NORITIC DIOGENITES NORTHWEST AFRICA 6928 AND NORTHWEST AFRICA 8000, AND FELDSPATHIC DIOGENITE NORTHWEST AFRICA 8367: DIVERSITY IN MINERALOGY OF ANCIENT MAGMA OCEAN CUMULATES ON THE DIOGENITE PARENT BODY.

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With increased finds (especially in Northwest Africa) the mineralogical diversity within diogenites has been extended with increasing modal olivine content beyond the familiar orthopyroxenitic varieties to harzburgitic and dunitic assemblages [1]. Very calcic plagioclase, while present as an accessory phase in some of these assemblages, occurs also in other specimens in modal amounts up to ~30%. The pyroxene in such *noritic diogenites* is notably more ferroan than in most plagioclase-poor diogenites.

NWA 6928 is relatively coarse grained with cumulate texture, and consists of 80 vol.% orthopyroxene ($Fs_{33.4-34.1}Wo_{2.5-1.2}$; FeO/MnO = 31-33), 19 vol.% calcic plagioclase ($An_{92.9-94.2}Or_{0.6-0.4}$) and accessory Ti-Al-bearing chromite, troilite and merrillite. **NWA 8000** is a relatively coarse grained, equigranular assemblage of orthopyroxene ($Fs_{34.1-34.2}Wo_{2.4-2.5}$, FeO/MnO = 28-31) plus ~10 vol.% calcic plagioclase ($An_{88.1-89.0}Or_{0.5-0.2}$) with accessory clinopyroxene, chromite and troilite. **NWA 8367** is a moderately shocked feldspathic diogenite composed of orthopyroxene ($Fs_{33.6-33.7}Wo_{2.4-2.3}$, FeO/MnO = 31-34; containing minor blebby exsolved clinopyroxene $Fs_{14.0-14.3}Wo_{43.1-43.2}$, FeO/MnO = 24-25) with ~5 vol.% calcic plagioclase ($An_{92.4-94.6}Or_{0.5-0.4}$; polycrystalline and partially converted to maskelynite), and minor Ti-poor chromite, apatite and troilite. Several clasts (up to 5 mm across) of noritic diogenite were found in polymict diogenite **NWA 6945**, and consist of ~80 vol.% orthopyroxene ($Fs_{36.7-37.2}Wo_{4.0-2.7}$) and ~20 vol.% calcic plagioclase ($An_{95.7-99.9}Or_{0.2-0.1}$) with accessory Ti chromite, fine Ni-free metal and troilite.

Discussion: We interpret diogenites to be magma ocean cumulate assemblages of orthopyroxene±olivine±calcic plagioclase formed on a small parent body within 0.6 Ma of its accretion [2]. Whether that parent body might be 4Vesta remains debatable, even in light of the results from the orbital Dawn mission, since little (if any) definitive evidence for diogenitic lithologies was found [3]. Furthermore, although spectral evidence supports the hypothesis of eucritic lithologies on 4Vesta, it remains unclear exactly which among the at least ***five*** different types of eucrites (with differing oxygen isotopic compositions) might originate from there. For example, if Ibitira and Northwest Africa 2824 are the types of eucrites on 4Vesta [4] (which is impossible to refute from any Dawn results), then we must still seek the sources for all the other types of eucrites (keeping in mind that their parent bodies may not be extant but collisionally-destroyed long ago).

Given the presence of exotic CM2 chondrite, ordinary chondrite and iron clasts in some howardites and polymict eucrites (e.g., NWA 3197, NWA 5232, NWA 6475), and the much higher shock exhibited by diogenitic materials, a separate origin for the latter relative to their eucrite companions cannot be ruled out.

References: [1] Beck A. and McSween H. 2010. *MaPS* 45: 850-872; Wittke J. et al. 2011. Abstract #5223. *74th Meteorit. Soc. Mtg.* [2] Schiller M. et al. 2011. *Ap. J. Lett.* 740: L22. [3] De Sanctis C. et al. 2013. *MaPS* 48: 2166-2184. [4] Bunch T. et al. 2009. Abstract #5367. *72nd Meteorit. Soc. Mtg.*