A CATHODOLUMINESCENCE STUDY OF SILICA AND K-FELDSPAR IN THE NAKHLITES MIL 03346 AND NWA 5790:. H. Chennaoui Aoudjehane[1-2], A. Jambon[2] and O. Boudouma[2], [1]Université Hassan II Aïn Chock, Faculté des Sciences, Equipe Patrimoine Géologique du Maroc, BP 5366 Maârif Casablanca Morocco (e-mail : chennaoui_h@yahoo.fr), [2]UPMC Univ Paris 06 CNRS UMR7193, 4 place Jussieu, 75252 Paris, France (e-mail: albert.jambon@upmc.fr) , (e-mail: omar.boudouma@upmc.fr).

Introduction: NWA5790 is a recent nakhlite (martian meteorite) found in Morocco last year [1], it has large mesostasis areas with dendritic oxides, pyroxenes, feldspars, glass and silica.

Shock intensity in Martian meteorites has been actively studied in recent years to understand their formation and ejection from their parent body. The analysis of high-pressure phases like stishovite, post-stishovite, majorite, hollandite or maskelynite in shergottites permits to constrain the intensity of the shock between 30 and 90 GPa [2- 5]. Nakhlites are definitely less shocked and none of them contain high-pressure minerals.

CL spectroscopy is an easy approach for determining which polymorphs of silica or other silicates are present in thin or polished sections of meteorites [6]. We applied this technique to the determination of silica phases and feldspar speciation in the nakhlite NWA 5790. We previousely registered CL spectra of this phases on MIL03346 [7]. Notice that a previous CL study of MIL03346, with a comparison to Lafayette, was restricted to imaging [8].

Analytical techniques: CL images and spectra have been recorded by the cathodoluminescence system in the scanning electron microscope (SEM) of the UPMC (Université Pierre et Marie Curie Paris VI) a detailed description of which can be found in [6].

Backscattered electron (BSE) images of the mesostasis have been collected first (Fig 1). Details of

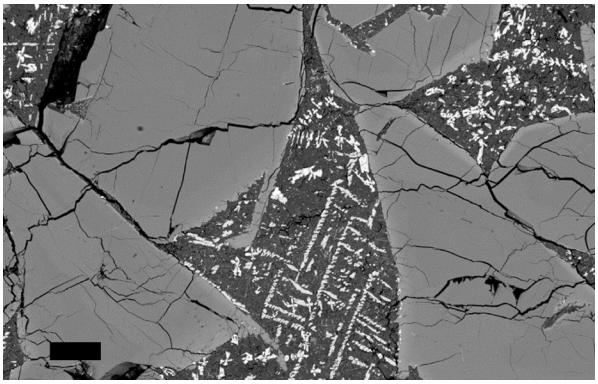

Figure 1: BSE image of the mesostasis surrounded by fractured pyroxenes (Px). Scale bar 0.1mm.

the images show silica grains, euhedral grains of pyroxene and dendritic oxides (Fig 2). In comparison

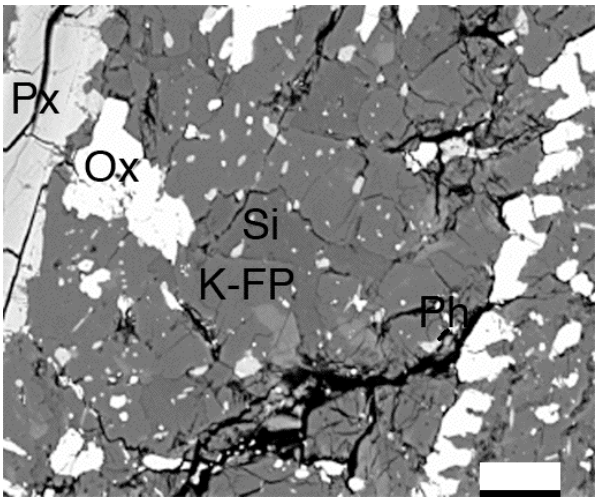

Figure 2: BSE image of the detail in the mesostasis of NWA5790 with tridymite (Tr), pyroxene (Px), Fe-Ti oxide (Ox) and potassic feldpars (K-FP). Scale bar 10 micrometers.

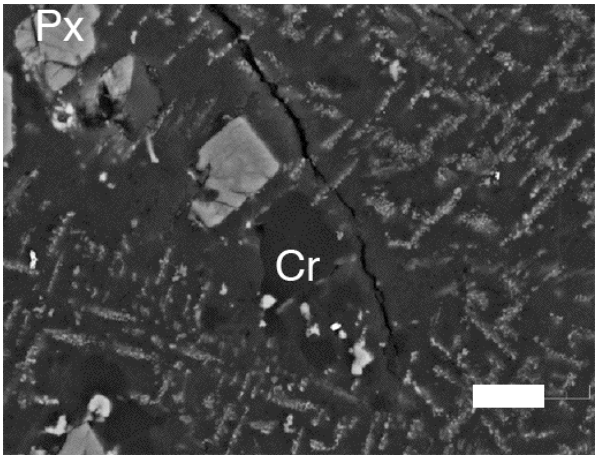

Figure 3: BSE image of the detail in the mesostasis of MIL03346 with euhedral cristobalite (Cr), euhedral oxene (Px) (light grey), K-FP rich mesostasis and dendritic Fe-Ti oxides

with MIL03346 (Fig 3), the minerals in the mesostasis are anhedral, especially silica. In MIL03346, the strong luminescence of the K-FP irradiates the whole mesostasis, of CL images, hiding the weaker luminescence of silica (Fig 4). In NWA5790, the mesostasis is less luminescent, the higher luminescence is from phosphates, followed by silica (tridymite), then K-FP (Fig 5).

We collected CL spectra of phosphates (Fig 6), silica and K-FP in NWA5790.

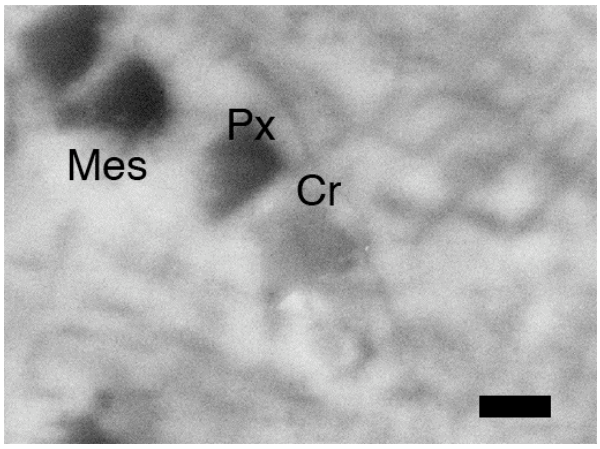

Figure 4: CL image in MIL03346; luminescence decreases from the K-FP rich mesostasis (Mes), to cristobalite and not luminescent at all is pyroxene. Same area as fig. 3.

CL Spectra permit to identify tridymite with three peaks near 15300, 18300 and 20500 cm^{-1}. In MIL 03346, the silica phase is cristobalite with three peaks at 16300, 19600 and 26000 cm^{-1}. K-FP is characterized by a peak near 13800 cm^{-1} (Fig 6). In MIL03346, a second peak appears near 20000 cm^{-1}. The spectrum of K-FP is the same on the two considered nakhlites. For the phosphate, 7 peaks are observed.

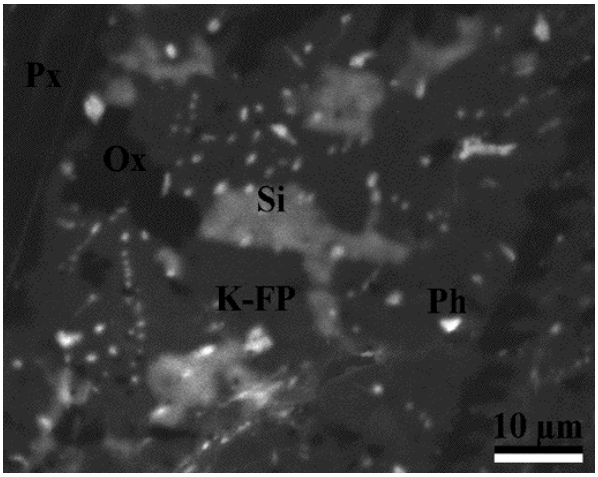

Figure 5: CL image in NWA5790; luminescence decreases from the phosphate (Ph), to silica (Si) tridymite, K-FP, Pyroxene and oxides. Mesostasis is not luminescent. Same area as fig. 2

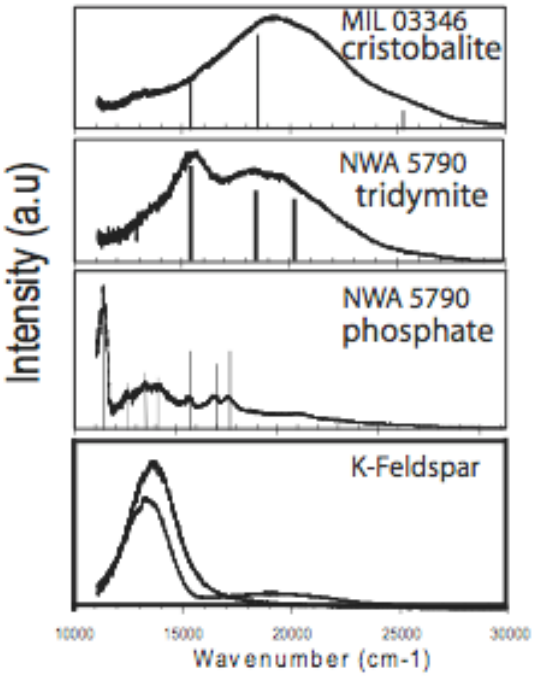

Figure 6 : CL spectra of the various luminescent phases in both NWA 5790 and MIL 03346.

Conclusion: The different spectra observed for silica in NWA 5790 and MIL 03346, suggest either a different temperature of cristallization or a different rate of cooling. The different CL intensities of the mesostases despite their similar bulk composition [1] suggest that iron oxide is dissolved in the glass (NWA 5790) while it is expressed in critalline phase in MIL 03346.

References: [1] Jambon et al. this volume. [2] Stöffler D. (2000) LPSC **XXXI,** #1170. [3] Malavergne V. et al. (2001) MAPS **36**, 1297-1305. [4] El Goresy A. et al. (2000) Science **288**, 632-634. [5] Beck P. et al. (2005) LPSC. **XXXVI**, #1333. [6] Chennaoui Aoudjehane H. et al. (2005) MAPS **40**, 967-979. [7] Chennaoui Aoudjehane et al (2006) LPSC XXXVII, #1037. [8] Rost D. and Vincenzi E.P (2005) MAPS **40**, A130.