

## MSC.54P X-RAY INDUCED LUMINESCENCE IN $ZnIn_2S_4$ AND $Zn_3In_2S_6$

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Compounds belonging to the system  $Zn_xIn_2S_{3+x}$  ( $x = 1, 2, 3$  and  $5$ ) are of special interest due to their peculiar properties. They are wide-band materials ( $E_g \approx 3.0$  eV) weakly sensitive to doping and highly resistive to ionizing radiation [1]. Intensive luminescence and high photosensitivity in visible and ultraviolet range determine their potential applicability in various fields. The technology of crystal growth for these materials has reached a rather high level [2]. The problem is now topical to enlarge the range of excitation energy using x-ray induced excitation while investigating luminescence and conductivity in these materials. In the paper results are presented of the experimental study of x-ray induced luminescence in  $ZnIn_2S_4$  and  $Zn_3In_2S_6$ . For excitation a portable commercial installation with a Cu anode was used that provides the voltage of 5 – 45 kV and anode current up to 500  $\mu$ A.

X-ray induced luminescence spectra of single crystals of composition with  $x = 1$  and  $3$  were measured in a steady-state regime for  $U = 30$  kV and  $I_a = 250$   $\mu$ A,  $T = 100$  and  $300$  K. The analysis of the spectra has allowed determining the main characteristics that are presented in Table 1. One wide band has been observed with its temperature coefficient  $dE/dT = 3.5 \times 10^{-4}$  eV/K (for  $x = 1$ ) and  $dE/dT = 7.5 \times 10^{-4}$  eV/K (for  $x = 3$ ). As in the case of photoluminescence, x-ray induced luminescence also involves recombination of donor-acceptor pairs. In our opinion the traps located near the conduction band bottom play an important role in the radiation process in these materials. If to compare our results with the published data [3, 4], we may see that the total crystal volume is involved in the process. This may most clear be observed in  $CdGa_2S_4$  that is a wonderful luminescent material.

Table 1

Parameter	$ZnIn_2S_4$		$Zn_3In_2S_6$	
	300 K	100 K	300 K	100 K
Band maximum, eV	1.60	1.67	1.82	1.97
Halfwidth, eV	0.46	0.40	0.62	0.50
Plateau, eV	1.74	1.82; 1.92	1.42; 2.00	-

Note in conclusion that x-ray induced luminescence in these layered sulphides was not studied previously. The interpretation of results has been proposed.

### References

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