

Sample Results Summary Sheet

Please return this form to the Curator for each allocated Sample

Sample ID: RA-QD02-0093

PI: Eizo Nakamura

Type and date of analysis performed: major element analysis (SEM-EDS, and EPMA-WDS) [April 16-21, 2011], trace element (SIMS) [May 11-21, 2011], oxygen-isotope analysis (HR-SIMS) [May 5-6, 2011], TEM analysis [Aug 22-28, 2011]

Elements or phases identified: major phase: olivine, plagioclase; minor phase: diopside, low-Ca pyroxene, chromite, troilite, K-feldspar, Ca-phosphate, glass

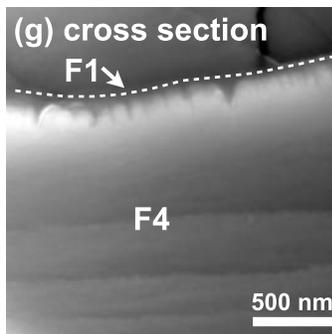
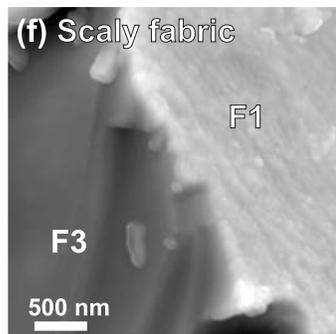
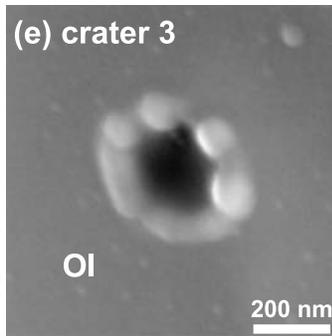
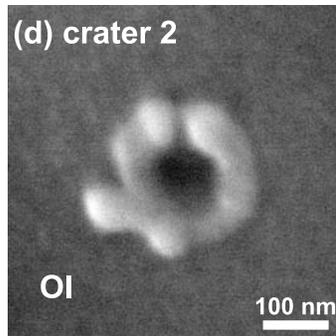
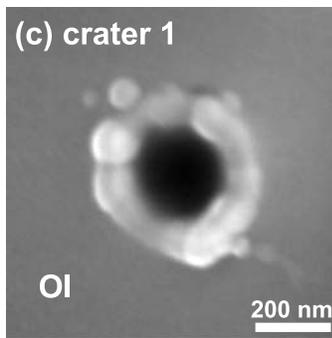
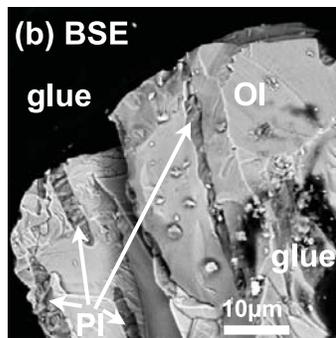
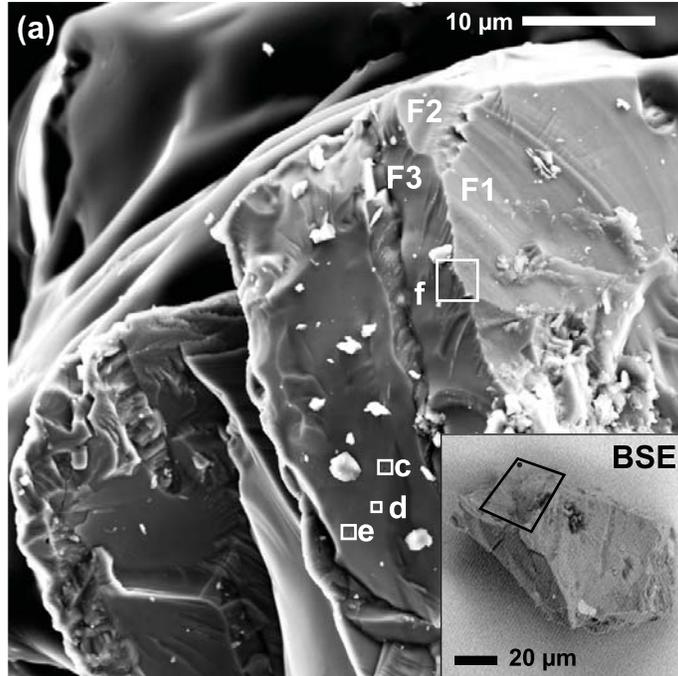
Contaminant phases identified: No

Sample handling: exposed in atmosphere, glued by glycol phthalate, coated C, sliced by FIB, and polished the FIB-sliced slab after acid-leaching, coated Au

State of sample pre-analysis: atmosphere, glued, C-coated, FIB-sliced, In-mounted, polished section, Au coted

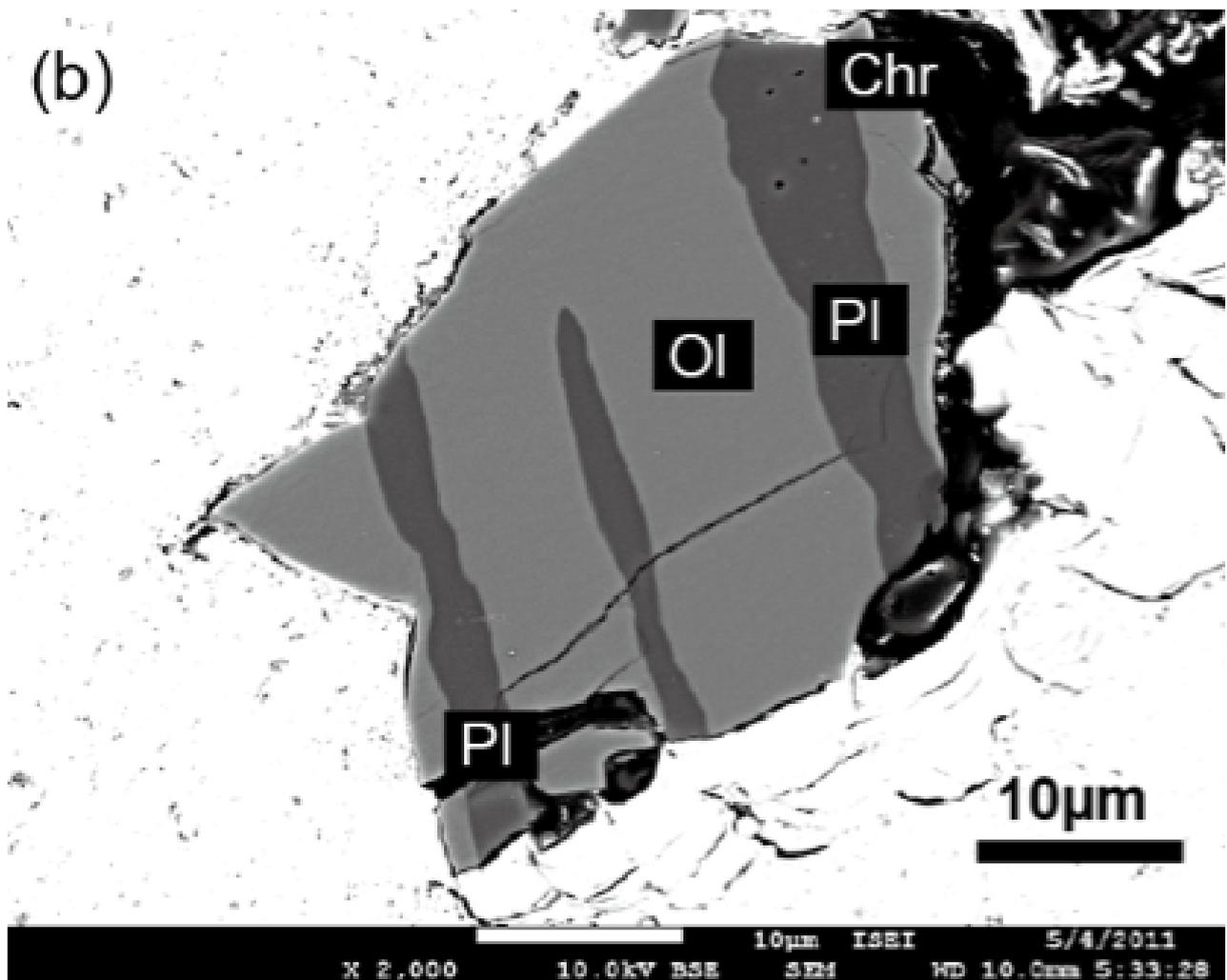
State of sample post-analysis: atmosphere, glued, C-coated, FIB-sliced, In-mounted, polished section, Au coted, sputtered by (spotted by) Cs- and O-beams

Analysis data Notes: This sample (original size: 110×90 μm) is a fragment of a single olivine with inclusions of oriented, very thin (10–20 μm), sub-parallel plates with the composition of plagioclase. This intergrowth resembles the “barred olivine” observed in chondrules. A 1 μm-sized diopside is also included in this single olivine grain, and sub-μm-sized chromites are included in both the olivine and the plagioclase. Ratios of Fe/Mg and Mn/Fe in olivine fall within the range for LL-ordinary chondrites. See details in Nakamura et al. (2012)’s “grain B”.

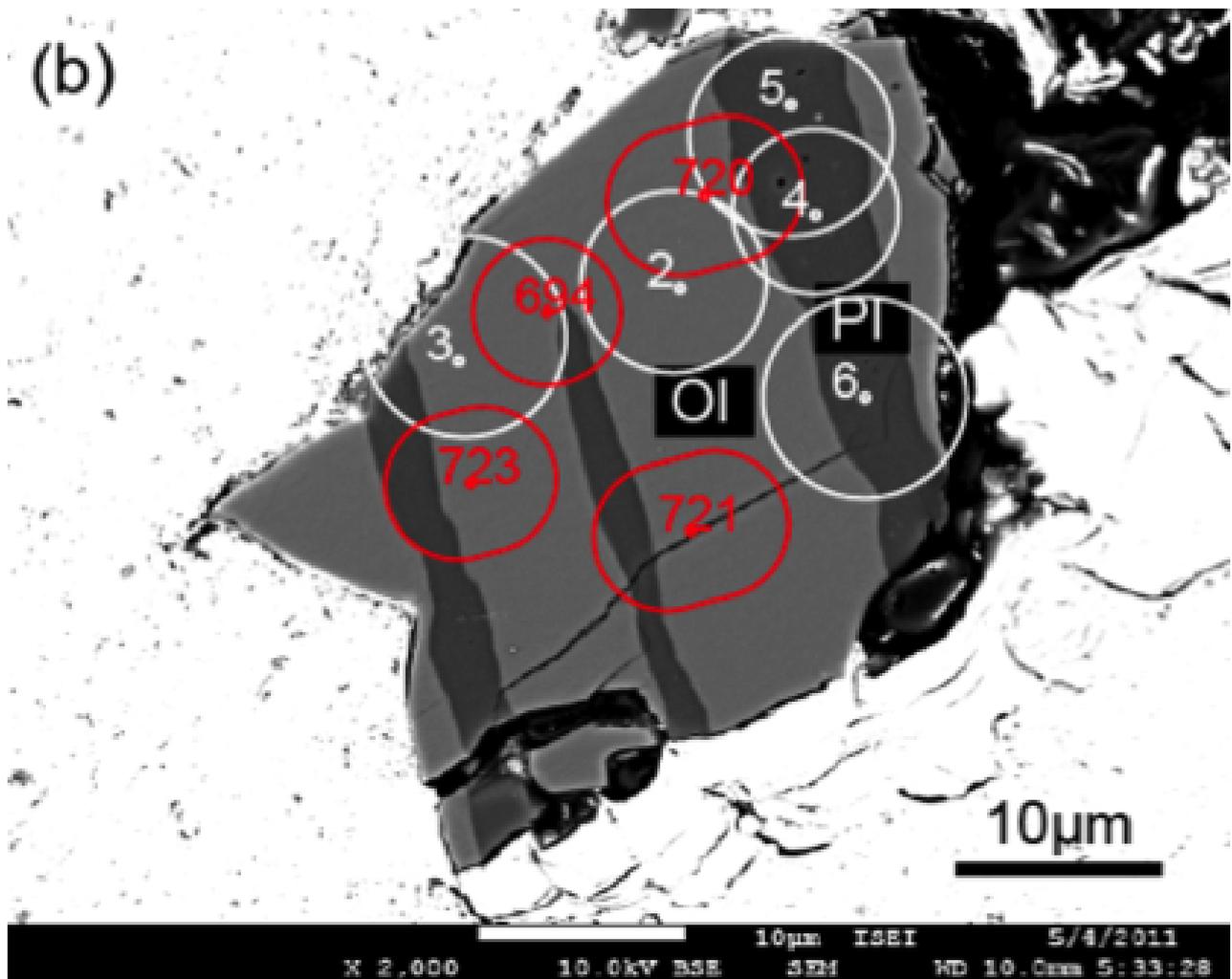


Target Phase	Grain B			
	n=12		Pl _{n=6}	
SiO ₂	38.93	(0.95)	65.40	(0.74)
TiO ₂	-		-	
Al ₂ O ₃	-		20.43	(0.56)
Cr ₂ O ₃	-		0.17	(0.03)
FeO	26.26	(0.44)	0.65	(0.19)
NiO	-		-	
MnO	0.44	(0.03)	-	
MgO	36.94	(0.81)	0.40	(0.26)
CaO	-		2.36	(0.16)
Na ₂ O	-		8.93	(0.31)
K ₂ O	-		0.97	(0.08)
total	102.9		99.1	
Formula	fo ₇₁		an ₁₂ ab ₈₂ or ₆	
Mg#	71	(0.6)		
(Fe/Mg) _{atom}	0.4			
(Fe/Mn) _{atom}	59			

(b)



(b)



Target	Spot	Phase	$\delta(^{18}\text{O}/^{16}\text{O})$	$\delta(^{17}\text{O}/^{16}\text{O})$	$\Delta(^{17}\text{O}/^{16}\text{O})$
Grain A	802	Ol _{0.5} low-Ca Px _{0.5}	6.9	4.1	0.5
Grain B	694	Ol _{0.95} Pl _{0.05}	5.2	5.2	2.5
	720	Ol _{0.8} Pl _{0.2}	2.4	2.5	1.3
	721	Ol _{0.8} Pl _{0.2}	4.0	4.6	2.5
	723	Ol _{0.6} Pl _{0.4}	5.1	5.0	2.3
Grain C	755	Di	7.2	5.5	1.8
	756	Di	8.0	4.2	0.1
	765	Pl*	8.8	5.8	1.2
Grain D	782	low-Ca Px	2.9	2.6	1.1
	783	low-Ca Px	1.7	1.7	0.8

Supplemental Table 7 | Chemical compositions of the Itokawa grains determined using the Cameca ims-5f ion microprobe. Abundances are expressed in a unit of $\mu\text{g}\cdot\text{g}^{-1}$ except for SiO_2 . In-run uncertainty ($1\sigma_{\text{mean}}$) is provided in parentheses. Note that SiO_2 concentration (wt.%) is obtained by electron microprobe analyses (Supplemental Table 1). For analyses sampling two phases, proportions of the two phases are indicated, and SiO_2 concentration[§] was calculated using these proportions. Dashes and dots indicate “not available” and “not analyzed”, respectively. † and ‡ were obtained in “LIGHT” and “RARE-EARTH” sessions, respectively.

Target	Grain A	Grain B	Grain B	Grain B	Grain B	Grain B
Spot	1	2	3	4	5	6
Phase	Ol _{0.5} low-Ca Px _{0.5}	Ol	Ol _{0.9} Pl _{0.1}	Pl	Pl _{0.3} Ol _{0.7}	Pl _{0.6} Ol _{0.4}
SiO ₂	39.61 §	38.93	38.93 §	65.40	65.40 §	65.40 §
TiO ₂	1,300 (44)	- (19)	•••	360 (70)	•••	•••
Al ₂ O ₃	1,500 (21)	430 (10)	•••	15,000 (840)	•••	•••
Cr ₂ O ₃	660 (9)	-	•••	1,700 (390)	•••	•••
FeO	•••	•••	•••	•••	•••	•••
NiO	-	-	•••	-	•••	•••
MnO	4,600 (26)	7,100 (50)	•••	1,200 (23)	•••	•••
MgO	•••	•••	•••	•••	•••	•••
CaO	4,500 (170)	110 (50)	•••	15,000 (540)	•••	•••
Na ₂ O	39 (1)	120 (2)	•••	40,000 (380)	•••	•••
K ₂ O	-	19 (1)	•••	6,100 (83)	•••	•••
P ₂ O ₅	-	720 (10)	•••	2,100 (210)	•••	•••
H ₂ O	580 (7)	690 (15)	•••	350 (9)	•••	•••
Li [†]	-	7.9 (0.1)	•••	3.0 (0.1)	•••	•••
Li [‡]	0.51 (0.03)	2.7 (0.1)	2.5 (0.2)	•••	1.3 (0.1)	3.0 (0.5)
B	-	-	•••	-	•••	•••
F	25 (2)	4.3 (0.3)	•••	36 (1)	•••	•••
Cl	5.6 (0.3)	-	•••	11 (1)	•••	•••
Sr	0.11 0.0	5.2 (0.4)	17 (4) (0.0)	•••	64 (7)	83 (15)
Y	0.27 (0.02)	0.26 (0.13)	0.16 7)	•••	1.1 (0.1)	54 (9)
Zr	0.78 (0.05)	0.44 (0.09)	1.3 (0.1)	•••	2.8 (0.6)	3.2 (0.5)
Nb	2.3 (0.2)	0.74 (0.27)	1.9 (1.4)	•••	15 (2)	45 (8)
Ba	-	-	-	•••	-	-
La	-	-	-	•••	-	-
Ce	-	-	-	•••	-	-
Pr	-	-	-	•••	-	-
Nd	-	-	-	•••	0.52 (0.002)	8.2 (1.4)
Sm	-	-	-	•••	-	-
Eu	-	-	-	•••	-	-
Gd	-	-	-	•••	-	-
Dy	-	-	-	•••	-	-
Er	-	-	-	•••	-	-
Yb	-	-	-	•••	-	-
Lu	-	-	-	•••	-	-
Hf	-	-	-	•••	-	-