

# Northwest Africa 2995, 2996, 3190, 4503, 5151, 5152

Basalt-bearing anorthositic (polymict) fragmental breccia  
538, 968, 40.7, 70, 289, 38 g



*Figure 1: Northwest Africa (NWA) 2995 with a cut face exposing the interior.*

## **Introduction**

Northwest Africa (NWA) 2995 was found in Algeria in 2005 and purchased in November 2005 (Fig. 1). It is fully fusion crusted and exhibits minimal weathering (no alteration veins). Its interior reveals a multitude of light grey and white feldspathic clasts in a dark fine grained matrix (Fig. 2; Connolly et al., 2006; Bunch et al., 2006). Subsequently, five additional masses have been paired with NWA 2995 – NWA 2996, 3190, 4503, 5151, and 5152 – on the basis of mineralogy and bulk composition (Connolly et al., 2008; Weisberg et al., 2008, 2009); they are also distinct from other lunar meteorites.

## **Petrography, mineralogy, and chemistry**

This fine grained feldspathic fragmental breccia contains many lithologies, such as norite, olivine basalt, sub-ophitic basalt, gabbro, KREEP basalt, troctolite, granulitic impact melt, anorthosite, and glassy impact melt. Breccia within a breccia textures are common, and there are shock melt veins crossing the sample (Bunch et al., 2006; Connolly et al., 2006, 2008; Korotev and Ziegler, 2007; Korotev et al., 2008). Compositionally, these samples fall between the basaltic and anorthositic end members of lunar meteorites,

indicating that they are likely a mixture of these two lithologies (Fig. 3; Korotev et al., 2009).



Figure 2: slab cut of NWA 2995 illustrating the feldspathic nature of the sample. Scale bar at left has 1 mm divisions (photo from R. Korotev).

**Radiogenic age dating**

None yet reported.

**Cosmogenic isotopes and exposure ages**

None yet reported.

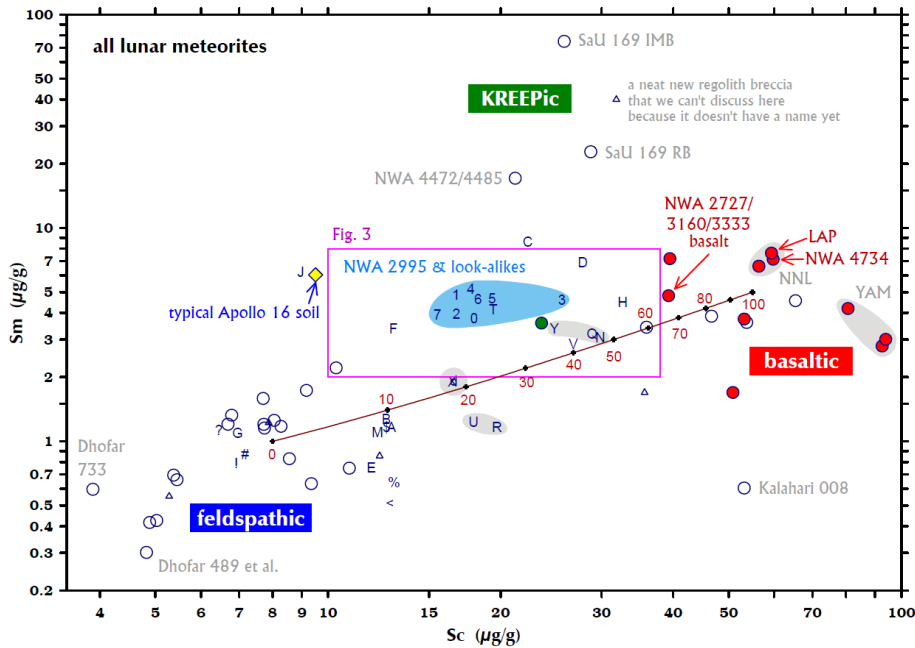


Figure 3: Sm versus Sc for a broad range of lunar meteorites showing the intermediate compositional range exhibited by the NWA 2995 pairing group (from Korotev et al., 2009).

**Table 1a:Chemical composition  
of NWA 2995**

<i>reference</i>	2995-6	2995-6	2995 et			
<i>weight</i>	1	1	al.			
<i>technique</i>	20-60	1563	1			
	a	c	c			
SiO <sub>2</sub> %	46.2					
TiO <sub>2</sub>	0.68					
Al <sub>2</sub> O <sub>3</sub>	20.6					
FeO	9.75	9.75	9.72			
MnO	0.15					
MgO	8.08					
CaO	13.5	14.3	14.2			
Na <sub>2</sub> O	0.51	0.471	0.466			
K <sub>2</sub> O	0.19	0.18	0.13			
P <sub>2</sub> O <sub>5</sub>	0.14					
S %						
sum	100					
Sc ppm		18.8	18.7			
V						
Cr		1570	1580			
Co		34.1	34.9			
Ni		200	200			
Cu						
Zn						
Ga						
Ge						
As		<0.6	<1.0			
Se		n.a.	<1.0			
Rb		<5	<5			
Sr		164	158			
Y						
Zr		137	126			
Nb						
Mo						
				Ru		
				Rh		
				Pd ppb		
				Ag ppb		
				Cd ppb		
				In ppb		
				Sn ppb		
				Sb ppb		
				Te ppb		
				Cs ppm	0.15	0.12
				Ba	173	166
				La	10.25	9.94
				Ce	27.3	26.6
				Pr		
				Nd	16	15
				Sm	4.65	4.44
				Eu	1.07	1.07
				Gd		
				Tb	0.92	0.86
				Dy		
				Ho		
				Er		
				Tm		
				Yb	3.16	2.97
				Lu	0.439	0.412
				Hf	3.61	3.29
				Ta	0.42	0.38
				W ppb		
				Re ppb		
				Os ppb		
				Ir ppb	6	6.1
				Pt ppb		
				Au ppb	5	13.1
				Th ppm	1.73	1.55
				U ppm	0.5	0.42

*technique (a) EMPA, (b) ICP-MS, (c) INAA (d) XRF*

**Table 1b. Light and/or volatile elements  
for NWA 2995**

Li ppm		
Be		
C		
S		
F ppm		
Cl		
Br	0.36	0.34
I		
Pb ppm		
Hg ppb		
Tl		
Bi		

References: 1) Korotev et al. (2009b)

K. Righter – Lunar Meteorite Compendium - 2010