

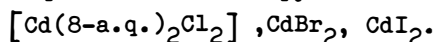
THE PHOTOLUMINESCENCE OF CRYSTALLINE COMPLEX COMPOUNDS
OF CADMIUM (II) HALIDES WITH 8-AMINOQUINOLINE

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8-Aminoquinoline forms with cadmium halides complexes of crystal structure. The absorption spectra of their solutions show that the complexes exist only in solid state. The quantitative ratio of their molecular constituents is

$$8\text{-a.q.}/\text{Cd(II)hal} = 2:1$$

which corresponds to that of the known octahedral amino-complexes. Cadmium is in an octahedral structure where the halogen atom form a "bridge" between the cadmium atoms, while the 8-a.q. molecules occupy free coordination sites:



All compounds are characterized by an intense green photoluminescence. The emission spectrum in all the cases contains one band the maximum of which is given in Table 1.

Table 1.

8-a.q.with:	WAVELENGTH IN nm		
	CdCl ₂	CdBr ₂	CdI ₂
FLUORESCENCE	510	529	520
PHOSPHORESCENCE	510 ; 643,9	-	536,8; 581; 622,3

At the temperature of liquid nitrogen the complexes 8-a.q. with CdCl₂ and CdI₂ also show a transition corresponding to phosphorescence.

The excitation spectra of these complexes are broad bands with a large number of peaks, some of which were identified as those pertaining to 8-a.q., while the remaining ones were found to be the peaks of charge-transfer bands.

The temperature variations of luminescence intensity and of emission band half-width follow the corresponding laws, which makes it possible to present the energy scheme of the emission center Cd²⁺ by the single-configurational coordinate method(1,2). In the case of the compound of 8-a.q.

with CdCl_2 , by fitting to corresponding laws the following equations were obtained:

1) for the temperature variation of luminescence intensity:

$$I = 47279./1 + 256,6.\exp(-3693,7/T)/$$

whence the activation energy for quenching is found to be $W = 0,32 \text{ eV}$;

2) for the temperature variation of band half-width:

$$1/L^2 = 0.195.10^{-3} \text{tgh}(144,9/T) + 0,315.10^{-3}$$

whence the excited state frequency is determined to be $n_e = 0.6039.10^{13} \text{ s}^{-1}$.

The ratio of coefficient a (which express the linearity of variation of the logarithm of the function of transition matrix factor, $\ln G$, with the square of difference between wave numbers for the same $\ln G$) to coefficient m (which describes the asymetry of the Gaussians into which the emission band is resolved) is constant for any temperature: $a/m = -0.354.10^{-4} \text{ cm}$.

From the above presented data the following parameters are obtained for configurational curves:

- the excited state minimum energy, $U_0 = 2,91 \text{ eV}$;
- the corresponding conf. coordinate, $R_0 = 0,18 \text{ \AA}$;
- the conf. coordinate that corresponds to thermal desactivation, $R = 0,48 \text{ \AA}$;
- the ground state frequency, $n_g = 0,7744.10^{13} \text{ s}^{-1}$.

On the basis of these parameters the potential curves are constructed for the ground (U_g) and excited (U_e) states:

$$U_g = 13,975 R^2 \text{ (in eV)}; U_e = 3,616 R^2 - 1,357 R + 3,044.$$

R e f e r e n c e s

1. H.Payen de la Garanderie, Thesis, Paris 1964.
2. K.Nikolić, F.Lignou and H.Payen, J.Luminescence 8,137(1973).