STRUCTURE AND LUMINESCENCE CHARACTERISTICS OF AQUAMARINE FROM TURKEY.

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The beryl crystal has the chemical formula $Be_3Al_2Si_6O_{18}$ and is composed of hexagonal rings.The each ring is formed of six SiO_4 tetrahedrons. Pure beryl is colorless and transparent. However, beryl crystals may show various color tones if they contain transition metal ions as an impurity localized in crystalline sites. The beryl crystal can accommodate several kinds of impurities, either as interstitials or in the channel, substituting ions on the wall. Natural beryl crystals are found in nature with green (emerald), blue (aquamarine), yellow (golden beryl), pink (morganite) colors. Colorless minerals (goshenite) are also found. The color and other physical properties of beryl are sensitive to the presence of impurities [1-3]

Aquamarine (blue beryl) from TURKEY was investigated in this work. The ICP-AES and ICP-MS techniques were used to find composition of the mineral. Large variation was found, generally with little bearing on the properties of aqumarine investigated, this being essentially 0.13% MgO, 0.03% MnO, 3.08% Fe_2O_3 and of course, SiO_2, Al_2O_3 and BeO. The crystal structure of the sample was analysed by using X-ray diffraction (XRD).

Thermoluminescence (TL) is a sensitive technique for recording the presence of defects and for monitoring the changes in defect concentrations in insulators. Naturally occurring crystals of minerals are usually insulators so that TL is useful in characterizing minerals. The aquamarine sample displays spectral luminescence emissions of thermoluminescence (TL) and cathodoluminescence (CL). As seen from the figure 1, aquamarine has a broad peak at 105 ^oC in TL glow curve when it was exposed to X-ray. CL data of aquamarine at 300 K (Figure 2) show two peaks at 450 nm and 580 nm for different modulation frequencies.

The sample was also studied with SEM and optical absorption.

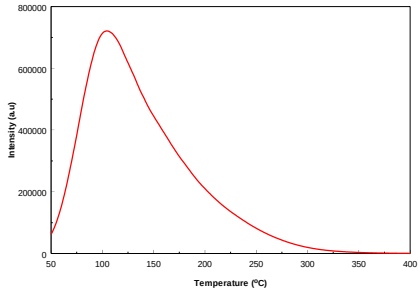

Fig.1 TL spectrum of diaspore after exposure to X ray.

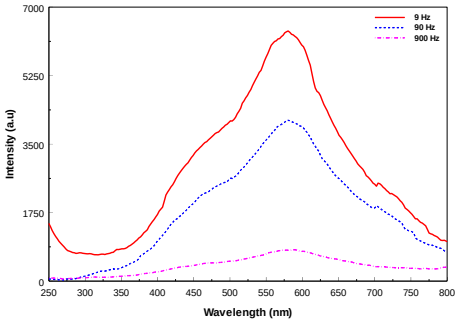

Fig.2 The AC CL spectra of aquamarine crystal 300 K

References: [1] R.I. Khaibullin et.al. Nuclear Instruments and Methods in Physics Research B 206 (2003) 277–281 [2] Tae HoYeom and Ae Ran Lim, Journal of Physics and Chemistry of Solids 72 (2011) 56–59 [3] J.C.R. Mittani et.al. Surface and Coatings Technology 158 –159 (2002) 708–711 [4]Petit P.E. et al. (2001) *J. Synch. Rad., 8,* 952-954.