Northwest Africa 4898

Unbrecciated basalt

137 g

Figure 1: Slice through NWA 4898, with close up of matrix (upper right) and 1 cm cube for scale.

Introduction

Northwest Africa 4898 (Fig. 1) was found in northwest Africa in 2007, and consists of one fragment almost completely covered with fusion crust and weighing 137 g (Connolly et al., 2008). Inspection of the interior reveals it basaltic texture (Fig. 1).

Petrography and Mineralogy

The texture of this sample is spherulitic with lath-shaped plagioclase, pyroxene, and skeletal ilmenite. Olivine is present as larger crystals ($Fa_{26.3\text{-}27.2}$; FeO/MnO = 73-92), and often contains chromite inclusions. The calcic plagioclase ($An_{92.6\text{-}96.5}$) has been completely transformed into maskelynite during shock metamorphism. And the pyroxenes ($Fs_{25.1\text{-}58.7}Wo_{13.2\text{-}34}$; FeO/MnO = 42-76) are compositionally zoned Ti-rich pigeonite and augite. FeNi-metal and troilite are present as minor phases (Connolly et al., 2008).

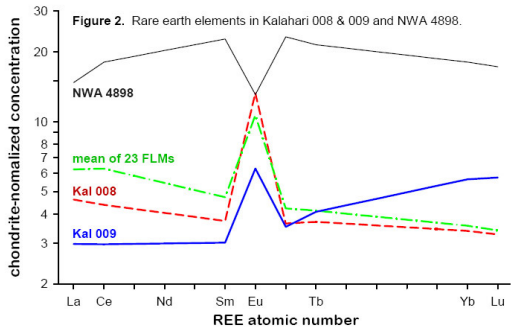

Figure 2: Rare earth element diagram for NWA 4898 illustrating a Eu anomaly (from Korotev et al., 2008).

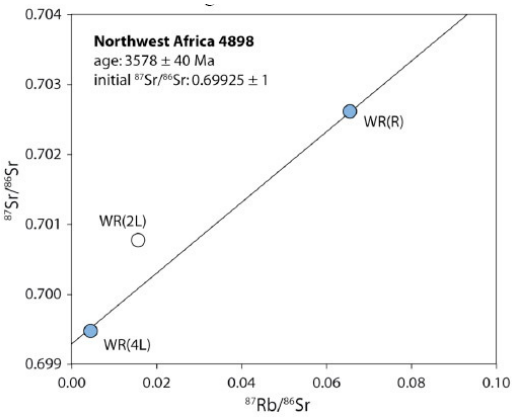

Figure 3: Whole rock isochron for NWA4898 indicating an age of 3.58 Ga (from Gaffney et al., 2008).

Chemistry and Radiogenic age dating

INAA analyses of 6 small (133 mg total) chips of NWA 4898 reveal its low FeO nature (Table 1) and Eu anomaly (Fig. 2). A whole rock Rb-Sr isochron based on three measurements from NWA 4898 yields an age of 3.58 Ga (Fig. 3; Gaffney et al., 2008). Additional Nd isotopic analyses show that NWA 4898 may have been derived from one of the most LREE depleted lunar mantle sources known (Fig. 4; Gaffney et al., 2008).

Cosmogenic isotopes and exposure ages

None yet reported.

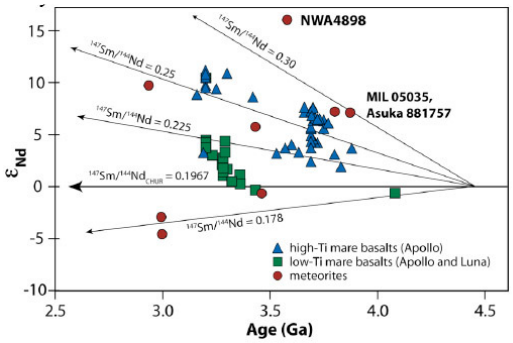

Figure 4: Results of Nd isotopic analyses of Gaffney et al (2008) showing the depleted nature of this sample relative to other Apollo, Luna and meteorite samples.

Table 1. Chemical composition of NWA 4898

reference	1
weight	133
technique	INAA
SiO_2 %	-
TiO_2	-
Al_2O_3	-
Cr_2O_3	-
FeO	17.2
MnO	-
MgO	-
CaO	-
Na_2O	0.296
K_2O	-
P_2O_5	-
S %	-
sum	-
Sc ppm	65.4
V	
Cr	3020
Co	
Ni	<180
Cu	
Zn	
Ga	
Ge	
As	
Se	
Rb	
Sr	
Y	
Zr	
Nb	
Mo	
Ru	
Rh	
Pd ppb	
Ag ppb	
Cd ppb	
In ppb	
Sn ppb	
Sb ppb	
Te ppb	
Cs ppm	
Ba	
La	
Ce	
Pr	
Nd	
Sm	4.55
Eu	0.997
Gd	
Tb	
Dy	
Ho	
Er	
Tm	
Yb	
Lu	
Hf	
Ta	
W ppb	
Re ppb	
Os ppb	
Ir ppb	
Pt ppb	
Au ppb	
Th ppm	0.44
U ppm	

References: 1) Korotev et al. (2008).