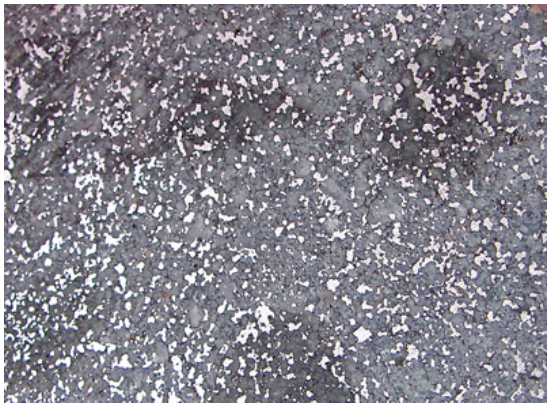
MINERALOGY AND PETROLOGY OF NORTHWEST AFRICA 7214: A LARGE AUBRITE FROM MOROCCO.

T. E. Bunch[1,4], J. H .Wittke[1], A. J. Irving[2,4], P. P. Sipiera[3,4] and D. Pitt [1]Geology Program, SESES, Northern Arizona University, Flagstaff, AZ 86011, USA, tbear1@cableone.net; [2]Dept. of Earth and Space Sciences, University of Washington, Seattle, WA 98195, USA; [3]Field Museum of Natural History, Chicago, IL, USA; [4]Planetary Studies Foundation, Galena, IL, USA.

Background: Aubrites are rare achondrites [1]. A stone found in southern Morocco in 2006 is the third largest aubrite mass discovered in Africa, and may be the parent stone for most of the smaller, more weathered aubrite material classified previously by us (and others) variously as NWA 4537, NWA 4799, NWA 4832, NWA 4871, NWA 5217, NWA 5419, NWA 6193, NWA 6350 and NWA 6675. [Note that we categorically exclude Al Haggounia 001 and its many pairings from consideration here, since it is evident that this multi tonne find is not an aubrite at all, but instead an anomalous EL3 chondrite – see [2]].

Petrography: NWA 7214 consists mainly of fine to medium grained (0.3 to 1.2 mm), euhedral to subhedral equant grains of enstatite ($En_{99.6}Fs_{0.1}Wo_{0.3}$) with subordinate interstitial kamacite (5.3 wt.% Ni, 4.0-5.8 wt.% Si), plus schreibersite, graphite, troilite (2.3-3.6 wt.% Ti, 1.8 wt.% Cr; containing round inclusions of a silica phase) and daubreelite. Accessory brezinaite (46.3-52.1 wt.% Cr, 9.1-3.0 wt.% Fe, 1.1 wt % Mn, 45.4 wt.% S) and oldhamite occur together in complex intergrowths, and sodic plagioclase ($An_{4.2}$) is present as small lath-shaped, intercumulus grains.



Reflected light image showing opaque phases (bright), enstatite (light gray), plagioclase (darker gray) and interstitial silica pockets (darkest). Base width = 15 mm.

Discussion: Apart from the nine well-known falls (Aubres, Bishopville, Bustee, Cumberland Falls, Khor Temiki, Mayo Belwa, Norton County, Peña Blanca Spring, Pesyanoe), aubrites are only rarely preserved as finds because of their propensity to suffer terrestrial weathering (even in "dry" deserts). All enstatite-rich meteorites seem to be especially unstable in the terrestrial environment, presumably because their major minerals (enstatite and kamacite) and even some of their characteristic accessory phases (formed under very reducing conditions) are far from equilibrium with the oxidizing and hydrous conditions on Earth.

References: [1] Keil K. 2009. *Chemie Erde* 70: 295-317. [2] http://www4.nau.edu/meteorite/Meteorite/Al_Haggounia.html; Bunch T. et al. 2010. Abstract #5378. *73rd Met. Soc. Mtg.*