

MINERALOGY AND PETROGRAPHY OF H5 CHONDRITES FROM THE LUT DESERT, IRAN.

A.Yu. Pastukhovich¹, V. V. Sharygin^{1,2,3}, G.A.Yakovlev, R.N. Kolunin¹, V.I. Grokhovsky¹, ¹Institute of Physics and Technology, Ural Federal University, Ekaterinburg, 620002, Russian Federation, a.iu.pastukhovich@urfu.ru
²V.S.Sobolev Institute of Geology and Mineralogy, Novosibirsk, 630090, Russia; ³Novosibirsk State University, 630090, Russian Federation.

Introduction: The most abundant meteorites of the Lut desert in Iran are the H5 chondrites. We studied in detail three new chondrites found during the UrFU expedition in Iran in January 2017. These meteorites were confirmed in December 2017 by the Meteorite Nomenclature Committee under the designations Gandom Beryan 008, 009 and Kerman 203.

Experimental: Polished samples and thin sections of the Lut meteorites were examined using an Olympus BX51 optical microscope, TESCAN MIRA 3MLU SEM with EDS/WDS system and JEOL JXA-8100 (WDS electron microprobe).

Results and Discussion: The studied meteorites belong to the class of H5 chondrites. They have a low level of shock metamorphism (S2) and exhibit a high level of hot desert weathering (W3-4) which is common for Lut meteorites [1-3]. The main characteristics of the studied H5 meteorites are summarized in Table 1. In general, we found all primary paragenesis minerals typical for ordinary chondrites (chondrules and matrix): olivine, orthopyroxene, diopside, albite, chromite, merrillite, chlorapatite (rarely fluorapatite), troilite and Fe-Ni-metals (kamacite, taenite, tetraenaite). Chondrules are readily delineated with sizes mostly varying from 200 to 800 μm (rarely up to 1.5-5 mm). They have a barred or porphyritic texture, rarely cryptocrystalline, and consist of Ol+Pl, Opx+Pl, Ol+Opx+Cpx+Pl±Crt or Opx+Cpx+Pl±Crt. Weathering products (goethite and other Fe-hydroxides, akaganeite, rarely droninoite and anhydrite) are very abundant, occurring as veins and *in situ* partial-to-complete alteration of Fe-Ni-metals and troilite as well as filling all microfractures in minerals from matrix and chondrules. In addition, pyrrhotite, hydrated sulfide $\text{FeS}\cdot n\text{H}_2\text{O}$, smythite, violarite and pyrite seem to be manifested as intermediate products of troilite alteration to goethite. The replacement of olivine and low-Ca pyroxene by serpentine/chlorite is occasionally fixed in outer zones of grains. A secondary association (anhydrite + natrojarosite ± goethite ± celestine ± monazite-(Ce)), which appears to be due to an inflow of additional components into the meteorite, is common in Kerman 203 and Gandom Beryan 009.

Based on chemical and mineralogical data, we conclude that meteorites belong to single meteorite shower.

Acknowledgements: This work was supported by the Act 211 of the Government of the Russian Federation, agreement N 02.A03.21.0006.

References: [1] Pourkhorsandi H. et al. 2015. *Meteoritics and Planetary Science* 50SI:5055pdf. [2] Pourkhorsandi H. et al. 2017. *Meteoritics and Planetary Science* 52:1843-1858. [3] Cecchi V. M. et al. 2017. *Meteoritics and Planetary Science* 52SI:A239-A239.

Table 1. Main characteristics of the studied chondrites from the Lut desert, Iran

Meteorite	Gandom Beryan 008	Gandom Beryan 009	Kerman 203
Date of finding	5 January 2017	4 January 2017	9 January 2017
Total mass, in grams	11000	217.92	59.32
Pieces	many	2	6
Petrological class	H5	H5	H5
Shock stage	S2	S2	S2
Weathering grade	W3-4	W3-4	W3
Fa in olivine (mol.%)	18.42±0.45 (n=41)	19.85±0.11 (n=41)	19.49±0.38 (n=61)
Fs in low-Ca pyroxene (mol.%)	16.31±0.52 (n=43)	17.20±0.26 (n=47)	17.06±0.47 (n=52)
Wo in low-Ca pyroxene (mol.%)	1.05±0.19 (n=43)	1.14±0.24 (n=47)	1.34±0.17 (n=52)
High-Ca pyroxene (mol.%)	En _{46.9} Fs _{8.9} Wo _{44.2} (n=6)	En _{47.8} Fs _{6.9} Wo _{45.3} (n=13)	En _{41.1} Fs _{7.6} Wo _{45.3} (n=15)
Plagioclase (mol.%)	Ab _{83.4} An _{9.5} Or _{7.1} (n=11)	Ab _{82.2} An _{12.2} Or _{5.6} (n=27)	Ab _{82.8} An _{11.1} Or _{6.1} (n=31)
Chromite (mol.%)	Crt _{81.0} Spl _{13.7} (n=27) Crt _{49.0} Spl _{48.0} (n=5)	Crt _{80.7} Spl _{14.4} (n=9)	Crt _{80.4} Spl _{14.4} (n=35)
Kamacite (Fe, Ni, Co in wt.%)	94.3; 5.0; 0.4 (n=4)	89.6; 9.7; 0.4 (n=23)	92.5; 7.1; 0.4 (n=35)