

LUMINESCENT DETECTION OF ACTIVE STRESS IN MELILITE-ANORTHITE CAI GRAINS OF ALLENDE CV3 CHONDRITE (MEXICO).

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Introduction: Calcium–aluminum-rich inclusions (CAIs) are the oldest known materials formed in the Solar System (Petaev & Jacobsen, 2009). FoBs are important forsterite-bearing Type B CAIs because of their intermediate chemistry and refractory inclusions. The studied Allende CAI has Forsterite (Fo) grains Al-rich clinopyroxene (Cpx), spinel (Sp), Mg-rich melilite (Mel) and minor anorthite (An) intergrown with Cpx forming a core surrounding Fo-Cpx as a discontinuous Al-rich mantle of Mg-depleted melilite. Many melilite grains are almost completely pseudomorphed by grossular (Gr) and monticellite (Mo). Anorthite-melilite grains shows zonings of extreme mineral chemical disequilibrium between their cores and mantles which could be producing the inferred Si–O strained structures as probable responsible emission-defects of the 340 nm CL emission peak.

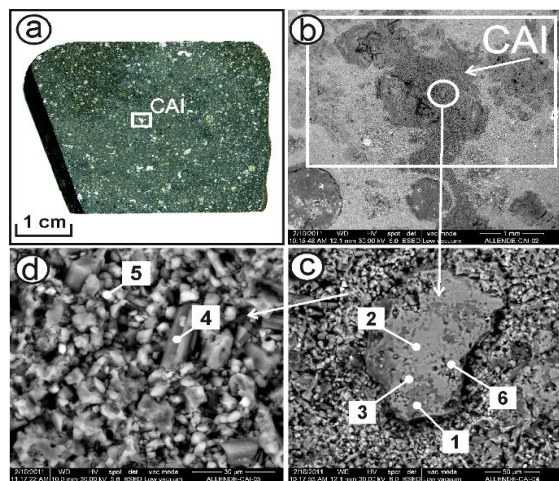


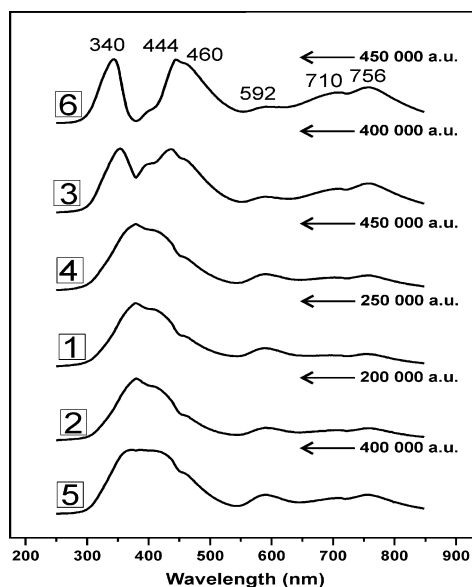
Figure 1.- (a) Allende CV3 chondrite (b) FoB-CAI (c) Melilite-Anorthite grain (b) Matrix with Fo, Cpx, Sp, An, Me, Mo, Gr.

Spectra blue luminescence : We previously published on the luminescence emission band at 340 nm of stressed tectosilicate lattices (Garcia-Guinea et al., 2007) observed just only in stressed silicon–oxygen lattices. The non-bridging-oxygen or silicon vacancy-hole centers associated with Si–O strained structures are the probable responsible emission-defects. The 340 nm CL emission is rarely detected in stressed aluminum-silicates and quartz with large amounts of Al³⁺--alkali⁺ substituting silicon. At low temperature silicates enhance its 340 nm peak by cryogenic stress. The

340 nm emission peak can be observed in microcline with hatch-cross texture (Correcher et al., 1999).

ESEM-EDS analyses taken on the CL spots

	1	2	3	4	5	6
Na ₂ O	1,85	0	0,35	9,82	1,17	0,98
MgO	1,82	2,35	2,13	2,65	10,08	11,17
Al ₂ O ₃	33,96	32,92	26,23	35,48	26,72	45,57
SiO ₂	41,82	25,08	38,04	39	35,19	19,93
CaO	18,85	38,45	30,83	8,85	18,75	16,93
Fe ₂ O ₃	1,7	1,2	1,9	2,12	3,89	5,1
TiO ₂	0	0	0,52		4,2	0,32
K ₂ O	0	0	0	2,08	0	0
	100	100	100	100	100	100



Spectra CL plots of melilite-anorthite grains of FoB-CAI in the Allende CV3 Chondrite (Mexico).

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