SILICA IN MARTIAN METEORITES, THERE ARE DIFFERENCES. C. S. Schwandt,[1] G. A. McKay,[2] and G. E. Lofgren[2], [1]Lockheed Martin, 2400 Nasa Road 1, C23, Houston, TX 77058, craig.schwandt@jsc.nasa.gov, [2]Johnson Space Center, SN2, Houston, TX, 77058. gordon.mckay@jsc.nasa.gov, gary.lofgren@jsc.nasa.gov.

Introduction: [1,2,3] previously identified submicron net-veining of silica occurring within the feldspathic glass in the ALH84001 meteorite. The morphology of the silica gives the impression that it was originally deposited from an aqueous fluid. It appears inconsistant with formation by any kind of shock mechanism. To test the consistency of these statements we examined thin sections of Shergotty and Zagami with the same high contrast back-scattered electron (BSE) imaging technique that was used on the ALH84001 thin sections. Comparing the silica occurrences in these other Martian meteorites will determine whether the ALH84001 silica is unique or not.

Observations: Examination of the feldspathic glass in meteorite thin sections with 50 to 100 nA electron beam currents and high contrast BSE imaging shows small atomic number differences in the low Z end of the periodic table. Specifically, Na and Ca compositional changes are visible in feldspathic glasses, and silica can be distinguished from feldspathic glass. These Z variations are easily confirmed by energy dispersive X-ray analysis or wave-length dispersive X-ray analysis.

Figure 1 shows the type of silica net-veining described by [1,2,3]. We have attempted to determine the extent that this silica might occur along the surfaces of fractures within the pyroxene. However, given the high Si content of the pyroxene, the silica has been much more difficult to map out and trace through the pyroxene fractures than those that are within the feldspathic glass. We have found some occurrences but they are not as extensive as the silica in the feldspathic glass.

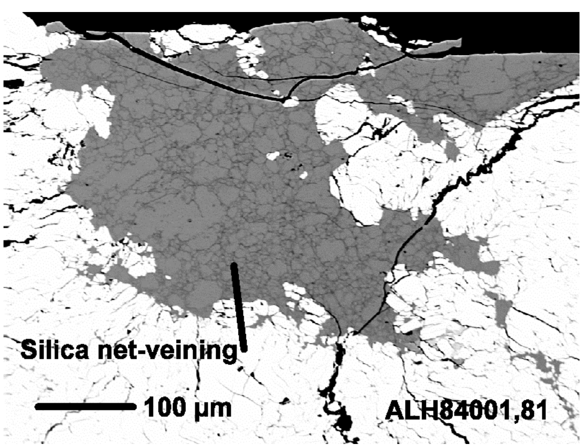

Figure 1. ALH84001: pyroxene surrounding feldspathic glass with silica net-veining.

Figures 2 & 3 are BSE images of feldspathic glass in a portion of a Shergotty thin section. The glass shows feldspathic compositional zoning that is consistent with a remnant igneous texture. These maskelynite areas, in the thin sections we have, did not reveal any type of flow structures or diffusional smoothing of compositional boundaries, or recrystallization. However, what we want to point out is that the mesostasis contains some silica, which also appears to have a remnant igneous texture.

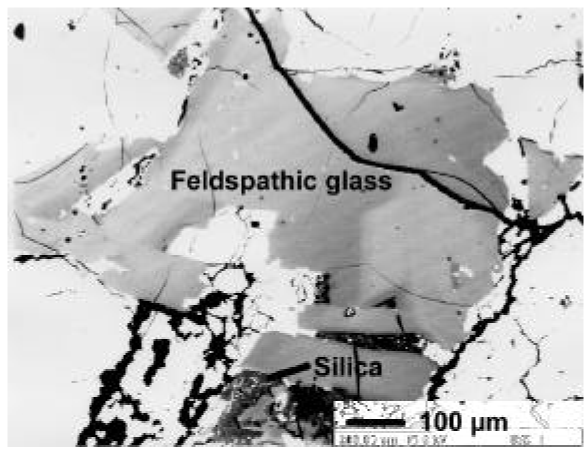

Figure 2. Shergotty: feldspathic glass with compositional zoning, and mesostasis containing silica.

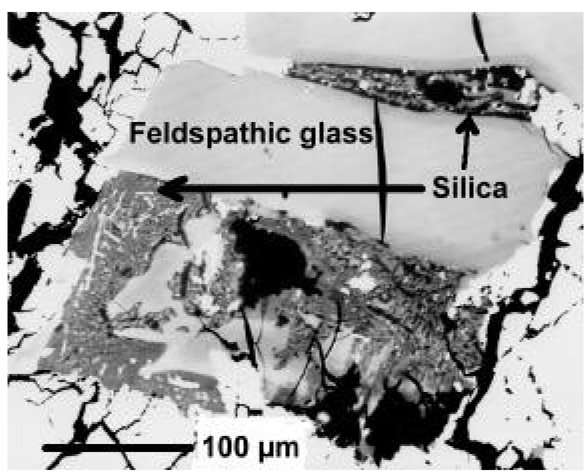

Figure 3. Shergotty: feldspathic glass and silica.

Similar silica is also in Zagami. Figure 4 shows silica and feldspathic glass. They have a texture that is reminiscent of "graphic granite." While an exact origin for this kind of texture is debated, co-crystallization of feldspar and quartz is favored [4].

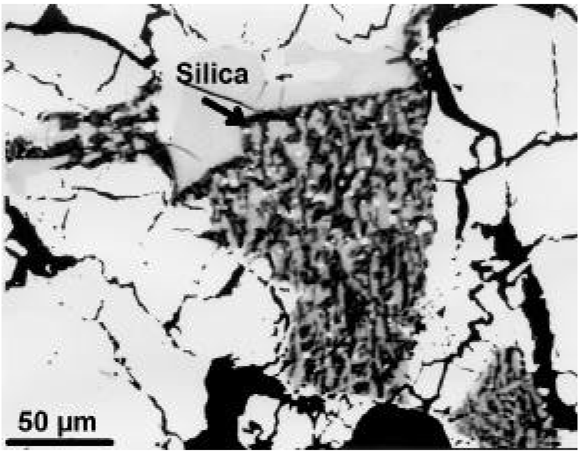

Figure 4. Zagami: feldspathic glass and graphic feldspathic glass and silica in a pyroxene matrix.

Discussion: It may be true that the feldspathic glass in Shergotty is truly a shock melt glass and maskelynite is a now a term not to be used too casually [5, 6]. The feldspathic glass in Zagami may also have been a melt glass [6]. However, the basic igneous compositions and textures of the feldspars are still preserved in these glasses of both meteorites[6]. Examination of our high contrast BSE images of Shergotty and Zagami easily convinces one that the features are igneous relicts. As the silica in these two meteorites is so intimately associated with the feldspathic glass, the logical conclusion is that the silica also represents an igneous precursor. Therefore, it appears that shock has neither altered the bulk chemistry nor the morphology of the feldspar and quartz precursors in these two Martian meteorites and by extension not in ALH84001 either.

The net-vein silica in ALH84001 is quite different from the silica in Shergotty and Zagami. Its texture is consistent with secondary silica cement deposited from an aqueous fluid that passed through the extensively fractured pyroxene and feldspar matrix, before impact. We know of no shock mechanism that would cause phase separation with boundaries as sharp and fine (submicron) as those in the ALH84001 feldspathic glass. Therefore given that shock has not destroyed the original textures and compositions of Shergotty and Zagami, we feel that ALH84001 also preserves mineral textures and compositions developed prior to ejection from Mars. More specifically ALH84001 preserves a record of interaction with the Martian hydrosphere.

References: [1] McKay G., Mikouchi T., Schwandt C., and Lofgren G. (1998) *LPS XXIX*, #1944. [2] McKay G.A., Schwandt C.S., and Mikouchi T. (1998) *Antarctic Meteorites XXIII*, 75-76. [3] McKay G., Schwandt C., and Mikouchi T. (1998) *Meteoritics and Planetary Science, 33*, A102. [4] Best M. G. (1982) *Igneous and Metamorphic Petrology*, Freeman, p.630 [5] El Goresy et al. (1997) *Meteoritics and Planetary Science, 32*, A38. [6] Mikouchi T., McKay G.A., and Miyamoto M. (1998) *Meteoritics and Planetary Science, 33*, A109-110.