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Classification and $^{53}Mn–^{53}Cr$ chronology of enstatite chondrite meteorites from a new strewn field in Oman.

ANULEKHA PRASAD[1], BEDA HOFMANN[1,2], KLAUS MEZGER[1], ARYAVART ANAND[3], PASCAL MAURICE KRUTTASCH[1] AND EDWIN GNOS[4]

[1]University of Bern
[2]Natural History Museum Bern
[3]Universität Bern
[4]Natural History Museum Geneva

Presenting Author: anulekha.prasad@students.unibe.ch

Enstatite chondrites constitute ~1% of all meteorites. They are characterized by reduced and anhydrous minerals assemblages including enstatite, metallic Fe–Ni, and sulphides. The Oman desert is one of the most important resources of meteorites [1]. 26 paired enstatite chondrites collected from a new Omani strewn field are studied for a detailed classification of the samples as well as to obtain chronological constraints on the thermal evolution of the enstatite chondrite parent body(ies) using the $^{53}Mn–^{53}Cr$ short lived chronometer.

The meteorite samples from the strewn field typically show a pristine core and a weathered rim. A large weathering range from W1 to W4 is indicated by the degree of oxidation of troilite and iron ranging from minor to complete transformation to iron (hydr)oxides. Enstatite (En_{98}) and minor olivine (Fo_{99}) have compositions typical of E chondrites. Petrographic analysis indicates that the samples have different metamorphic grades ranging from 4 to 6 suggesting the original mass was a breccia. Some clasts within a representative sample from the strewn field show well-preserved chondrules with fine-grained mesostasis and heterogeneous plagioclase that suggest a petrographic grade of 4. Whereas, the absence of chondrules and >50 mm size of plagioclase in other clasts suggest petrographic grade 6. The samples belong to group EL as indicated by the mean chondrule size (~0.5 mm), the presence of alabandite (MnS), the Ni content in the phosphides (~30 wt%) and the Si content in the metal (~3 wt%). Petrographic features such as undulous extinction of silicates and the lack of planar fractures [2] suggest shock stages from S1 to S2 (i.e., unshocked to very weakly shocked).

Additionally, sequential digestion is performed on a representative sample of the strewn field to obtain mineral fractions with variable Mn/Cr ratios. The Cr isotopes and Mn/Cr ratios obtained from the leachates are used to determine an isochron that constrains the age of prograde metamorphism in the sample using the ^{53}Mn-^{53}Cr decay scheme.

References-

[1]Meteoritical bulletin database, https://www.lpi.usra.edu/meteor/metbull.php

[2] Rubin, A. E., Scott, E. R. & Keil, K. (1997), Geochimica et Cosmochimica Acta 61(4), 847-858.