

MOST FERROAN FELDSPATHIC LUNAR METEORITE NWA 2200.

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Introduction: Northwest Africa (NWA) 2200 is a feldspathic lunar meteorite (552 g) which was found in the Atlas Mountains, Morocco in August 2004 [1]. Kuehner et al. [2] reported that NWA 2200 is a polymict glassy impact-melt breccia with ferroan anorthosite (FAN) affinity based on petrological investigation. We examined bulk chemistry and mineralogy of NWA 2200 in order to characterize this meteorite in comparison with other feldspathic lunar meteorites and Apollo samples.

Mineralogy: Two polished thin sections were studied. NWA 2200 is composed of diverse mixtures of glassy clasts and lithic clasts embedded in a dark glassy matrix. Most lithic clasts display either fine-grained ophytic / dendritic texture, or granulitic texture. These clasts are dominated by plagioclase with minor olivine and pyroxenes. A relatively large, granulitic clast (1×0.75 mm in size) consists of plagioclase and olivine (~15 vol%) with smaller volume of orthopyroxene and augite. Fragments olivine and pyroxene (< 200 μm) are widely distributed, though they are volumetrically minor. Plagioclase compositions (An₉₆₋₉₇) are consistent across the thin sections. Olivine compositions are mostly Fo₅₄₋₅₇ with one Mg-rich grain (Fo₇₄₋₇₅). Pyroxenes are slightly more Mg-rich (Mg#₆₆₋₇₀ for augite and Mg#₆₀₋₆₄ for orthopyroxene) than olivines. Pyroxenes generally exhibit exsolution lamellae of submicron to a few μm in thickness. Pyroxene fragments with chemical zoning are Mg-rich (Mg#₆₃₋₇₃) unlike those in mare basalts. The highly feldspathic nature and the presence of calcic plagioclase and relatively Fe-rich olivine/pyroxene indicate a derivation from FAN-suite rocks.

Bulk Chemistry: Measured major-element composition (in wt. %) is: SiO₂ = 42 ± 2, TiO₂ = 0.18 ± 0.01, Al₂O₃ = 30.0 ± 0.4, FeO = 4.8 ± 0.3, MgO = 3.5 ± 0.6, MnO = 0.055 ± 0.002, CaO = 17 ± 1, Na₂O = 0.33 ± 0.03, and trace element (in μg/g) is: Sm = 1.0 ± 0.2 (Errors are due to counting statistics (1σ)). Most elements were determined by neutron-induced prompt gamma-ray analysis (PGA). Our data about sodium and samarium of NWA 2200 are nearly consistent with those of Korotev et al. [3] (Na₂O = 0.330 wt. %, Sm = 1.09 ppm). However, the iron content is slightly (~1 wt. %) higher than that of Korotev et al. [3] (FeO = 3.95 wt. %). While the chemical composition is within the range of known feldspathic lunar meteorites, the Mg# (56) is the lowest among them (57 - 80). Concentrations of Al₂O₃, MgO and FeO is consistent with those of Apollo FAN rocks (Al₂O₃ = 28.0 - 35.6 wt. %, MgO = 0.25 - 5.11 wt. %, and FeO = 0.21 - 5.89 wt. %) [e.g. 4]. These chemical composition and mineralogy suggest that NWA 2200 is originated from FAN lithologies, in line with the previous study [2], and that it may represent the ferroan portion within the range of the FAN suite.

References: [1] Connolly et al. 2006. *M&PS* **41**, 1383. [2] Kuehner et al. 2005. *M&PS* **40**: A88. [3] Korotev et al. 2008. *LPSC* **39**, Abstract #1209. [4] Heiken et al. 1991. Lunar Sourcebook. Cambridge, Cambridge University. Press.