FERROAN GABBRO AND LEUCOGABBRO LITHOLOGIES IN NWA 3170, POSSIBLE PETROGENETIC LINK, AND COMPARISON TO NWA 2727. S. N. North-Valencia, B. L. Jolliff and R. L. Korotev, Dept. of Earth & Planetary Science, Washington University in St. Louis, MO, 63130, USA (snorth@levee.wustl.edu)

Introduction: Lunar meteorite Northwest Africa (NWA) 3170 is one of the eleven paired meteorite stones in the “NWA 773 clan” [1-3]. The NWA 773 clan is a breccia consisting of five lithologies: olivine gabbro (OG), olivine phryic basalt (OPB), ferroan gabbro (FG), leucogabbro (LG), and a fragmental or regolith breccia. NWA 3170 is composed of olivine gabbro, ferroan gabbro, and leucogabbro, along with a breccia component (Fig. 1). The main mass is ~60 g and was found in 2007 [1]. There is some alteration (i.e. Ca-rich veins) in the slab studied, resulting from weathering in a hot-desert environment.

The FG and LG lithologies are similar to those found in NWA 2727 [2]. The FG lithology has only recently been found in NWA 773 clan members NWA 2727 and NWA 7007 [2,4,5]. The LG lithology has also only recently been found in NWA 2727 and NWA 3170, first reported here. This work is aimed at understanding how the FG and LG lithologies fit into the petrogenesis of the NWA 773 clan meteorites.

Petrography of NWA 3170: The sample of NWA 3170 that we have investigated is a thick polished slab (Fig. 1) composed of 40.4% OG, 14.8% LG, 3.6% FG, and 41.2% breccia. Pyroxene, olivine and plagioclase are the major minerals present. Minor K-feldspar, silica, and ilmenite also occur. Trace minerals include armalcolite, troilite, phosphates, zirconolite and spinel.

Olivine gabbro is prominent in our section of NWA 3170. It is composed of 24.6% olivine (Fo0.67-0.70Fa0.30-0.33), 35.9% pyroxene (Wo12.6-23.9En49.1-66.7Fs16.0-25.2), and 39.5% plagioclase (Ab88.5-93.6Ab8.9-9.9Or0.7-1.9) with minor to trace amounts of ilmenite, troilite and phosphates. The modal mineralogy is higher in plagioclase and pyroxene, and lower in olivine than those reported for NWA 773 [7-10].

Pyroxene and plagioclase dominate the breccia, with minor olivine. Symplectites are common in the breccia, and are composed of hedenbergite, Fayalite, and silica, resulting from the breakdown of pyroxferroite [6]. Ilmenite, chromite, troilite, and phosphates are also present.

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The leucogabbro is composed of 61.8% plagioclase (An$_{0.2\pm0.3}$Ab$_{0.5\pm0.1}$Or$_{0.5\pm0.1}$Cn$_{0.0\pm0.1}$) laths and 38.2% pyroxene (Wo$_{1.4\pm0.5}$En$_{24.8\pm5.3}$Fs$_{52.1\pm5.5}$). Pyroxene is zoned in Mg-Fe (Fig. 2). Trace minerals include ilmenite, troilite and phosphates.

The ferroan gabbro is a complex lithology dominated by Mg-Fe zoned pyroxene (Wo$_{1.4\pm0.3}$En$_{3.3}$Fs$_{45.8}$) and plagioclase (An$_{0.2\pm0.3}$Ab$_{0.5\pm0.1}$Or$_{0.5\pm0.1}$Cn$_{0.0\pm0.1}$). K-feldspar (Ab$_{0.8\pm0.1}$Or$_{0.1\pm0.1}$Cn$_{0.0\pm0.1}$) is also present, and is zoned in Ba, with up to ~8.5 wt% BaO (Fig. 2A). Olivine (Fa$_{0.7\pm0.2}$Fo$_{0.3\pm0.2}$) is present with both melt inclusions and troilite inclusions (Fig. 2B). A Qtz-Hed-Fay symplectite occurs along the margin of the gabbro clast in NWA 3170.

Comparing NWA 3170 and NWA 2727: The LG in NWA 3170 is a complex breccia composed of OC, FG and LG lithologies, along with a significant breccia component. The LG in NWA 3170 is texturally and compositionally similar to the LG in NWA 2727, suggesting that these clasts are two pieces of the same lithology. The FG in NWA 3170 has different modal mineralogy than the FG in NWA 2727, but this may be a function of non-representative sampling of the coarse gabbro. Pyroxene and plagioclase compositions of the FG in NWA 3170 and NWA 2727 are similar. Compositional overlap of pyroxene in the FG and LG lithologies suggest that the petrogenesis of these lithologies may be linked, but further petrogenic modeling is needed to confirm the link.

**Petrogenesis of LG and FG:** The petrogenesis of the lithologies of the NWA 773 clan has been attributed to formation in a shallow magma chamber, with a fraction of the melt removed after ~20% crystallization of olivine to form the OPB present in some NWA 773 clan members [7]. The melt remaining in the chamber solidified to form the OG [7]. After ~85% crystallization of the melt body, remaining intercumulus material could have solidified into the FG lithology [11]. The similarities in plagioclase and overlap in pyroxene composition between the FG and LG lithologies suggest that their petrogenesis may be linked.

**Conclusions:** NWA 3170 is a complex breccia composed of OC, FG and LG lithologies, along with a significant breccia component. The LG in NWA 3170 is texturally and compositionally similar to the LG in NWA 2727, suggesting that these clasts are two pieces of the same lithology. The FG in NWA 3170 has different modal mineralogy than the FG in NWA 2727, but this may be a function of non-representative sampling of the coarse gabbro. Pyroxene and plagioclase compositions of the FG in NWA 3170 and NWA 2727 are similar. Compositional overlap of pyroxene in the FG and LG lithologies suggest that the petrogenesis of these lithologies may be linked, but further petrogenic modeling is needed to confirm the link.


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