Dhofar 302

Anorthositic impact melt breccia

3.83 g

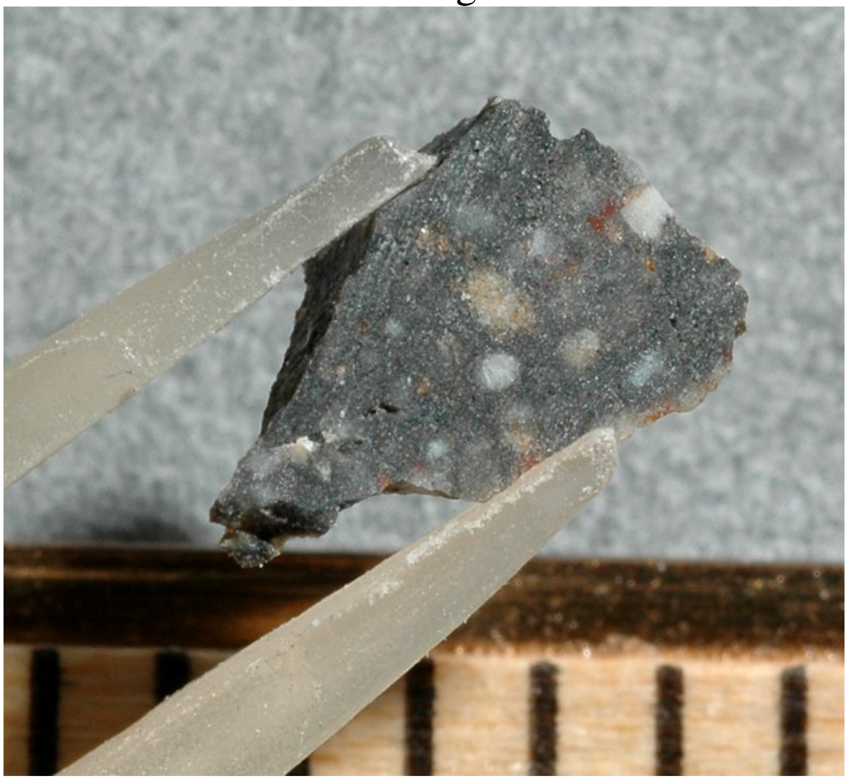


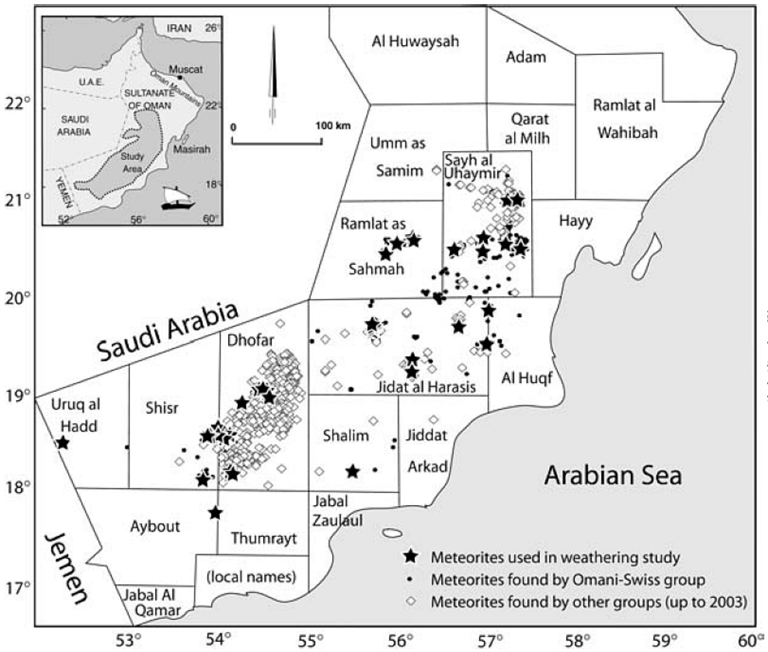
Figure 1: Cut slab of Dhofar 302 showing feldspathic clasts in a breccia. Divisions on scale are 1 mm.

Introduction

Dhofar 302 (Fig. 1) was found in the Dhofar region of Oman (Figs. 2 and 3) in June, 2001. The 3.83 g stone lacks fusion crust, but has very little terrestrial weathering products. Although it has been found near many other feldspathic lunar meteorites in the Oman desert, its distinctive composition has precluded its pairing with other Dhofar meteorites. As a result, it may be a unique stone without recognized pairs.

Petrography and mineralogy

This meteorite is a clast-rich impact melt breccia. The lithic clasts are comprised of both primary igneous rocks and granulites of anorthosite, gabbro-norite and troctolite lithologies (Russell et al., 2002; Nazarov et al., 2002). There are also rare glass fragments of KREEP composition. Plagioclase feldspar ranges in composition from An_{90} to An_{99}, and olivine varies from Fo_8 to Fo_{94} (Nazarov et al., 2002). Accessory phases include Ti-rich chromite, MgAl spinel, ilmenite, baddeleyite, silica, troilite, and FeNi metal. The compositions of olivines, pyroxenes and feldspars bridge the gap between FAN and Mg suite rocks of the Apollo highlands samples (Fig. 4).



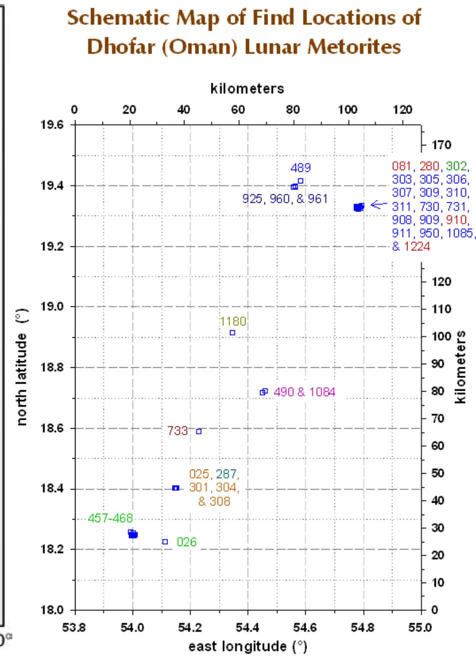


Figure 2 and 3: Location maps of the Dhofar region in Oman (from Al-Kathiri et al., 2005) and the specific coordinates for Dhofar 302 (in green, upper right).

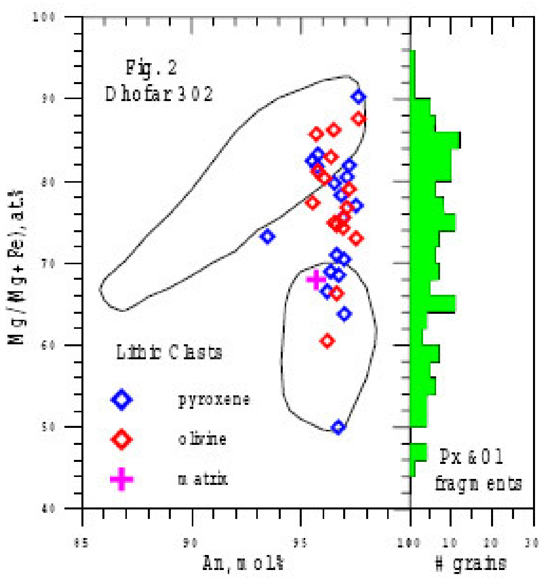
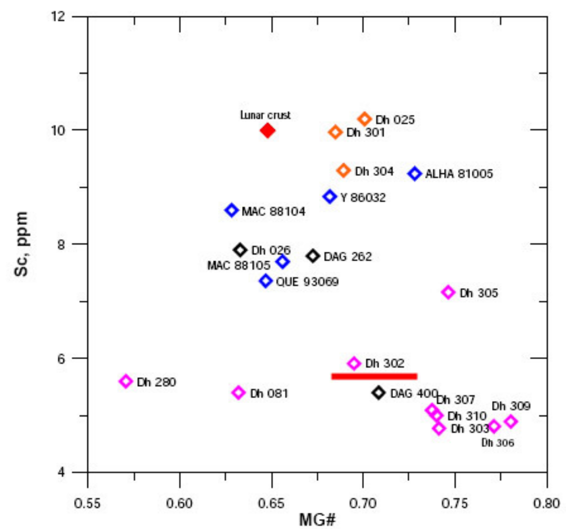
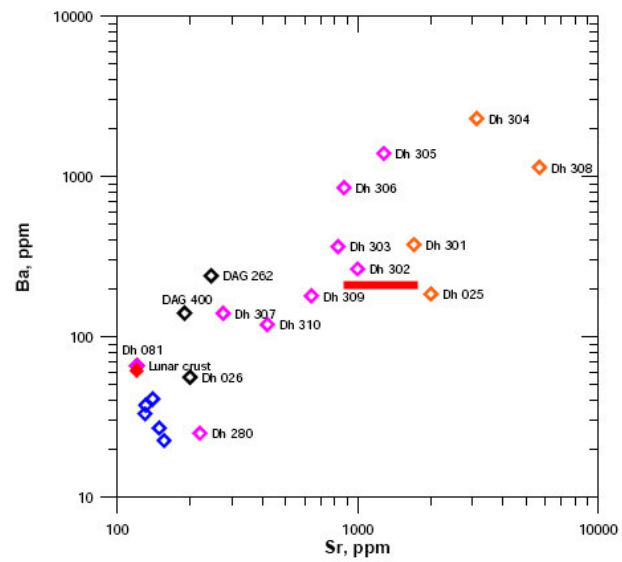


Figure 4: Mg# (in olivine, pyroxene and matrix) vs. An content (mole%) for lithic clasts and fragments of the Dhofar 302 lunar meteorite compared to fields defined for FAN and Mg suite rocks of the Apollo collection. (from Nazarov et al., 2002).

Chemistry

Dhofar 302 is similar to other feldspathic highlands breccias having Mg# near 0.70, Sc ~ 6 ppm, and Ni ~ 200 ppm. The extent of terrestrial desert weathering can be monitored with Ba and Sr contents relative to other feldspathic highlands meteorites such as those from Antarctica (Fig. 5). Dhofar 302 has Ba and Sr contents lower than many other Dhofar lunar meteorites, consistent with its lack of alteration products and minerals that are prevalent on many desert meteorites. Compositional aspects of Dhofar 302 have not been studied in great detail and will be of great interest.





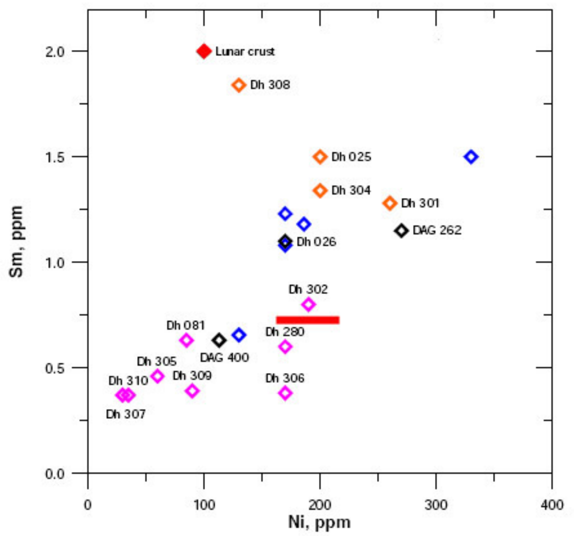


Figure 5: Mg# vs. Sc, Ba vs. Sr, and Sm vs. Ni for some Dhofar lunar feldspathic meteorites, compared to Antarctic lunar feldspathic meteorites (from Nazarov et al., 2003). Dhofar 302 is underlined in red in each figure.

Radiogenic age dating

No work has been reported yet.

Cosmogenic isotopes and exposure ages

No work has been reported yet.

Table 1: Chemical composition of Dho 302

reference	1
weight	1000
method	a,e,g
SiO_2 %	44.5
TiO_2	0.27
Al_2O_3	28.1
FeO	4.02

MnO	0.06
MgO	4.84
CaO	16.5
Na_2O	0.41
K_2O	0.09
P_2O_5	0.12
S %	
sum	
Sc ppm	5.91
V	
Cr	492
Co	18.5
Ni	190
Cu	
Zn	
Ga	
Ge	
As	
Se	
Rb	
Sr	995
Y	
Zr	23
Nb	
Mo	
Ru	
Rh	
Pd ppb	
Ag ppb	
Cd ppb	
In ppb	
Sn ppb	
Sb ppb	
Te ppb	
Cs ppm	
Ba	265
La	2.36
Ce	5
Pr	
Nd	2.8
Sm	0.8
Eu	0.9
Gd	
Tb	0.18
Dy	
Ho	
Er	

Tm	
Yb	0.65
Lu	0.11
Hf	0.8
Ta	
W ppb	
Re ppb	
Os ppb	
Ir ppb	5.1
Pt ppb	
Au ppb	
Th ppm	0.43
U ppm	

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

Table 1b. Light and/or volatile elements for Dho 302

Li ppm	
Be	
C	
S	
F ppm	
Cl	
Br	
I	
Pb ppm	
Hg ppb	
Tl	
Bi	

Reference: 1) Demidova et al. (2007)