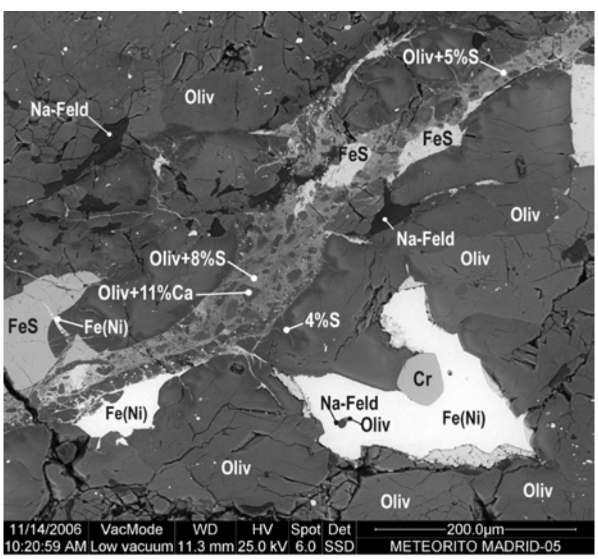
MADRID L6 CHONDRITE (FALL 1896): ESEM-CATHODOLUMINESCENCE SURVEY. O. Azumendi[1], L. Tormo[2], J. Ruiz[1], J. Garcia-Guinea[2], [1]Departamento de Geodinamica, Universidad Complutense de Madrid. Madrid 28040 Spain. oscarazumendi@yahoo.es, [2]Museo Nacional Ciencias Naturales. CSIC. 28006 Madrid. Spain. ltormo@mncn.csic.es

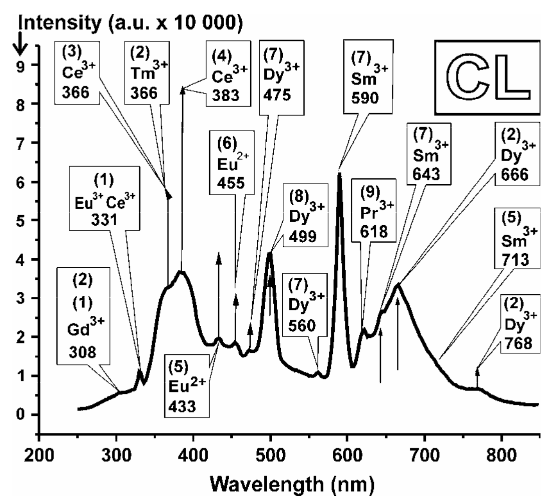
Introduction: The Madrid meteorite fell in Madrid downtown the 10th of February of 1896, seconds before 9:30 am. Ten samples were recovered in the city, just after a bright white-blue light and a strong explosion scared and advertised the people of the meteorite fallen. The heaviest and lightest weight 143.79 and 1.3 respectively. The meteorites distribution formed an ellipse NW/SE orientated, where the largest meteorites fell in the NW. The compositions of olivines (Fa_{25}) and low-Ca pyroxenes (Fs_{24}) in Madrid meteorite are within the range of equilibrated L chondrite. The amount of troilite (5.02 wt. %) and metallic Fe-Ni (5.95 wt. %) support this classification. The material is highly crystallized and brecciated, with chondrules poorly defined and clearly visible (bigger than 50μm across) feldspars. This classify the meteorite in the petrographic type 6: the Madrid meteorite is therefore an impact melt breccia L6 ordinary chondrite. The main aim of this work is to analyse feldspars and whitlockites from Madrid meteorite by cathodoluminescence and to determine the trap structure. The impact events of this chondrite have also been using the mineralogy and ESEM images interpretations.



ESEM-BackScattering Image showing a schock vein composed by a mixture of Olivine, Troilite and infilled iron in very thin veins sized from 1 to 3 microns.

Schock veins: In similar cases have been demonstrated: (i) the presence of eutectic Fe and FeS indicates that the temperature during melt formation exceeded 988ºC, (ii) the troillite nodules occurred in many shocked chondrites being characteristic of the shock stage S3-S6. This L6-chondrite suffered two main impacts episodes. The first one produced the breccia, with thick dark areas, very heterogeneous, mixed with the unmelted minerals. This shock is been dated by $^{40}Ar/^{39}Ar$ in 470 Ma, when a big body impacted L6 parent body (all L6 meteorites have the same porphyritic to holocristaline texture, produced by this impact), and a mayor degassing event occurred. The second shock melted the Fe and FeS, propagating the hot liquid and gaseous metals through the breccia, entering into the minerals background in very thin shock veins of few microns.

Merrilite cathodoluminescence: This $CaPO_4$ phase is related with mesostasis processes having a late crystallization. The characteristic emission peaks of the CL spectra from 300 nm to 1000 nm has been associated to specific activators such as Ce^{3+}, Eu^{2+}, Mn^{2+}, Dy^{3+}, Sm^{3+} and Sm^{2+} the two structural positions of calcium.



This merrilite ($CaPO_4$) from Madrid L6 Chrondrite emits cathodoluminescence peaks attributed to Ce^{3+} (360-380 nm peak), Dy^{3+} (499 nm peak and 666nm peak), Sm (590 nm peak) and Tm^{3+} (366 nm peak).