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Photocreation and hyperbolic decay of Sb^{2+} in $Sn_2P_2S_6$:Sb. SERGEY BASUN, Air Force Res. Lab. WrightPatterson Air Force Base, LARRY HALLIBURTON, Dept of Physics, West Virginia University, SERGUEY ODOULOV, ALEXANDR SHUMELYUK, Institute of Physics, 03 650 Kyiv, Ukraine, ALEXANDER GRABAR, Institute of Solid State Physics and Chemistry, DEAN EVANS, Air Force Res. Lab. WrightPatterson Air Force Base — In $Sn_2P_2S_6$:Sb, photorecharging of Sb^{3+} ions to Sb^{2+} causes a new interesting phenomenon – photo-sensitizing of photorefraction.[1,2] The decay of the optically produced Sb^{2+} ions was directly measured through EPR and was found to have a hyperbolic character: ~$1/(t/\tau+1)$ with an activation energy of 0.42 eV. This decay character and a very similar activation energy were also found in photorefraction and optically induced absorption experiments. The observed hyperbolic decay was explained through the set of rate equations that takes into account the EPR result: only Sb^{3+} ions are present in $Sn_2P_2S_6$:Sb in thermal equilibrium. The long-wavelength onset of the EPR-measured Sb^{2+} "photocreation" spectrum together with the activation energy of the Sb^{2+} decay allowed to firmly locate the position of the $Sb^{2+/3+}$ electron level in the bandgap of $Sn_2P_2S_6$: 0.42 eV below the conduction band bottom. [1] D. R. Evans, A. Shuymelyuk, G. Cook, S. Odoulov. Opt. Lett. 36, 454 (2011). [2] Y. Skrypka, A. Shumelyuk, S. Odoulov, S. Basun, D. Evans, Opt. Comm. 356, 208 (2015).

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