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THERMAL DEPENDENCE OF COLOUR AND ULTRAVIOLET LUMINESCENCE EMISSION IN AMAZONITE FELDSPAR

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Amazonite is a natural blue-green coloured perthite Pb-bearing feldspar, structurally hydrous occuring in pegmatite ore deposits. The irradiation-induced colour in amazonite can develop only in K-feldspar having both, structurally bound H_2O and Pb impurities. The different types of colour are linked with a limited presence of Pb (as Pb^{3+} or Pb^{1+} colour centres) and structurally bound H_2O. In accordance with Hofmeister and Rossman (1985) the dependence of the colour intensity on both, Pb and H_2O concentration suggest that the lead and water occur in a 1:1 ratio in the colour centres. They also point to water plays a catalytic role in the irradiative transformation of Pb^{2+} to the amazonite chromophore. Recently we demonstrate the close association existant between twinning and the UV band in perthite K-feldspar points to charge trapping and light emissions from complexes of structural defects located at the twin-domain boundaries. The high temperature slope of the TL glow curve follows a power law decay, suggesting possible trapping-detrapping dynamics related to cooperative phenomena inside the complexes (Sanchez-Muñoz et al., 2006). Assuming the following published features: (1) some feldspars with as much as 1000 ppm Pb are not coloured, (2) Pb^{1+} centers are present in amazonites but not in other feldspars, (3) radiation converts Pb^{2} + to Pb^{1+} (4) Correlation between loss of colour and weight loss during dehydration of amazonite. Here we analize preheated aliquots (RT, 80, 120, 170, 220ºC) of a Brazilian amazonite sample by electron probe microanalysis (EPMA) spectra thermoluminesce (3DTL) and optically stimulated luminescence (OSL) and we observe cluster linkages between decolouration, dehydration, dropping of the ultraviolet 3DTL and OSL emission fitting. This well know scenario, together with the attached analytical data on amazonite, strongy suggest that the UV light emissions of amazonite come from complexes of structural defects located into the twin-domain boundaries including H_2O, (OH)- and Pb^{3+} colour centres since the feldspar lattice has little room for large ions (Pb) or water molecules.

References

Hofmeister A.M., Rossman G.R.(1985) a spectroscopic study of irradiation coloring of amazonite structurally hydrous, Pb-bearing feldspar Amer Miner. 70, 794-805

Sanchez-Muñoz, L., Garcia-Guinea, J., Sanz J., Correcher V., Delgado A. (2006). Ultraviolet Luminescence from Defect Complexes in the Twin Boundaries of K-Feldspar. Chem Mater. 18, 3336-3342.

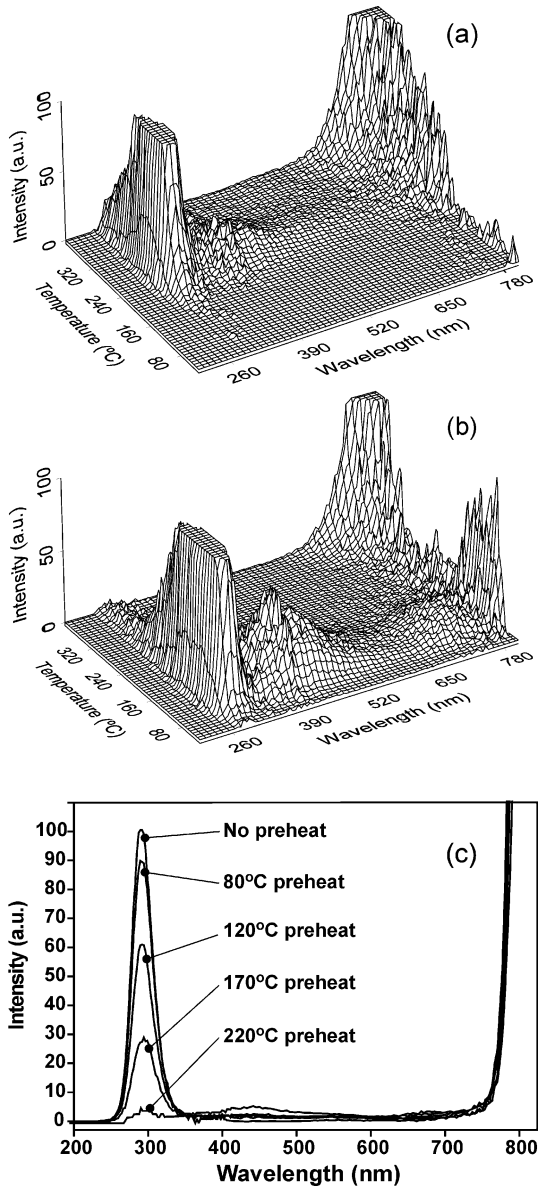

Figure 1. *Spectra thermoluminesce of amazonite from Brazil, (a) Natural sample, (b) After 50 Gy irradiation dose. (b) IRSL spectra of preheated aliquots.*

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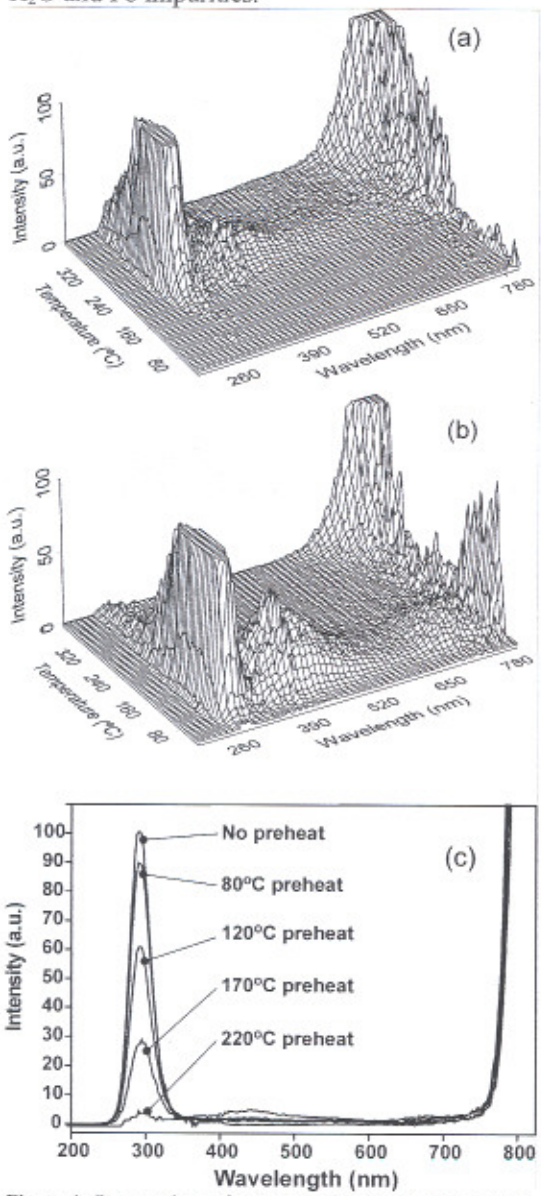

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