

NWA 2646: A MARTIAN PLAGIOCLASE-OLIVINE CLINOPYROXENITE AKIN TO “LHERZOLITIC SHERGOTTITES”.

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Introduction: A 9.3 gram broken stone (allegedly from a larger specimen) purchased in Morocco is a new type of ultramafic Martian rock with affinities to the so-called “lherzolitic shergottites”. This specimen is distinctive in comparison to similar rocks because of its higher abundance of plagioclase (now maskelynite), more ferroan mafic mineral compositions, and the presence of alteration assemblages containing calcite, (?)kaolinite and chlorides.

Primary Characteristics: Based on point counting of one thin section, this heterogeneous specimen is composed of 40.7% pigeonite, 24.3% augite, 21.6% olivine and 11.4% maskelynite, with 2% chromite, ilmenite, merrillite and pyrrhotite. Euhedral to subhedral chromite ($Cr/(Cr+Al) = 0.869$, $Mg/(Mg+Fe) = 0.12$) and augite ($Fe_{19-23}Wo_{26-36}$, $Cr_2O_3 = 0.6$ wt.%, $Al_2O_3 = 2.2$ wt.%, $FeO/MnO = 22-27$) appear to have crystallized first, followed by subhedral to anhedral olivine (Fe_{38-44} , $FeO/MnO = 35-56$). These are poikilitically enclosed in large oikocrysts of pigeonite ($Fe_{24.4}Wo_{5.7}$ zoned to $Fe_{34.4}Wo_{12.1}$, $FeO/MnO = 26-32$); augite and olivine chadacrysts tend to be clustered. Plagioclase laths ($An_{58.4-60.7}Or_{0.9}$) are interstitial (some in sheaf-like bundles).

Secondary Alteration Assemblages: All maskelynite grains are surrounded by zones up to 40 microns wide of fine grained calcite + hydrous Al silicate (+ very minor calcium chloride), which appear to be replacing the primary feldspar. These assemblages may result from weathering or possibly hydrothermal alteration (possibly pre-terrestrial).

The “Lherzolitic Shergottite” Nomenclature Problem: Although six Martian meteorites (including ALHA77005, Y793605, LEW88516, GRV99207 and NWA 1950) have been called “lherzolitic shergottites” [e.g.,1], the absence of orthopyroxene in these rocks precludes the use of the term “lherzolitic”. If IUGS nomenclature [2] were applied, they would be Martian olivine clinopyroxenites. NWA 2646 appears to be a more evolved member of this group, but poses further nomenclature problems because of its higher plagioclase content (it could even be called an olivine gabbro).

Affinities With NWA 480: Trace element and isotopic data imply that *olivine-free* shergottite NWA 480 and pairing [3] appear to be derived from the same “Bulk Mars” source region as the “lherzolitic shergottites” [4]. Thus, there may be a continuum from more primitive rocks with cumulus textures to more evolved magmatic liquids like NWA 480.

References: [1] Meyer C. 2005 *Mars Met. Compend.*; Gillet P. et al. 2005 *MAPS*, 40 [2] LeMaitre R. et al. 1989 Blackwell [3] Barrat J.-A. et al. 2002 *MAPS*, 37, 487-499; Irving A. and Kuehner S. 2003 *LPS XXXIV*, #1503 [4] Nyquist L. et al.. 2004 *2nd Conf. Early Mars*, #8041.