

Unique NWA 11119/11558, NWA 7325 (and pairs) and Almahata Sitta individuals MS-MU 011/035: new light on very early parent body differentiation.

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In recent years a set of unique meteorites – achondrites – with partly significantly high contents of plagioclase and/or various silica phases such as cristobalite, trydimite or quartz have been identified. Almahata Sitta individuals MS-MU 011 and later MS-MU 035 were the first meteorites of this new type indicating high-silica trachy-andesitic magmatism, in this case possibly a near-crustal or upper mantle formation on the ureilite parent body. [1,2,6 and refs]

NWA 7325 and pairs represent another unique set of meteorites which was classified as a cumulate olivine-microgabbro containing more than 50% of feldspar – plagioclase and clinopyroxene (diopside). Oxygen isotopy indicates similarities concerning formation and origin to the 2 Almahata Sitta individuals, all plotting in the ureilites region. [1,2]

Last year NWA 11119 (and paired NWA 11558) attracted the meteorite community even further: the silica content of this stone was found to be as high as at least 30%, mainly revealing cristobalite / trydimite and traces of quartz; further main phases are plagioclase – anorthite – and diopside – a fascinating whitish – green rock. Practically all phases are frequently found in small cavities in beautifully crystallized individual crystals. [1-7]

NWA 11575 is the most recent find in this direction, classified as an ungrouped achondrite, petrologically also a trachy-andesite with an oxygen isotopy in the LL region. [7]

In our projects we have undertaken a series of systematic investigations on several of these meteorites – with the exception of NWA 11575.

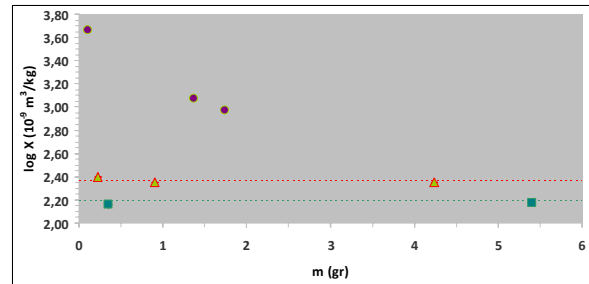
In our contribution we will mainly focus on

- Mineralogy and phase composition
- Shock degree
- Formation processes
- Magnetic signatures

and summarize our major results [5,6 and refs].

As an example, figure 1 shows the results on magnetic susceptibility which we have obtained these materials.

Figure 1: Magnetic susceptibility: (a) ▲ NWA 11119, (b) ■ NWA 7325 and pairs, (c) ● Almahata Sitta MS MU 011/035. For (a) and (b): the dotted lines indicate the average values, respectively.



MagSus values of NWA 11119 and NWA 7325 and pairs represent the lowest MagSus values which have been measured so far on any meteorites to our best knowledge, please note that both are finds. Therefore, one has to state that these values are not directly comparable with Almahata Sitta MS-MU 011/035 values which is a fall. Also in comparison with terrestrial equivalents, MagSus values are quite low, which means that the concentration of Fe-bearing phases is neglectable. This is confirmed by our mineralogy analyses data: no metals or strongly magnetic Fe-oxides [5].

The preliminary results would support our conclusion that these unique meteorites may probe the crust/upper mantle of a yet unknown planetary body which existed only in a very early period of time of our planetary system.

References:

- [1] NWA 11119: Meteor. Bull. 106, 3/2017. NWA 11558 NWA 7325, NWA 8409: Meteor. Bull. 101, 12/2012. Almahata Sitta: Meteor. Bull. 96, 11/2009. NWA 11575: Meteor. Bull. 107, 1/2018. Last Visit: 02/2018.
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- [3] Srinivasan P., et al., 2017. 80th Metsoc Conf., # 6129.
- [4] Huyskens M.H., et al., 2018. 49th LPSC, #2311.
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- [6] Mikouchi T., et al., 2018. 49th LPSC Houston, # 2383.
- [7] Agee, C.B., et al., 2018. 49th LPSC Houston, #2226.