

Optical Absorption, Cathodo- And Radioluminescence In Diaspore. M.I.Katı¹, M.Türemis¹, I.C.Keskin¹, B.Tastekin¹, M.Hatipoğlu², R.Kibar¹, A.Çetin¹ and N.Can¹, Celal Bayar University, Faculty of Arts and Sciences, Physics Department, 45140 Manisa-Turkey, email;miak_84@hotmail.com
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Diaspore [α -AlO(OH)] is one of the bauxitic minerals in the Al_2O_3 - H_2O system and is part of the gibbsite, bayerite, bohemite, diaspore, and corundum series. [1] The properties of diaspore (α -AlOOH) are of interest in different fields such as production of alpha-alumina, extraterrestrial water exploration and jewelry. Diaspore is the only oxo-hydroxide suitable as a direct precursor of α - Al_2O_3 when dehydration at 450–500 °C is reached. Diaspore in nature can be also considered as one of the precursors of natural crystalline alumina usually named corundum (α - Al_2O_3).[2]

In diaspore the oxygens are in a hexagonal close packed layer. Luminescence spectra of the natural diaspore are typical of $^2\text{E} \rightarrow ^4\text{A}_2$ transitions of Cr^{3+} luminescence centers (R-lines) substituting for Al^{3+} in six – fold coordination [3]. Gem quality diaspores are formed by four remobilization processes (extraction, mobilization, migration and re-crystallization) of the metabauxite components in an aqua-complex as open-space fillings. This formation and its rarest crystal are only found in the Ilbir mountains region of the Menderes crystalline massif (SW Turkey) around the world. Thus, the studies on gem quality diaspores have fairly limited [4]

Fig. 1 shows cathodoluminescence (CL) and radioluminescence (RL) spectra of diaspore at room temperature. As seen from the figure, diaspore exhibits luminescence maxima at 430, 488, 571, 697 and 712 nm at CL spectrum.

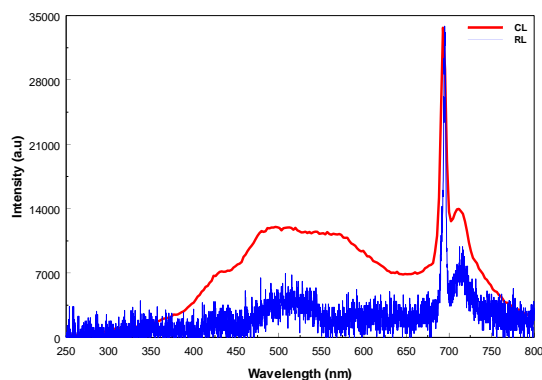


Fig.1 CL and RL spectra for diaspore at room temperature.

In the absorption spectrum of diaspore, there are a few peaks at 371 nm, 385 nm, 397 nm, 450 nm, 560 nm and 640-750 nm. These can be attributed to some impurity elements.

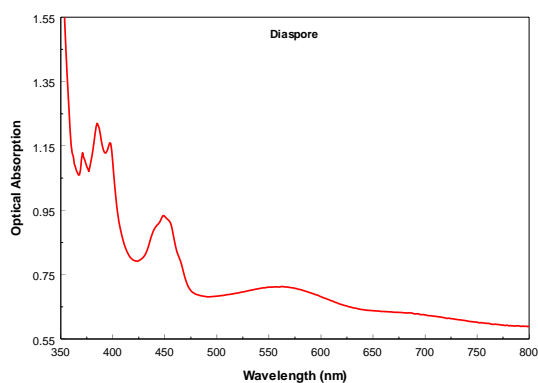


Fig.2 Optical absorption spectrum of diaspore in the range of 350-800 nm.

References: [1] J. Garcia-Guinea; *et. al.* Radiation Measurements 33 (2001) 653– 658 [2] J. Garcia-Guinea *et. al.* Journal of Physics and Chemistry of Solids 66 (2005) 1220–1227 [3] S.Shoval *et.al.* Journal of Thermal Analysis and Calorimetry 71 (2003) 699-706 [4] M. Hatipoğlu *et.al.* Physica B 405(2010)1729–1736