PETROLOGY AND ISOTOPIC COMPOSITION OF ORTHOPYROXENE-BEARING NAKHLITE NWA 998. A. J. Irving[1], S. M. Kuehner[1], D. Rumble, III[2], R. W. Carlson[3], A. C. Hupé[4] and G. M. Hupé[4], [1]Dept. of Earth & Space Sciences, University of Washington, Seattle, WA 98195; irving@ess.washington.edu, [2]Geophysical Laboratory and [3]Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, DC, [4]The Hupé Collection, Renton, WA

Discovery: A 456 gram stone acquired in Morocco in September 2001 (provisional number NWA 998) is the sixth known nakhlite, and differs from other examples [1, 2, 3]. It is a friable, dark green rock with minor orange-brown alteration products that probably are of pre-terrestrial origin.

Petrography: This sample is composed mainly of subhedral, olive-green, complexly-zoned subcalcic augite ($Fs_{22}Wo_{39}$) with subordinate yellow olivine (Fa_{64}), orthopyroxene ($Fs_{49}Wo_4$), interstitial plagioclase ($Ab_{61}Or_4$ containing 0.1 wt.% SrO, and exhibiting normal birefringence), titanomagnetite, chlorapatite and pyrrhotite. The overall texture is that of a hypabyssal, adcumulate igneous rock, and the apparent crystallization sequence is olivine, orthopyroxene, titanomagnetite, augite, apatite, plagioclase. There is a weak preferred orientation of prismatic pyroxene crystals, and some of the large pyroxenes have very distinctive zoning, with cores of augite surrounded by irregular, inverted pigeonite rims (now consisting of orthopyroxene with fine augite lamellae).

Trains of tiny melt inclusions are present along healed fractures within pyroxene; microprobe study confirms that these are K-Na-Al-bearing silicate glass, and some appear to be quenched immiscible silicate-(?)carbonate liquids. Symplectitic intergrowths of titanomagnetite and low-Ca pyroxene are present at grain boundaries between large, discrete olivine and titanomagnetite grains. Chromian titanomagnetite inclusions occur within olivine, but the absence of associated symplectites implies that the pre-terrestrial oxidative process that produced the symplectites involved high temperature, deuteric fluid infiltration along grain boundaries; such fluids may also have produced the irregular pigeonitic rims on augite crystals. Secondary (probably pre-terrestrial) ankeritic carbonate, K-feldspar (some Fe-bearing), (?)serpentine, calcite and a Ca sulfate are present on grain boundaries and within cracks in augite.

Oxygen Isotopic Composition: Replicate analyses of acid-washed augite by laser fluorination gave $\delta^{18}O = +3.9 \pm 0.2$, $\delta^{17}O = +2.2 \pm 0.01$, $\Delta^{17}O = +0.24 \pm 0.01$ per mil.

Radiogenic Isotopic Compositions: Analyses of Pb, Hf, Sr and Nd isotopes in acid-washed augite are in progress (Sm=1.4195 ppm, Nd=1.909 ppm, $^{143}Nd/^{144}Nd = 0.513336$). **References:** [1] Wadhwa M. and Crozaz G. (1995) *GCA*, *59*, 3629 -3645 [2] Imae et al. (2002) *LPS XXXIII*, #1483 [3] Sautter V. et al. (2002) *EPSL*, *195*, 223-238.