OXYGEN ISOTOPE COMPOSITIONS OF DIFFERENTIATED FRAGMENTS FROM KAIDUN.

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Introduction: The Kaidun meteorite breccia is characterized by an extremely wide variety of components [1 and references therein]. Fragments of differentiated material are important for understanding the formation processes of this unique breccia. It was proposed that the parent body of Kaidun is the martian moon Phobos, and that the differentiated clasts in Kaidun are of martian origin [1-5]. Here, we report results of *in situ* and bulk oxygen isotope analyses of several differentiated clasts and their minerals in order to test this hypothesis.

Methods: (1) The $\Delta^{17}O$ values of manually removed bulk clasts were analyzed with the IR heating-assisted fluorination system [6] at UNM. Molecular O_2 was extracted from 1 mg-sized samples, and the isotope ratios measured on a gas source mass spectrometer (Delta PlusXL). Analytical precision for $\Delta^{17}O$ is 0.02 ‰. (2) Individual minerals were measured *in situ* using the ims-1280 ion microprobe at HIGP. Analyses were done in multi-collection mode using a 30 pA primary Cs^+ beam; spots sizes were ~ 2 µm.

Samples and Results: Sample *#d4A* is an alkaline rock fragment [2] with an albite crystal containing small grains of apatite, aenigmatite and wilkinsonite. Sample *#d(3-6)D* is a partly melted subalkaline fragment with primary unmelted grains of apatite and pyroxenes, and crystals of plagioclase crystallized from melt [2]. Sample *#d(3-8)B* is an olivine-pyroxene fragment with pegmatoid-like textures and well-formed olivine crystals in fractures [4]. Sample *#d6G* is a completely remelted fragment with secondary enstatite and plagioclase (An80) crystals in glassy groundmass.

Oxygen isotope results are listed in the following table (M = method; errors are 1 st. dev. for method 1):

Sample	M	$\delta^{17}O$ (‰)	$\delta^{18}O$ (‰)	$\Delta^{17}O$ (‰)
#d4A, alb. (n=3)	2	0.07 ± 0.42	1.10 ± 0.53	−0.53 ± 0.47
#d6D, bulk (n=2)	1	4.62 ± 0.18	9.61 ± 0.20	−0.46 ± 0.07
#d4D, plag (n=3)	2	3.00 ± 0.69	6.53 ± 1.10	−0.40 ± 0.35
#d6B, bulk (n=2)	1	7.89 ± 0.25	12.30± 0.44	1.40 ± 0.02
#d8B, oliv. (n=8)	2	6.99 ± 0.57	9.45 ± 0.71	2.00 ± 0.19
#d6G, bulk (n=2)	1	4.42 ± 0.05	8.29 ± 0.12	0.04 ± 0.01

Discussion: The clasts of differentiated material in Kaidun do not have $\Delta^{17}O$ values typical for martian meteorites (+0.28 to +0.32 ‰ [7]), nor do they fall in a 3-oxygen-isotope space occupied by Mars or any known meteorite material. Our data do not support the hypothesis that the differentiated material in Kaidun is of martian origin. These new Kaidun data, and those from alkali-granitoid clasts from Adzhi-Bogdo [8], could testify to the presence of several parent bodies with advanced differentiation. For example, rock fragments *#d4A* and *#d(3-6)D* have similar $\Delta^{17}O$ values, possibly indicating a common origin. If Phobos is indeed the Kaidun parent body, it, then, must have collected these clasts prior to being captured by Mars.

References: [1] Zolensky M. and Ivanov A.V. (2003) *Chemie Erde* **63**: 185-246. [2] Ivanov A.V. *et al*. (2003) *MAPS* **38**: 725-737. [3] Ivanov A.V. *et al.* (2007) *Geochemistry Intern* **45**: 957-970. [4] Ivanov A.V. *et al.* (2008) *Geochemistry Intern.* **46**: 759-774. [5] Ivanov A.V. (2004) *Solar Syst. Res.* **38**: 97–107. [6] Sharp Z.D. (1990) *Geochimica et Cosmochimica Acta* **54**: 1353-1357. [7] Franchi, I.A. *et al.* (1999) *MAPS* **34**: 657-661. [8] Sokol A.K. *et al.* (2007) *MAPS* **42**:*, Suppl.,* A143.