NORTHWEST AFRICA 817: A NEW NAKHLITE SIMILAR TO OTHERS BUT DISTINCT. T. Mikouchi and M. Miyamoto, Dept. of Earth and Planetary Science, University of Tokyo, Hongo, Tokyo 113-0033, Japan (mikouchi@eps.s.u-tokyo.ac.jp).

Introduction: NWA817, discovered in Morocco, is a new nakhlite since Governador Valadares in 1958 [1]. Here we report its petrology and mineralogy and compare with the previously known nakhlites.

Petrology and Mineralogy: We prepared one thin section (about 3 x 3 mm) from a small NWA817 chip. The chip was brittle and partially shows altered brownish appearance. Our thin section roughly consists of ~70% augite and ~10% olivine plus abundant mesostasis (~20%). Minor phases include magnetite, ilmenite, Fe sulfide, and Ca phosphate (Cl-rich). ***Augite*** is euhedral, generally 500 µm long. It is nearly homogeneous ($Wo_{39}En_{39}$) except for the ~20-30 µm zoned Fe-rich rims (~$Wo_{42}En_{15}$). Al and Ti are positively correlated (TiO_2: 0.25-0.7 wt%, Al_2O_3: 0.6-2.0 wt%). We do not find exsolution lamellae coarser than 10 µm at the Fe-rich rims unlike other nakhlites [2]. ***Olivine*** is euhedral to subhedral and extensively zoned ($Fa_{54\text{-}85}$). There are minor compositional variations from one grain to another. Olivine cores contain 0.5-0.6 wt% CaO, and it decreases down to 0.1 wt% at the rim. The core Fa content is slightly more Mg-rich than other nakhlite olivines. Ca content is comparable to those of Nakhla and Governaor Valadares. Symplectic exsolution of augite and magnetite is occasionally found at olivine rims. Olivine is altered along fractures and grain boundaries like other nakhlites, forming "iddingsite" [3]. Magmatic inclusions were found in both augite and olivine. The mesostasis is mainly composed of Si-rich feldspathic glass with skeletal titano-magnetite (with ilmenite exsolution) and blades (~200 µm long) of fayalite (Fa_{90}), pyroxene, and Ca phosphate.

Cooling Rates of Olivine: Both augite and olivine in NWA817 show the most extensive zoning at the rims in contact with the mesostasis, suggesting that the rim zoning was produced by atomic diffusion [2,4]. We calculated cooling rates of olivine rims by assuming originally homogeneous Fa and Ca compositions. The obtained best-fit cooling rates are 2.5 ^{o}C/hr for Fa and 0.2 ^{o}C/hr for Ca. (1100-700 ^{o}C @logfO_2=QFM). These cooling rates correspond to the burial depths of 0.5-4 m. Since olivine zoning in the inner portion of some grain shows minor disturbance, more detailed microprobe analysis is required.

Discussion and Conclusion: NWA817 is a new sample of nakhlites showing several common characteristics of each nakhlites, but is clearly distinct from them. The homogeneity of augite and the presence of abundant iddingsite are closest to Lafayette. The core composition of NWA817 olivine is generally similar to Nakhla and Governador Valadares, yet NWA817 olivine extends more Fe-rich compositions. The presence of homogeneous augite and zoned olivine in NWA817 is vice versa of the previous nakhlites (zoned augite and rather homogeneous olivine). Also, the mesostasis abundance is higher than other nakhlites. We suggest that original cumulate zoning of augite and olivine in NWA817 was erased during residence in magma and then subsequent rapid cooling near the surface (0.5-4 m) caused mesostasis formation and its interaction with augite rims and olivine. The subsolidus re-equilibration appears minor comparing with other nakhlites. The terrestrial analogue of nakhlites (Theo's flow) supports a single stage crystallization of nakhlites in the magma body with convection of crystallized clusters. Further analysis is necessary to clarify nakhlite formation processes. At any rate, it is likely that NWA817 formed in the same magma body as other nakhlites. Probably, its final crystallization occurred near but different position of the magma body where abundant intercumulus melt was still present.

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