A VOLCANIC (QUENCHED) ANGRITE CLAST IN POLYMICT UREILITE DAG 319. C.A. Goodrich[1], T. Mikouchi[2] and A.H. Treiman[3]. [1]Planetary Science Institute, cgoodrich@psi.edu; [2]Univ. Tokyo; [3]Lunar & Planetary Institute.

Introduction: Typical polymict ureilites are breccias thought to have formed in a regolith layer on a ureilitic asteroid [1,2]. They consist mostly of clasts of main group ureilite materials. However, they also contain a few % non-indigenous clasts that represent impactors. These include fragments of enstatite, ordinary, carbonaceous, and Rumuruti-type chondrites [1-4], as well as angrites [3,5,6], a group of plutonic/volcanic achondrites [7]. Previously identified angrite clasts appear to be the plutonic variety. We describe a clast of a volcanic angrite in DaG 319.

Methods: Using whole section WDS X-ray maps for Si, Mg, Fe, Al and Ca, we identified clast B40 in section DaG 319_M1 as having much higher Fe, Al and Ca contents, and being finer-grained, than main group ureilite materials.

Petrography and Mineral Compositions: Clast B40 is ~1×1.5 mm in size. It is roughly elliptical and has irregular boundaries with surrounding ureilitic matrix. The clast has a subophitic texture, consisting of subhedral to anhedral olivine grains (~5-130 μm), plagioclase laths (~10-40 μm), and intergranular pyroxene. Minor phases include kirschteinite, Fe-Ti oxide(s), and Fe-sulfide.

Olivine compositions range from mg# 28 to 92. CaO contents of olivine are inversely correlated with mg#, and range from ~0.06 to 7.0 wt.%. Most olivine grains are normally zoned. The 4 largest (≥100 μm) have ~20-80 μm-sized cores of mg# 88-92, and are strongly zoned to mg# ~25 rims. Boundaries between cores and rims are diffuse. Smaller olivines have more ferroan cores and are less strongly zoned, but there is no significant gap in size between the 4 largest grains and smaller ones. Cr_2O_3 contents are ~0.2-0.25 wt.% in the most magnesian cores, and much lower (≤0.06 wt.%) in rims and smaller olivines. Cores of some of the smaller olivines contain many ≤μm-sized inclusions (glass?) and/or pits.

Plagioclase is An 99. Pyroxene is rich in Ca, Al and Ti, with Wo ~51, mg# 53-59, ~7-8 wt.% Al_2O_3 and ~1.5 wt.% TiO_2 (zonation of pyroxene has not yet been investigated). Kirchsteinite (~22% CaO, mg# 13-15) occurs as overgrowths on olivine.

Discussion: Mineralogy and mineral compositions of clast B40 are consistent with those of angrites [7]. Texture and grain sizes are within the range of those in the volcanic angrites, and are similar to the groundmass of Asuka 881371 [8,9]. The absence of a significant gap in size between the largest, most magnesian olivines and smaller ones is a significant difference from Asuka 881371, in which large olivines are interpreted as xenocrysts [8,9]. Nevertheless, the magnesian cores of the largest olivines in clast B40 may be remnants of partially resorbed xenocrysts, as interpreted for the similar-sized olivines in LEW 87051 [10]. This clast adds to the array of cooling histories of volcanic angrites.

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