The unique silico-rich meteorites: Fe – poor parent body with very early extrusive volcanism?

The uniqueness of NWA 11119 and related meteorites is also confirmed by their distinct magnetic signature. We can demonstrate this fact by classifying the meteorites using magnetic susceptibility (X, MagSus).

Magnetic susceptibility was studied by the SM 30 and SM 100 instrumentation, ZH Instruments (Brem, CR). As mentioned above, due to the certain similarities in several properties, we decided to also include the two Almahata Sitta trachy-andesite individuals, as well as NWA 7325 and pairs in our investigations.

Summarizing, the unique NWA 11119 does not represent the first direct indication pointing towards the existence of silica-rich volcanism: as mentioned above, Almahata Sitta individuals MS-MU 011 and 035 were the first samples of this kind [5-8, 12], interpreted as crustal extrusive volcanism on the ureilite parent body. Recently, also in lunar rocks (Apollo 12 samples) and on the Martian surface (Gale crater by Mars Science Laboratory rover Curiosity) low pressure, high temperature polymorphs of SiO$_2$ have been found [8,10], as well as in certain HED meteorites, eucrites [13].

Formation and existence of trachy-andesite rocks requires active plate tectonics on a respective parent body, and is mainly connected with subduction zone volcanism, including partial melting of lower crust / upper mantle material.

More detailed investigations on these unique cristobalite – tridymite rich meteorites and its phase relations, formation and cooling conditions are topic of further investigations [see also 12,13].

References