

PETROLOGY AND MINERALOGY OF PROTOGRANULAR ANGRITE NORTHWEST AFRICA 14758: EVIDENCE FOR EVEN MORE DIVERSITY IN THE ANGRITE PARENT BODY OR BODIES.

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Introduction: The continued recovery of angrite meteorite specimens (predominantly in desert regions of north-western Africa) has expanded our knowledge considerably about these very ancient, highly refractory achondrites. At this writing **23 unpaired** angrite specimens are known, and remarkably they continue to display the most diversity in textures, mineralogy and cosmic ray exposure ages (ranging from 0.6 to 56 Myr) of any group of achondrites [e.g., 1-11]. Given the narrow range in crystallization ages (4.543 to 4.564 Ga) for the well-dated examples [e.g., 12-15], it may be reasonable to propose that all angrite specimens were originally portions of a single very ancient (but possibly no longer extant) differentiated planetary body, the disrupted debris from which was sampled more recently at widely different times. Yet, just as there are at least five distinct groups of eucrites [see 16], the possibility must be considered that more than one angrite parent body may have existed in the early Solar System.

Northwest Africa 14758: This specimen has a medium-grained, hypidiomorphic-granular or protogranular texture (mean grain size ~0.7 mm) and is composed of equant grains of Ca-bearing olivine (Fa_{40,3-40,9}, FeO/MnO = 82-83, CaO 1.1-1.4 wt.%), Al-rich augite (Fs_{10.4-10.8}Wo_{54,5-52.1}, FeO/MnO = 71-92, Al₂O₃ 5.7-7.9 wt.%, TiO₂ 0.9-1.6 wt.%), anorthite (An_{99,5-99,7}Or_{0,1-0,0}), pleonaste and kamacite (some terrestrially altered to Fe hydroxides). Kirschsteinite, silicophosphate, ulvöspinel, troilite and rhönite are apparently absent. The estimated mode from pixel counting of a composite elemental X-ray map (Figure 2) is olivine 54.7, augite 27.3, anorthite 11.2, pleonaste 3.8, metal 3.0.



Figure 1. Partially cross-polarized optical thin section image. Note the unusually large olivine grain at center. Width of field = 23 mm. Image © Neil Buckland.

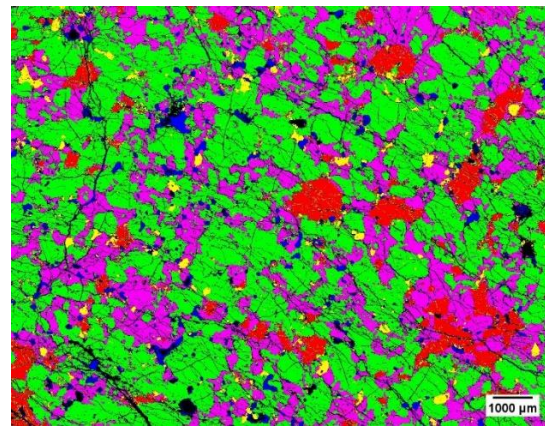


Figure 2. Composite elemental X-ray map. Green = olivine, magenta = augite, red = anorthite, yellow = spinel, blue = metal.

Discussion: NWA 14758 has some textural similarities to Angra dos Reis, Lewis Cliff 86010 and NWA 8535; however, Angra dos Reis is composed of >90 vol.% Al-Ti-augite, whereas LEW 86010 is a coarser grained olivine gabbro, and NWA 8535 consists of >90 vol.% compositionally-zoned olivine and lacks plagioclase [6]. Although metal is a rather minor component in NWA 14758, only gabbroic angrite breccia NWA 2999 and its 10 pairings may be more metal-rich. The relatively equant grain shapes, high olivine content, paucity of plagioclase, and homogeneity of mineral compositions together suggest that this specimen may represent an igneous cumulate.

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