

NWA 5790

DRAFT

145 grams
Nakhlite



Figure 1: Photo of NWA5790 by Aziz Habibi (lifted from Chladni's Heirs).



Figure 2: Closeup photo of surface of NWA5790.

Mineralogical Mode for NWA5790

Jambon et al. 2010	
Olivine	9 %
Augite	51
Magnetite	~1
Mesostasis	40
Tridymite	
Na-plagioclase	
K-spar	
ilmenite	

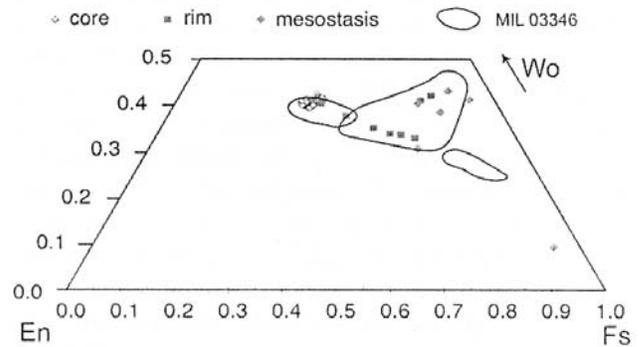


Figure 3: A comparison of pyroxene composition in NAW5790 with that of MIL03346 (Janbon et al. 2010).

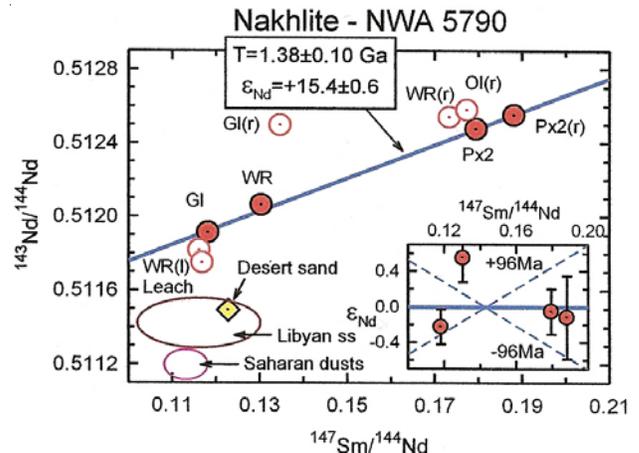


Figure 4: Sm-Nd internal mineral isochron for NWA5790 (Shih et al. 2010).

Introduction

NWA 5790 was found in Mauritania; apparently as two pieces. There could be more! It apparently lacks fusion crust, and has many crevices filled with terrestrial contamination (figures 1 and 2). It has been dated at 1.38 b.y. with exposure to cosmic rays for ~ 7 m.y. Its terrestrial age has yet to be determined.

Petrography

Jambon et al. (2010) reported the texture (figure 5), along with mineral and mesostasis composition (table 1). Olivine phenocrysts are large and zoned. Euhedral augite phenocrysts have sector zoning with iron-rich rims. The mesostasis has numerous dendritic crystals of Ti-magnetite, trace Na-rich plagioclase, even K-spar. Cl-rich amphibole is trapped in melt inclusions

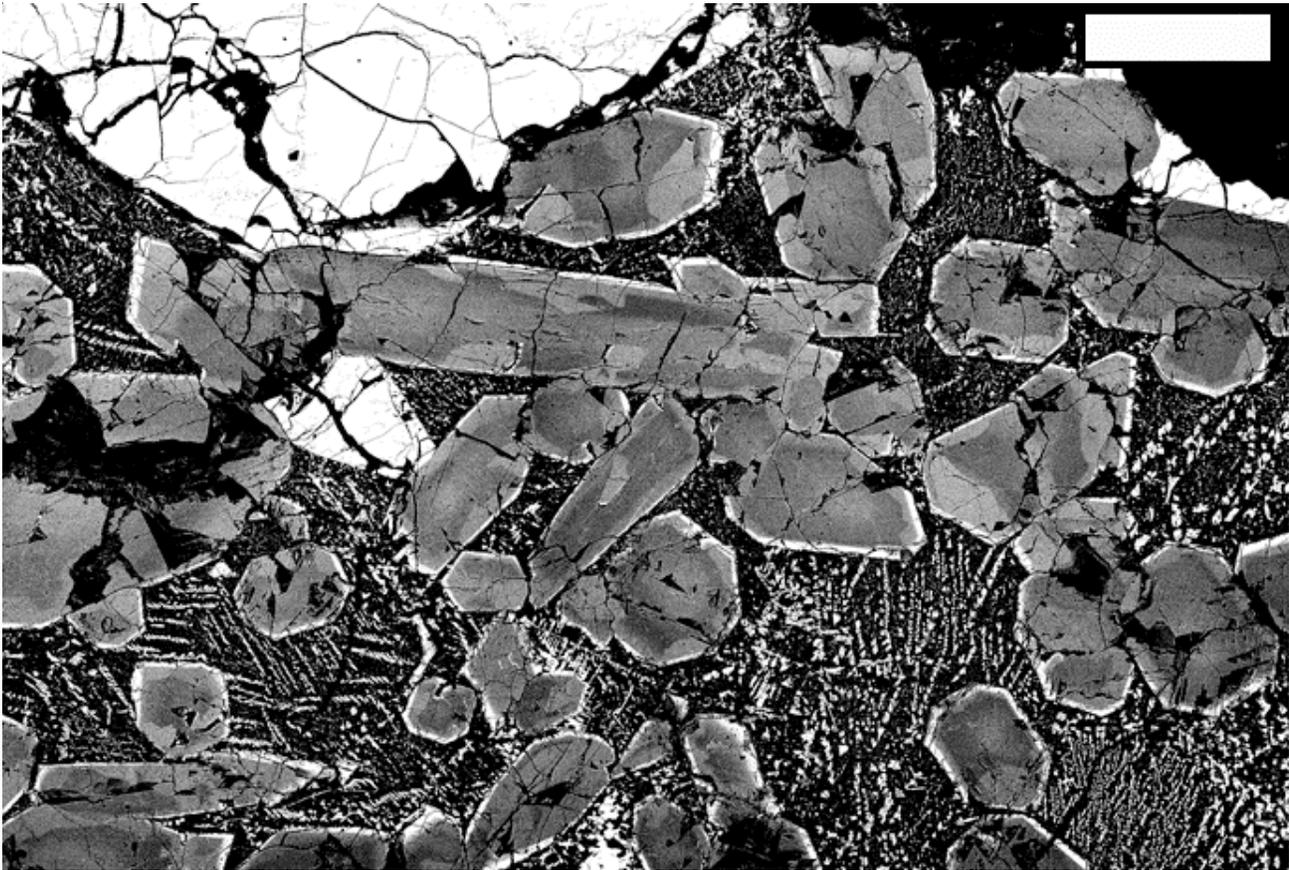


Figure 5: Back-scatter-electron image of NWA5790 (Jambon et al. 2010). scale bar is 0.5 mm.

(Jambon et al. 2010). Chennaoui-Adoudjehane et al. (2011) determined the cathodoluminescence spectra of tridymite, phosphate and K-spar in the mesostasis.

Calichi is reported on the surface of this weathered meteorite (Tomkinson et al. 2012).

Mineralogy

Olivine: Olivine phenocrysts are zoned (Fa₆₅₋₈₀).

Pyroxene: Augite phenocrysts are highly zoned (figure 3).

Plagioclase: Minor Na-rich plagioclase is found as microlites in mesostasis.

Phosphate: Sanborn et al. (2011) determined the REE content of apatite.

Chemistry

The chemical composition of NWA5790 was reported by Janborn et al (2010) and Sanborn et al. (2011). Terrestrial contamination was studied by Tomkinson

et al. (2012). The rear-earth-element pattern is similar to that of nakhlites, but elevated (figure 6).

Radiogenic age dating

Shih et al. (2010) determined the crystallization age of NWA5790 as 1.38 b.y. by the Sm-Nd method (figure 4).

Cosmogenic isotopes and exposure ages

Huber et al. (2012) determined an exposure age of 7.3 m.y. by the ³⁸Ar method.

Other Studies

The oxygen isotopic composition has been reported by Janbon et al. (2010).

Processing

Very nice sample.

References for NWA5790

Chennaoui Aoudjehane H., Jambon A. and Boudouma O. (2010) A cathodoluminescence study and K-feldspar in the Nakhlites MIL03346 and NWA5790 (abs#1934).

Table 1. Composition of mesostasis NWA 5790.

reference	Janborn10	weight	mesostasis
SiO ₂ %	54.6	(a)	
TiO ₂	0.81	(a)	
Al ₂ O ₃	14.33	(a)	
FeO	17.13	(a)	
MnO	0.26	(a)	
MgO	0.44	(a)	
CaO	4.25	(a)	
Na ₂ O	5.4	(a)	
K ₂ O	1.1	(a)	
P ₂ O ₅	0.96	(a)	
S %			
sum			

Sc ppm
V
Cr
Co
Ni
Cu
Zn
Ga
Ge ppb
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
Eu
Gd
Tb
Dy
Ho
Er
Tm
Yb
Lu
Hf
Ta
W ppb
Re ppb
Os ppb
Ir ppb
Pt ppb
Au ppb
Th ppm
U ppm
technique: (a) caution, not rock

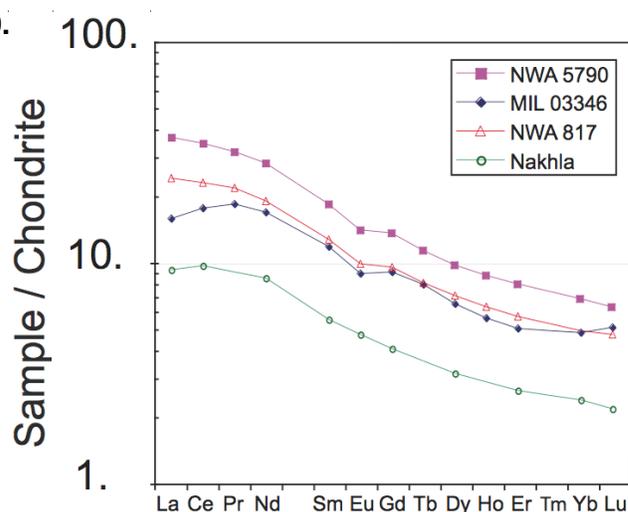


Figure 6: Normalized rare-earth-element patterns for Nakhrites including NWA5970(topmost)(Jambon et al. 2010).

Lunar Planet. Sci. LXI Lunar Planetary Institute, Houston.

Huber L., Irving A.J., Maden C. and Wieler R. (2012) Noble gas cosmic ray exposure ages for four unusual Martian meteorites: Shergottites NWA 4797, NWA 5990, NWA 6342 and Nakhlite NWA 5790 (abs#1408). *43rd Lunar Planet. Sci. Conf.* Lunar Planetary Institute @ The Woodlands.

Jambon A., Barret J-A., Bollinger C., Sautter V., Bourdouma O., Greenwood R.C., Franchi I.A. and Badia D. (2010) Northwest Africa 5790. Top sequence of the Nakhlite pile (abs#1696). *Lunar Planet. Sci. LXI* Lunar Planetary Institute @ The Woodlands.

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Shih C-Y., Nyquist L.A., Reese Y. and Jambon A. (2010) Sm-Nd isotope studies of two Nakhrites, NWA 5790 and Nakhla (abs#1367). *Lunar Planet. Sci. Conf.* **41st** Lunar Planetary Institute @ The Woodlands.

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