

NWA1950
Lherzolic Peridotite
~ 797 grams (2 stones)



Figure 1. Photo of NWA1950 (courtesy of Bruno Fectay and Carine Bidaut). Scale is in cm. (nice clean fingers unknown).

Introduction

Two stones (414 and 383 grams) were found in the Atlas Mts. Morocco in 2001 (Russell et al. 2004; Gillet et al. 2005). They both have fusion crust (figures 1 and 4). Together, they are also known by their field name “Jules Verne”. Perhaps more specimens will be found.

NWA1950 has not been dated, but a cosmic ray exposure age (~4 m.y.) has been determined.

Petrography

The texture of NWA1950 is similar to that of ALH77005 (figure 2). Two lithologies are present; characterized as poikilitic and “non-poikilitic” (Gillet et al. 2005, Mikouchi 2005). The poikilitic lithology has large low-Ca pyroxene (up to 6 mm) surrounding large euhedral olivine and small chromite. The “non-poikilitic” lithology has intergrown augite, pigeonite and maskelynite as well as numerous accessory minerals including chromite, ilmenite, sulfide, phosphate, rare baddelyite and a K-rich phase (glass?). Magmatic melt inclusions are common in both olivine and pyroxene.

Fractures in NWA1950 contain calcite (from terrestrial weathering).

Mineralogy

Olivine: Olivine Fe_{66-75} has $FeO/MnO = 50 \pm 10$ (Gillet et al. 2005).

Pyroxene: Both pigeonite ($En_{78}Fs_{19}Wo_2 - En_{60}Fs_{26}Wo_{14}$) and augite ($En_{53}Fs_{16}Wo_{31} - En_{45}Fs_{14}Wo_{41}$) are present in NWA1950 (figure 3).

Plagioclase: All of the plagioclase in NWA1950 is shocked to maskelynite An_{57-40} (Gillet et al. 2005, Mikouchi 2005).

Mineralogical Mode of NWA1950

	Russell et al. 2004	Gillet et al. 2005
Olivine	55 vol. %	55
Pyroxene	35	35
Maskelynite	8	8

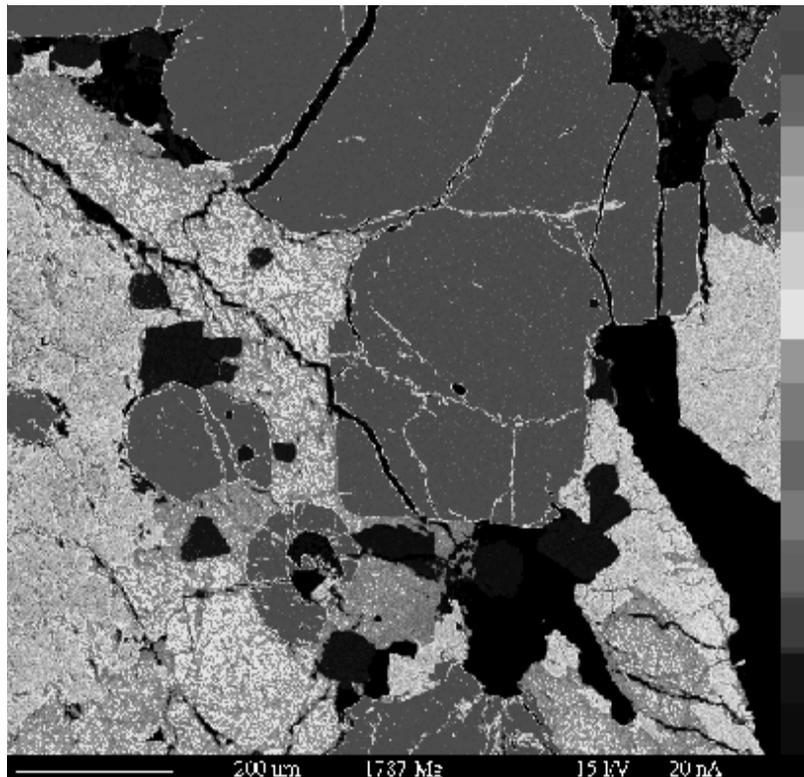


Figure 2: Texture of polished section of NWA1950 (courtesy J-A. Barrat and Marcel Bohn). Minerals generally lack chemical zonation. This striking photo is a map of Mg content of olivine (red), chromite and/or ilmenite (blue), maskelynite (black), pigeonite (orange) and augite (green).

Chromite: Small (20-100 microns) euhedral chromite inclusion in olivine and pyroxene have compositions similar to those in ALH77005 (Gillet et al. 2005).

Sulfide: The sulfide phase is pyrrhotite with high Ni, some pentlandite, and trace Cu.

Chemistry

The composition of NWA1950 has been determined by Gillet et al. (2005) (table 1). The rare earth elements (figure 5) are found to be between ALH77005 and NWA480.

Radiogenic age dating

None

Cosmogenic isotopes and exposure ages

Gillet et al. (2005) report cosmic ray exposure ages $^3\text{He} = 5.3 \pm 3.0$ m.y., $^{21}\text{Ne} = 3.5 \pm 0.8$ m.y., and $^{38}\text{Ar} = 2.3 \pm 1$ m.y. Christen et al. (2005) determined a exposure ages of $^3\text{He} = 4.1 \pm 0.6$ m.y., $^{21}\text{Ne} = 5.3 \pm 0.8$ m.y., and $^{38}\text{Ar} = 2.9 \pm 0.4$ m.y. (average is 4.1 ± 1.4 m.y.).

Other isotopes

Oxygen isotopes are reported as $\delta^{17}\text{O} = 2.54$ ‰, $\delta^{18}\text{O} = 4.28$ ‰, and $\Delta^{17}\text{O} = 0.31$ ‰ by Gillet et al. (2005).

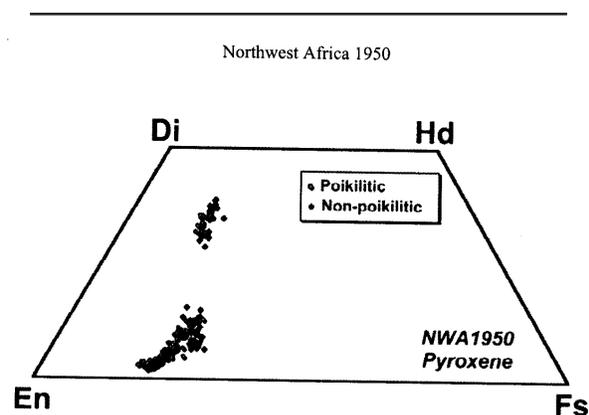


Figure 3: Pyroxene compositions in NWA 1950 (Mikouchi 2005).

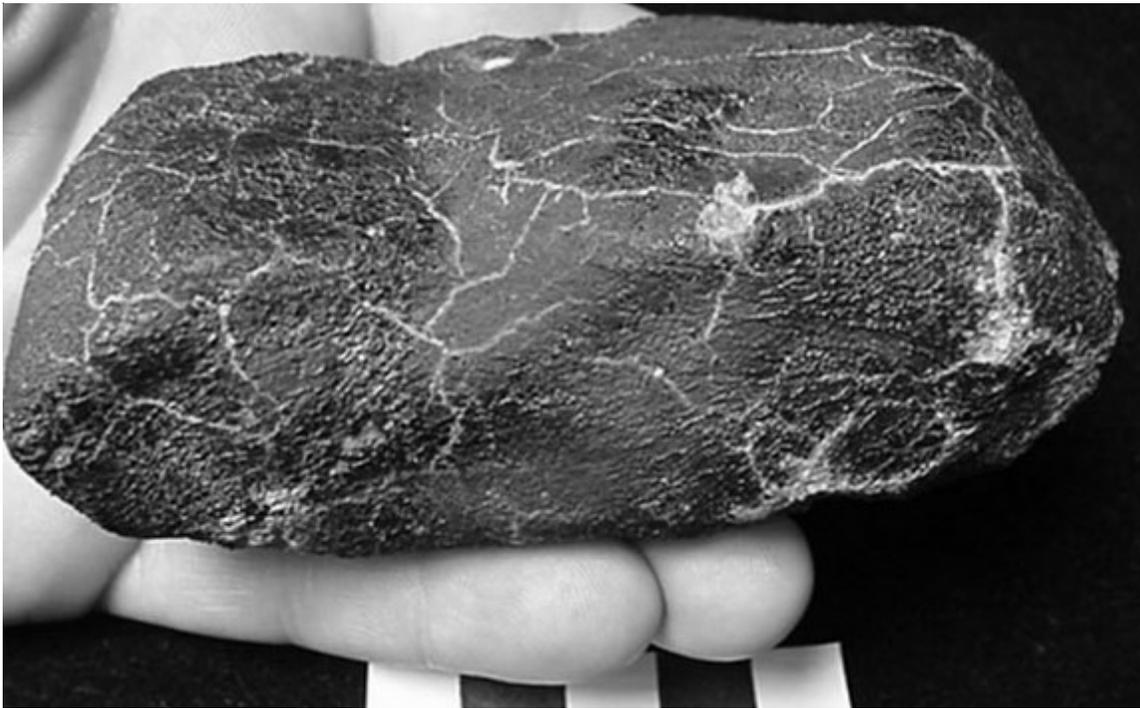


Figure 4: Jules Verne #2 (photo courtesy Bruno Fectay and Carine Bidaut). Scale is in cm.

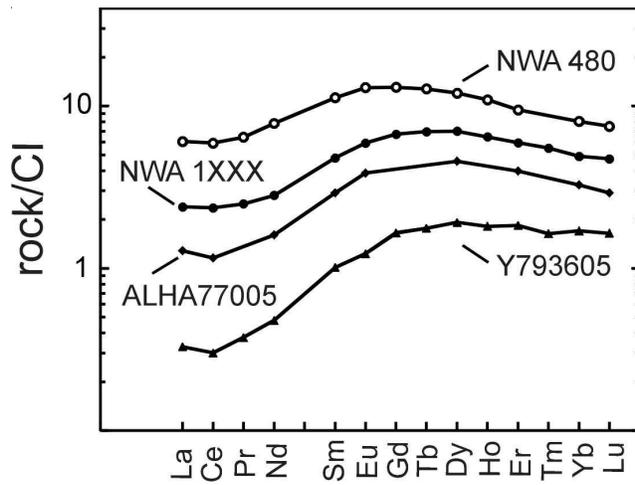


Figure 5: Rare-earth-element pattern for Jules Verne (NWA1950) (from Barret).

Table 1. Chemical composition of NWA1950.

<i>reference</i>	Gillet 2005	
<i>weight</i>	fusion crust	
SiO ₂ %		43.97 (a)
TiO ₂	0.55	0.56 (a)
Al ₂ O ₃	4.02	4.02 (a)
FeO	21.65	21.77 (a)
MnO	0.46	0.52 (a)
MgO	25.06	20.87 (a)
CaO	4.09	5.13 (a)
Na ₂ O	0.81	0.82 (a)
K ₂ O	0.1	0.02 (a)
P ₂ O ₅	0.65	0.7 (a)
S %		
<i>sum</i>		
Sc ppm		
V		
Cr	6400	(a)
Co	71	(b)
Ni	306	(b)
Cu	7.6	(b)
Zn	48.8	(b)
Ga	9.3	(b)
Ge ppb		
As		
Se		
Rb	0.78	(b)
Sr	21.5	(b)
Y	9.61	(b)
Zr	26	(b)
Nb	1.12	(b)
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm	0.041	(b)
Ba	9.94	(b)
La	0.586	(b)
Ce	1.51	(b)
Pr	0.24	(b)
Nd	1.34	(b)
Sm	0.739	(b)
Eu	0.343	(b)
Gd	1.37	(b)
Tb	0.261	(b)
Dy	1.77	(b)
Ho	0.367	(b)
Er	0.984	(b)
Tm	0.141	(b)
Yb	0.81	(b)
Lu	0.12	(b)
Hf	0.82	(b)
Ta	0.064	(b)
W ppb	119	(b)
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm	0.083	(b)
U ppm	0.019	(b)
<i>technique:</i>	(a) ICP-AES, (b) ICP-MS	