

# POLARIZED LUMINESCENCE OF BOUND EXCITONS IN Cu<sub>2</sub>O SINGLE CRYSTAL

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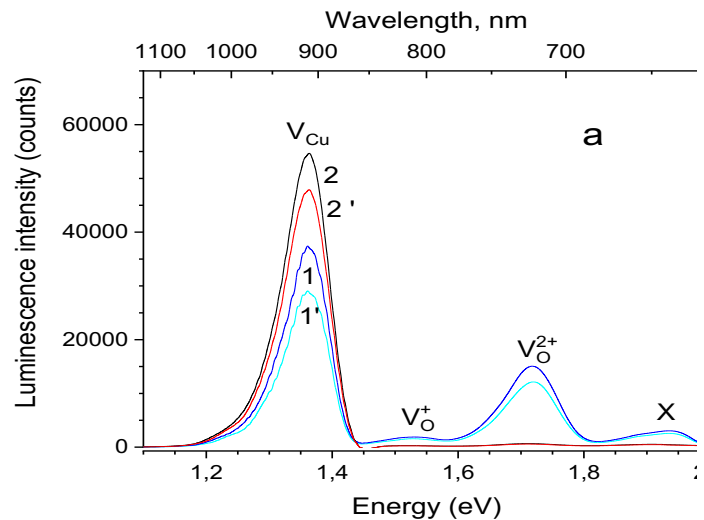
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Cuprous oxide Cu<sub>2</sub>O is a semiconductor material attracting practical interest for applications in solar energy conversion, photocatalysis, photochromic devices, antibacterial area and others, due to its p-type conductivity, high absorption coefficient, non-toxicity and rich deposits on Earth. The present study is devoted to polarized luminescence of bound excitons in Cu<sub>2</sub>O single crystal to find out the possibility to determine perturbation of the luminescence centres by neighboring defects and therefore, use of luminescence polarization for evaluation of material quality.

Photoluminescence was studied for undoped Cu<sub>2</sub>O (100) single crystal at low temperatures under polarized laser excitation 532 nm. In the 1.2-1.9 eV spectral range several emission bands assigned to bound excitons localized at oxygen vacancies  $V_O^{2+}$ ,  $V_O^+$  and copper vacancies  $V_{Cu}$  were detected at 1.72, 1.53 and 1.36 eV, correspondingly.

For the first time the polarized luminescence was detected for the

bound excitons localized at oxygen and copper vacancies in Cu<sub>2</sub>O single crystal. Presence of spectrally shifted orthogonally polarized subbands was observed for the most intense emission bands  $V_O^{2+}$  and  $V_{Cu}$ . Luminescence polarization degree, intensity and spectral position of the subbands depend on temperature as well as on the excitation light density and vary from point to point on Cu<sub>2</sub>O crystal sample (Fig.1). The origin of the polarized luminescence of the bound excitons in Cu<sub>2</sub>O crystal is discussed.



*Fig.1 Polarized luminescence of Cu<sub>2</sub>O crystal at 10 K in two sample points. Numbers without a prime - parallel, primed numbers - perpendicular orientation of an analyzer.*