3+}\) ions (see Figs. 1 and 2). We assumed that if the proposed model of excitation energy dissipation holds in the system under consideration, as the composition of the solid solution and the temperature vary the intensity of the radiative transitions between the terms of the 4f shell (the visible region of the spectrum) should not change as substantially as is characteristic of the ultraviolet region of the spectrum.

We should point out that such a mechanism of thermal quenching of luminescence was proposed in [5] for yttrium oxysulfides doped with rare-earth ions.

LITERATURE CITED

LUMINESCENT PROPERTIES OF VITAMINS IN MONOMERIC AND ASSOCIATED STATES IN A POLAR SOLVENT

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Low-temperature investigation of solutions of plant pigments and vitamins permits the disclosure of the mechanism of chromaticity and a determination of the pathways of their stabilization, which is of practical interest [1, 2].

It is known that when the temperature of solutions is substantially lowered, there is a breakdown of the solvate shell and an enhancement of intermolecular interaction, which is expressed in an association of molecules and the corresponding change in the electronic spectra [3]. As a result of isomorphic introduction of dye pigment molecules into a low-temperature solvent matrix, the intramolecular and intermolecular energetics undergo substantial changes [4].

We investigated the spectral luminescent characteristics of rutin and riboflavin (vitamin B\(_2\)) in ethanol, rendered absolute according to the method of [5]. The luminescence and luminescence excitation spectra were recorded on a setup working in a photon-counting system. Light rays emitted by an MDR-8 monochromator from a DKSSH-500M xenon lamp served as the luminescence excitation source.

An FEU-78 photoelectronmultiplier, coupled with an IBM-compatible computer, was used as the light receiver. The frequencies of the purely electronic transition (\(v_{60}\)) were deter-
Fig. 1. Normalized luminescence (1, 3) and excitation (1', 3') spectra of an ethanol solution of rutin (a) and riboflavin (b) (C = 10^{-6} M) at 300 (1, 1'), 123 (2), and 77 K (3, 3').

Fig. 2. Relative temperature dependence of the number of photons of rutin (1, 1') and riboflavin (2, 2'); C = 10^{-6} M (1, 2) and 10^{-3} M (1', 2').

mined according to V. L. Levshin's mirror-symmetry rule and B. I. Stepanov's universal function [5]. The program for calculating \( v_{00} \) was implemented in the Basic language. The electronic spectra of the compounds selected were recorded in the concentration range \( 1 \cdot 10^{-3} \) to \( 1 \cdot 10^{-6} \) M.

The results of our investigations showed that at \( T = 300 \) K in dilute solutions of rutin and riboflavin, the luminescence (f) and luminescence excitation spectra (a) consist of broad bands with maxima \( \nu_{\text{max}}^f = 21,700, \nu_{\text{max}}^a = 27,500 \) cm\(^{-1} \) and \( \nu_{\text{max}}^f = 19,500, \nu_{\text{max}}^a = 21,600 \) cm\(^{-1} \), respectively (Fig. 1, curves 1, 1').

Lowering the temperature of the rutin and riboflavin solutions leads to a slight increase in the fluorescence yields (Fig. 2, curves 1, 2). When the temperature is further lowered, beginning with \( T = 150 \) K, a sharp increase in the yield is observed (more than 15-fold; see Fig. 2). Such an increase in the quantum yield of luminescence continues when the temperature is lowered all the way to 70 K. Further lowering the temperature from 70 down to 4.5 K does not lead to any substantial increase in the number of photons of lumines-