

CONTRIBUTION TO THE INVESTIGATION OF CUPPRUM IODIDE
PHOTOLUMINESCENCE

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Among the cupric salts, cupreous iodide (CuJ) shows the most intense photoluminescence and photoelectric effect⁽¹⁾. The aim of this work was to investigate the dependence of the photoluminescence of CuJ on the temperature of treatment as well as to establish the correlation between photoluminescence and stable modifications: α -CuJ (cubic and stable up to 369°C), β -CuJ (hexagonal and stable up to 369-407°C) and γ -CuJ (cubic and stable above 407°C)⁽²⁾.

Two types of polycrystalline samples were used: the commercial (Merck) and CuJ obtained by direct influence of iodine vapours on metal plates of pure copper in the presence of air. The commercial samples of 2 cm³ of polycrystalline powder CuJ were heated in the welded glass tubes of 5 cm³ in volume at: 20°C, 200°C, 300°C, 374°C, and 450°C in the presence of air. In the other case, the samples of CuJ were formed by the influence of iodine vapour on copper plates (2 mg J per cm² of the plate) at the mentioned temperatures. The heating and forming of the samples took 30 min, except for the sample on 20°C which took a considerably longer time. All the samples were gradually cooled down to the ambient temperature after the heating. The colour of fluorescent light emitted by all the samples treated changes with the increase in temperature from dark red to bright yellow. The samples heated above 450°C lose their fluorescent features.

Certain samples were investigated by rentgenography (powder method), Table 1, where θ is the diffraction angle

On the basis of these results one may conclude that the diffraction line broadening increases with the increase of diffraction angle on the same sample. This broadening increases also with the increase of the temperature at which the sample was treated. Finally, the diffraction lines broadening is found to be greater for CuJ obtained by evaporation as compared to that for the commercial samples heated at the same temperature.

The photoluminescent spectra of some treated samples are shown in Fig.1: a- excitation spectrum, b-CuJ (Merck) at 20°C, c-CuJ (Merck) heated on 200°C, d-CuJ (Merck) heated on 300°C, e-CuJ (Merck) heated on 374°C, f-CuJ obtained by evaporation at 20°C and g-CuJ obtained by evaporation at 300°C.

The excitation spectrum has the maximum of intensity at $\lambda=4000 \text{ \AA}$, The photoluminescent spectra depend on the type of sample and on the temperature at which the sample was treated: spectra (b) and (c) show complex photoluminescence with two dominating emission lines (5.050 \AA and 6.200 \AA), while the spectra of the sample (a) has only one dominating emission line (6.000 \AA). In case of the samples (b) and (c) the effect of colour mixing is manifested: green and yellow turn to dark red which can be usually noticed. The photoluminescence intensity increases with the temperature of the sample treatment.

The following conclusions have been drawn on the basis of the results obtained: 1) at different heating temperatures CuJ behaves as a complex system: a) with and without crystalline water (commercial CuJ); b) with a surplus of iodine vapour or elementary copper (in the case of the other type of samples), 2) treatment of the sample increases concentration of the defects in CuJ crystals, 3) the correlation between photoluminescence and stable phases of CuJ on the basis of these experiments can not be established.

Diffraction line width at half maximum

Table 1.

Substance	2θ	50	67.5	77.2	82.8
	CuJ (Merck)	20°C	0.32	0.48	0.52
CuJ (Merck)	300°C	0.34	0.52	0.58	0.68
CuJ (Merck)	374°C	0.35	0.54	0.62	0.72
CuJ (evaporation)	300°C	0.38	0.56	0.66	-

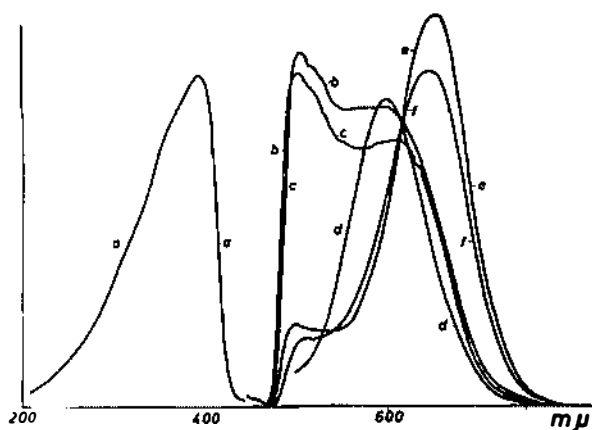


Fig. 1.

References:

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2. Takeo Matsubara, J.Phys.Soc.Japan, 38 (1975) 1076.