BASALTIC LITHIC CLASTS IN TYPE 1A AND 2A MESOSIDERITES: TREND TOWARDS A EUCRITIC COMPOSITION. B. Baecker[1], B. A. Cohen[1], A. E. Rubin[2], B. Frasl[1,3] and C. M. Corrigan[4]. [1]NASA MSFC, Huntsville, AL 35812. (bastian.baecker@nasa.gov). [2]UAH, Huntsville, AL 35805; [3]EPSS Department, UCLA, Los Angeles, CA 90095, USA; [4]Smithsonian Institution, NMNH, Washington DC, 20560, USA.

Introduction: We have initiated a study of silicate clasts and metal in mesosiderites (MES) using SEM, electron microprobe and noble gases in order to understand the formation and cooling history of these meteorites [1]. Here we report initial results on the petrography of selected lithic clasts and individual mineral grains in five MES. We focused on selecting lithic clasts and grains in the least recrystallized MES (Type 1A, 1B, 2A, 2B) in order to increase our understanding of their origin. Lithic clasts in MES commonly have igneous textures similar to those of eucrites and howardites (HEDs) [2]. We describe several lithic clasts and individual mineral grains that may (or may not) be associated with the igneous lithologies.

Clast Mineralogy and Petrology: We investigated the following grains and clasts in our initial sample set consisting of 5 MES:

Clover Springs (2A) (ASU 646.1). Lithic clast E18 is ~6.0×3.0 mm. It has a gabbroitic texture and consists of plagioclase (plag) and low-Ca pyroxene (px) and Ca px. In many cases, px- and plag form ~120° triple junctions. Troilite forms strings along px and plag boundaries. However, in a few cases the strings occur inside px and plag, probably along exsolution lamellae. Individual grains: L5d is a large low-Ca-px grain (1.7×1.5 mm) exhibiting a bright BSE rim, closely surrounded by Fe-Ni metal, merrillite and plag. All grains show multiple fractures and voids, many filled with Fe-Ni metal, sulfides and oxides.

Mount Padbury (2A) (ASU 927). Lithic clast Q17 (~7×6 mm) consists of plag, silica and low-Ca px (Fig. 1). This clast has a gabbroitic texture with areas of subophitic or fine-grained px and plag (50-200 µm). Some areas in the clast are rimmed by troilite up to ~100 µm in thickness. Individual grains: E8m is a very large low-Ca px grain (4.2×2.1 mm) surrounded by Fe-Ni metal and adjacent to a plag grain (G9m). All grains show multiple cracks, many of which are filled with troilite. As observed for *Clover Springs*, the px grain exhibits a BSE bright rim.

Patwar (1A) (ASU 634-1-4). C4 is a large, possibly lithic clast (~3.2×2.5 mm) composed of two anhedral plag and pyx grains surrounded by troilite. The low-Ca px contains abundant exsolution lamellae. Inside the clast troilite blebs and multiple cracks filled with troilite are observable. Individual grains: K2b is a low-Ca px grain rimmed by troilte. The size is ~2.5×1.5 mm. M4g (~1.8×1.4 mm) is a euhedral to subhedral olivine grain with a pyx-chromite corona/. The corona seems to consist of multiple, micrometer-sized mineral aggregates. Part of the olivine seems to be resorbed into the corona. The solid olivine core of the grain is not in close contact with metal or sulfides. However, some of the Fe-Ni metal and small individual grains surrounding M4g are (partly) embedded in the corona. Multiple small micrometer-sized inclusions are visible all over the grain. Both, K2b and M4g exhibit multiple cracks, none of which are filled with troilte.

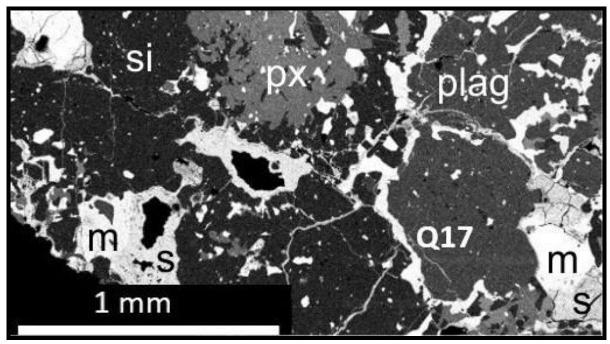

Fig.1. BSE image of lithic clast Q17 in *Mount Padbury* showing multiple px, plag, silica, metal and sulfides. si = silica, m = metal, s = sulfide.

Northwest Africa 1242 (1A). Lithic clast J5 (550×500 µm) consists of subhedral plag and silica. In some places, the clast is in contact with Fe-Ni metal. Voids or cracks filled with troilite are not observed. Some opaques occur in plag as well as in silica. Individual grains: P14r is a large low-Ca px grain (1.2×1.0 mm) close to Fe-Ni metal, as well as merrillite and plag grains. Yet the grains are separated by µm-sized aggregates of px surrounding P14r. The subangular, porous grain exhibits multiple cracks, many filled with troilite, and a BSE bright rim.

Toufassour. This MES has a high weathering grade; many limonite veins are present. Much of the Fe-Ni metal is oxidized and replaced by weathering products. A lithic clast with dimensions of ~1.2×1.0 mm consists of an assemblage of low-Ca px and plag. This clast has a fine-grained, granular-to-subophitic texture, indicating possible metamorphism and annealing. The clast contains cracks filled with troilite. Individual grains: C3v (low-Ca px) and Ch3 (merrillite) with sizes of ~500×350 µm and ~220×200 µm, respectively, are in proximity to large Fe-Ni grains (1-5 mm). These grains exhibit cracks filled with troilite.

Discussion: Many studies have shown both similarities and differences between silicates in MES and HEDs. One important indicator of a similar origin are oxygen isotopes, where these groups are basically indistinguishable from each other [3]. Although the bulk MES modal abundances of silicates show major differences with HEDs [4], MES gabbro-basaltic lithic clasts resemble eucrites in their modal abundances [4]. The mineralogy of the lithic clasts and single grains in our study is shown in Fig. 2a. The single-grain px are more Mg-rich than typical eucrites - closer in composition to the low Ca-px in diogenites, whereas low-Ca px in lithic clasts trend toward more Fe-rich compositons typical of eucrites and eucritic *Vaca Muerta* pebbles. Some results measured for MES (e.g. *Dyarrl Island* (1A) and *Morristown* (3A)) from other studies show a similar trend [5]. Low-Ca px in *Patwar* measured for both single grains and lithic clasts have a eucritic compositon. This similarity is also shown in Fig. 2b, where anorthite in plag is compared to Mg* (molar MgO/(MgO+FeO)) in low-Ca px. Overall, the single grains seem to follow the *Stannern* trend indicative of partial melting [6]. However, low-Ca px in lithic clasts shows a trend similar to the *Nuevo Laredo* trend reflecting fractional crystallization [6] (as also found for eucritic *Vaca Muerta* pebbles [7]).

Future work: We will measure the noble gas complement of the silicate clasts and individual mineral grains to determine CRE ages, trapped components and closure temperatures. We will be able to compare the thermal and exposure histories of these clasts with HEDs.

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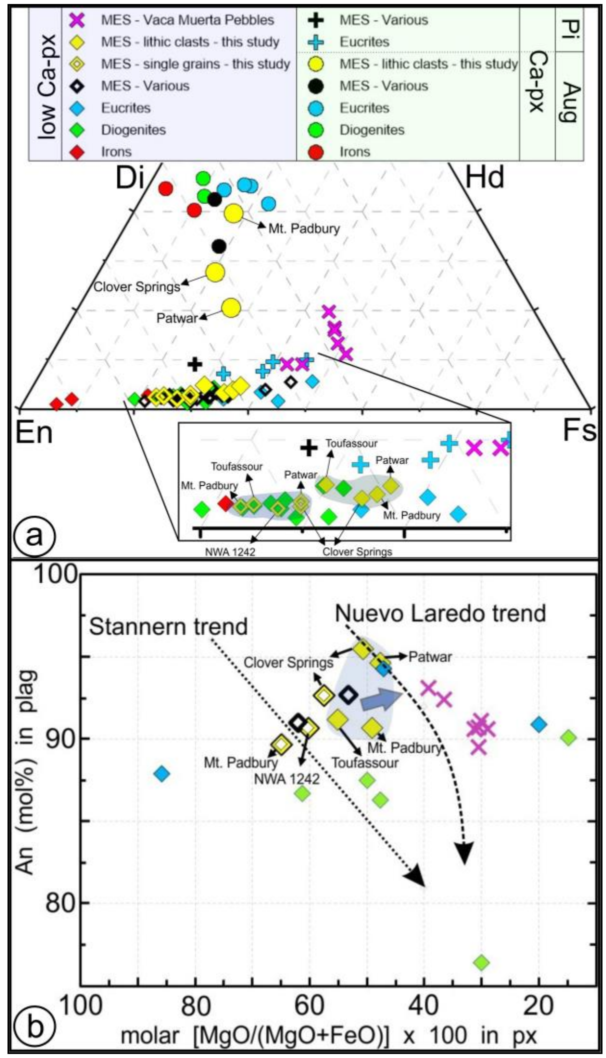

Fig.2. **a)** Px quadrilateral diagram for low-Ca px and Ca-px in our data, various MES, eucrites, diogenites and iron meteorites. We measured multiple points for lithic clasts and single grains in each MES silicate. Plotted are the average mean of the points for each MES, respectively. Additional MES data were adapted from [4], [5], [8-10]. *Vaca Muerta* Pebble data is from [11]; eucrite and diogenite data from [12] and iron meteorite data from [13, 14]. **b)** Diagram of mol% anorthite (An) in plag vs. Mg* in px for our MES data. Eucrite trends from [6]; MES data from [9, 11, 12]. Two lithic clasts (*Patwar*, *Clover Springs*) plot on the *Nuevo Laredo* trend (fractional crystallization trend). Lithic clasts of *Toufassour* and *Mount Padbury* seem to be shifted towards the euctiric composition of the *Vaca Muerta* pebbles. Individual mineral grains of *Mount Padbury*, *Clover Springs* and *Northwest Africa 1242* plot closer to the *Stannern* trend (partial melting trend).