Shisr 161

Anorthositic breccia

57.2 g

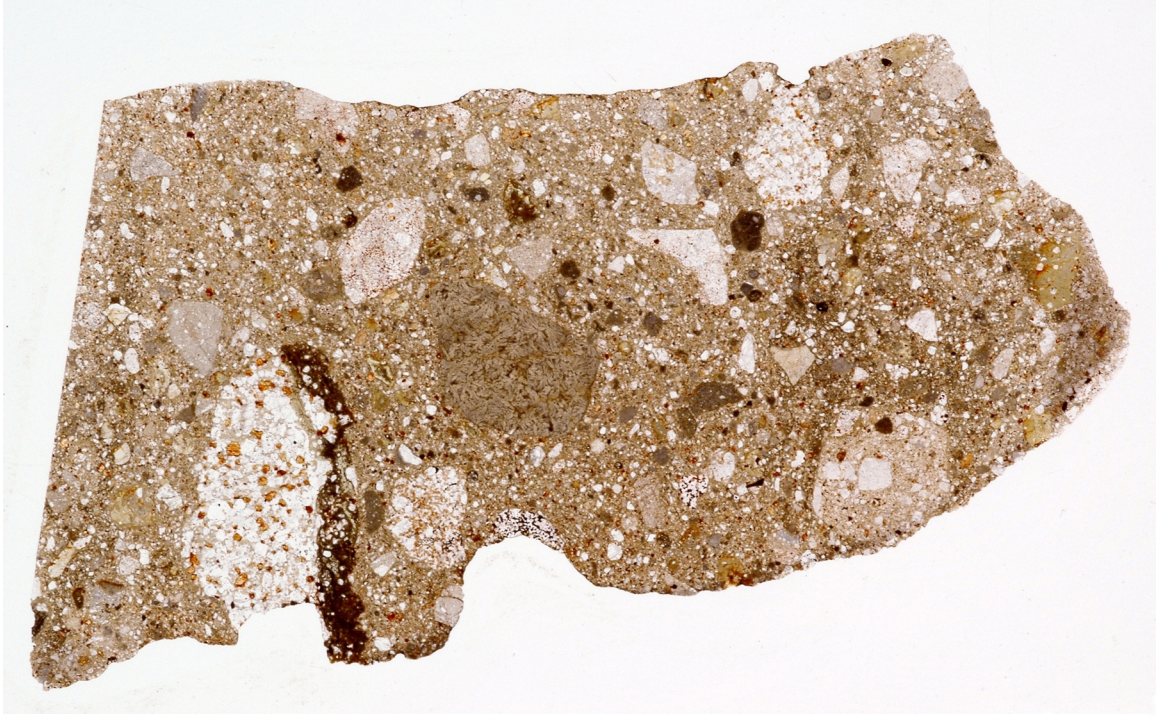
Figure 1: Image taken of Shisr 161 in the.

Introduction

Shisr 161 was collected from the al Shişr niyabat in the Dhofar governorate of Oman in January 2008 (Fig. 1; Weisberg et al., 2009a). The exterior has a thin coating of desert varnish, but no visible fusion crust. The interior is a dark gray matrix with white clasts throughout (Fig. 1).

Petrography

Shişr 161 is composed of a variety of lithic clasts (up to 7 mm) and angular to sub-rounded mineral clasts (≤0.4 mm) set in a fine-grained dark brown fragmented matrix with very minor glass veins (Fig. 2,3: Foreman et al., 2009; Wesiberg et al., 2009a). The fragmental clasts are olivine, plagioclase, orthopyroxene, augite, and pigeonite. Lithic clasts include: feldspathic granulitic breccias (8%), noritic mafics (4%), and fragmental breccias (3%). Rare clasts of mare basalt were also identified, as were melt spherules and rare clasts of crystallized impact melt. The section contains trace amounts of FeNi metal as discrete grains within lithic clasts and in the matrix, consistent with the low concentrations of Ni and Ir (Foreman et al., 2009; also see below).



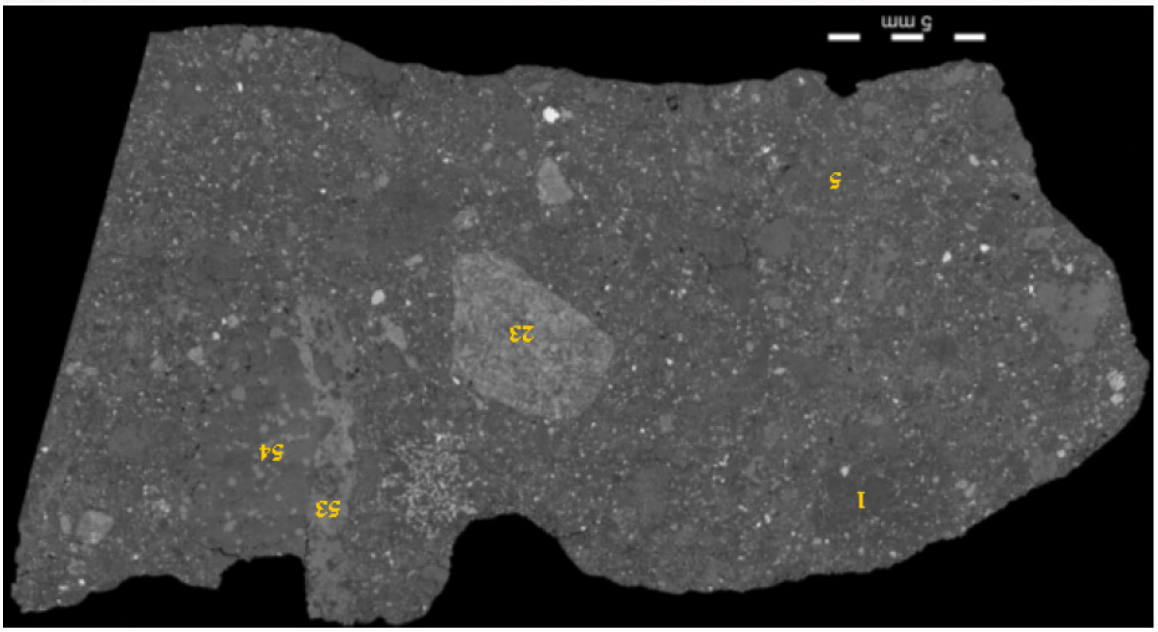


Figure 2: Optical microscopy image through a section of Shisr 161, from A.J. Irving.
Figure 3: BSE image of the same section, from the study of Foreman et al. (2009).

Chemistry

Shisr 161 has ~ 25 wt% Al2O3, 5.94 % FeO and 8.17 % MgO, giving it a bulk composition close to the end member for the feldspathic lunar meteorites (Foreman et al., 2009). However, it is at the mafic (Fe- and Sc-rich) end of the range of the feldspathic lunar meteorites. Sm/Sc is 0.049, slightly lower than the Apollo 16 plutonic anorthositic norites, so there is little or no KREEP component (typical Sm/Sc: 2–3) in the breccia. In this regard Shişr 161 is similar only to granulitic breccia NWA 3163/4483/4881; mean

Sm/Sc = 0.040) and NEA 001 (Sm/Sc = 0.063) among lunar meteorites (Fig. 4; Foreman et al., 2009). Concentrations of siderophile elements are at the low-end of the range for feldspathic lunar meteorites (88 ppm Ni), suggesting that the meteorite is composed of immature regolith. In addition, like many meteorites from hot deserts, Shişr 161 is significantly contaminated with Ba and especially Sr (1100 ppm) from terrestrial alteration. Shişr 161 is more magnesian than most ferroan anorthosites and most other feldspathic lunar meteorites, and is most likely attributable to the granulite component which is the most magnesian lithology in the meteorite (*Mg´* = 63–78; Korotev et al., 2009a).

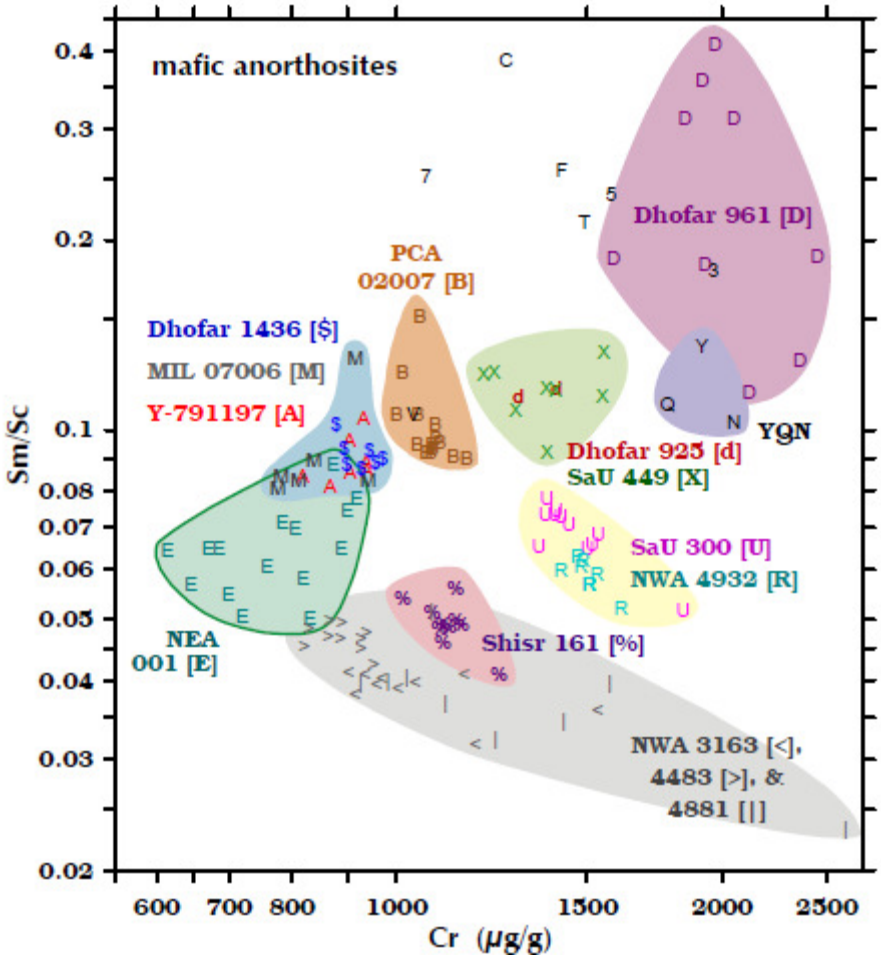


Figure 4: Sm/Sc versus Cr for Shisr 161 compared to many other feldspathic lunar meteorites (from Korotev et al., 2009a).

Radiogenic age dating

None yet reported.

Cosmogenic isotopes and exposure ages

None yet reported.

Table 1: Chemical composition of Shisr 161

reference	1	1
weight	~ 30 mg	294 mg
method	d	e
SiO_2 %	44.2	
TiO_2	0.21	
Al_2O_3	25.2	
FeO	5.94	
MnO	0.09	
MgO	8.17	
CaO	15	
Na_2O	0.32	
K_2O	0.04	
P_2O_5	0.03	
S %		
sum	99.4	
Sc ppm		13.1
V		
Cr	547	
Co		16.8
Ni		88
Cu		
Zn		
Ga		
Ge		
As		
Se		
Rb		
Sr		1100
Y		
Zr		<50
Nb		
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		

Ba	273
La	1.19
Ce	3.2
Pr	
Nd	1.9
Sm	0.642
Eu	0.639
Gd	
Tb	0.153
Dy	
Ho	
Er	
Tm	
Yb	0.68
Lu	0.099
Hf	0.45
Ta	0.06
W ppb	
Re ppb	
Os ppb	
Ir ppb	2.6
Pt ppb	
Au ppb	<4
Th ppm	0.16
U ppm	0.22

technique (a) ICP-AES, (b) ICP-MS, (c) wet chemistry (d) FB-EMPA, (e) INAA, (f) RNAA, (g) XRF

References: 1) Foreman et al. (2009)