NWA 2646

DRAFT

Weathered Gabbroic Shergottite ?

9.3 grams

Figure 1: Photo of NWA 2646 by Nelson Oaks

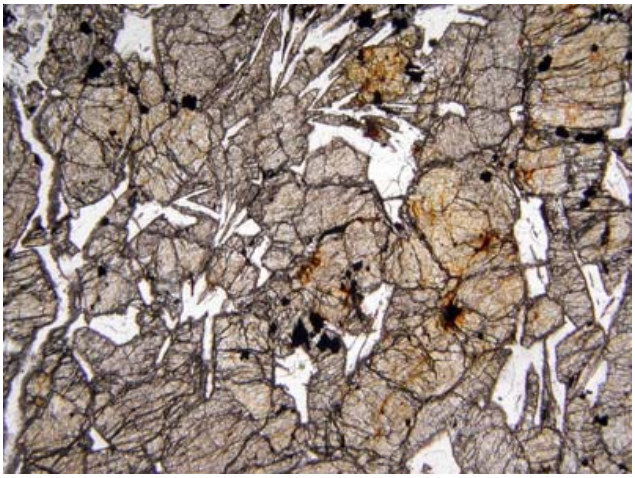

Figure 2: Thin section photo of NWA 2646 from Ted Bunch 2006. 6 mm across

Introduction

NWA 2646 is allegedly a piece of a larger specimen from an unknown location in Morocco or Algeria (Bunch et al. 2005). It is a relatively coarse-grained basalt or gabbro with unusual greenish color (figure 1). Maskelynite is rimmed with weathering or alteration products.

Petrography

Bunch et al. (2005) have described NWA 2646 as a "plagioclase-olivine clinopyroxenite akin to lherzolitic shergottites" (see mode determined by them below). They note that the rock may be modally heterogeneous. Chadocrysts of olivine, augite and chromite are enclosed in larger oikocrysts of zoned pigeonite. Olivine and augite chadocrysts tend to be clustered. Laths of plagioclase (now maskelynite) occur interstitially (figure 2).

Thin rims of alteration or weathering are found on the maskelynite. They are reportedly made up of a fine-grained mixture calcite, hydrous Al silicate and very minor calcium chloride, which appear to be replacing the maskelynite.

Mineral Chemistry

Olivine: Bunch et al. (2005) determined Fo_{62-56} with FeO/MnO = 35-56.

Mineralogical Mode for NWA 2646

	Bunch et al. 2005
Olivine	21.6 vol. %
Pigeonite	40.7
Augite	24.3
Maskelynite	11.4
Chromite	2
Ilmenite	tr.
Pyrrhotite	tr.
"weathering"	tr.

Pyroxenes: The composition of augite is $Wo_{26-36}En_{81-77}$ with FeO/MnO = 22-27. Pigeonite is $Wo_{6-12}En_{76-66}$ with FeO/MnO = 26-32.

Maskelynite: Plagioclase is ~An_{60}, but it is shocked to isotropic.

Whole-rock Composition

Brandon et al. (2012) reported Re, Os and PGE (table 1). A major element analysis of the thin section would be useful.

Isotopes

Nishiizumi et al. (2006) reported the cosmic ray exposure age as 2.5 – 3.1 m.y. Breezhnoy et al. (2010) reported ^{26}Al and ^{53}Mn, but the terrestrial age is still uncertain.

Table 1. Chemical composition of NWA 2646.

reference	Brandon12
weight	
SiO2 %	
TiO2	
Al2O3	
FeO	
MnO	
MgO	
CaO	
Na2O	
K2O	
P2O5	
S %	
sum	
Sc ppm	
V	
Cr	
Co	
Ni	
Cu	
Zn	
Ga	
Ge ppb	
As	
Se	
Rb	
Sr	
Y	
Zr	
Nb	
Mo	
Ru ppb	1.93
Rh	
Pd ppb	1.92
Ag ppb	
Cd ppb	
In ppb	
Sn ppb	
Sb ppb	
Te ppb	
Cs ppm	
Ba	
La	
Ce	
Pr	
Nd	
Sm	
Eu	
Gd	
Tb	
Dy	
Ho	
Er	
Tm	
Yb	
Lu	
Hf	
Ta	
W ppb	
Re ppb	0.08
Os ppb	1.45
Ir ppb	1.04
Pt ppb	2.9
Au ppb	
Th ppm	
U ppm	
technique:	*(a)*

Other Isotopes

Rumble and Irving have reported the oxygen isotopes (Delta ^{17}O = 0.24‰).

Processing

It is reported that this sample may be part of a larger specimen.

References for NWA2646

Berezhnoy A.A., Bunch T.E., Ma P., Herzog G.F., Knie K., Rugel G., Faestermann T. and Korschinek G. (2008) Al-26, Be-10 and Mn-53 in Martian meteorites (abs#5306). *Meteorit. & Planet. Sci.* **45**, A13.

Bunch T.E., Irving A.J., Wittke J.H. and Kuehner S.M. (2005) Nortwest Africa 2646: A Martian plagioclase-olivine clinopyroxenite akin to "Lherzolitic Shergottites" (abs #5209). *Meteorit. & Planet. Sci.* **40**, A25.

Connolly H.C. and 11 authors (2006) The Meteoritical Bulletin, No. 90. *Meteorit. & Planet. Sci.* **41**, 1383-1418.

Nishiizumi K. and Caffee M.W. (2006) Constraining the number of lunar and Martian meteoerite falls (abs#5368). *Meteorit. & Planet. Sci.* **41**, A133.

Rumble D. and Irving A.J. (2009) Dispersion of oxygen isotopic compositions among 42 Martian meteorites determined by laser fluorination: Evidence for assimilation of (ancient) altered crust (abs#2293). *Lunar Planet. Sci.* **XL**, Lunar Planetary Institute @ The Woodlands.