WEATHERING FEATURES AND SECONDARY MINERALS IN ANTARCTIC SHERGOTTITES ALHA77005 AND LEW88516. Susan J. Wentworth[1] and James L. Gooding[2]. [1]C23/Lockheed ESC, 2400 NASA Rd. 1, Houston, TX 77058. [2]SN2/Office of the Curator, NASA Johnson Space Center, Houston, TX 77058 USA.

The shergottite meteorites Allan Hills, Antarctica, A77005 (ALHA77005) and Lewis Cliffs, Antarctica, 88516 (LEW88516) are known to be closely similar in their igneous petrological and geochemical characteristics. Comparative SEM/EDS studies suggest greater contrast in their contents of secondary minerals; aqueous alteration appears to be more diverse in ALHA77005 than in LEW88516. Fusion crusts of both meteorites bear sulfates of Antarctic origin. The interior of LEW88516 contains traces of Na- and Ca-sulfates and a S,Cl-bearing iron silicate "rust"; the interior of ALHA77005 is distinguished by K,Fe-sulfate, a discrete low-Al silicate clay, free silica, and an unusual Mg,Fe-phosphate.

Introduction. Our previous work has shown that all three sub-groups of the shergottite, nakhlite, and chassignite (SNC) clan of meteorites contain aqueous precipitates of probable pre-terrestrial origin [1-4]. Results achieved through 1992 have been summarized elsewhere [5]. In the context of secondary minerals, the most thoroughly studied shergottite has been Elephant Moraine, Antarctica, A79001 (EETA79001). The recognition of LEW88516 as the latest SNC specimen [6], and its close similarity with ALHA77005, invite a comparative study of the latter two meteorites, and with EETA79001, from the perspective of aqueous alteration. Previous studies of alteration products in ALHA77005 (based on thin sections only) were reported in [7] and our preliminary results for LEW88516 were given in [6].

Samples and Methods. Samples included untreated chips, up tp several millimeters in size, of interior and exterior (fusion crusted) portions of ALHA77005 and LEW88516. Procedures were the same as those used for our previous studies of the SNCs [1-4]: samples were examined by scanning electron microscopy (SEM) with a JEOL 35CF, and by qualitative energy-dispersive X-ray spectrometry (EDS) using a PGT system with a thin-window detector capable of detecting light elements such as oxygen and carbon.

Results and Discussion. The fusion crusts of the two meteorites (exterior chips ALHA77005,70 and LEW88516,17-1) are quite similar except that the former is more vesicular (possibly indicating a higher indigenous volatile content). Secondary aluminosilicates (and salts on LEW88516) of definite Antarctic origin partially fill vesicles and fractures on both fusion crusts, as previously documented for non-SNC Antarctic stony meteorites [8].

Interior samples of the two meteorites (ALHA77005,72 and LEW88516,17-2) are grossly similar in that traces of secondary minerals are present in both (Table 1 and Figs. 1-3). Fig. 1a shows vesicular maskelynite in LEW88516 which is very clean (except for a trace of Na-sulfate elsewhere; Fig. 3), whereas a similar area in ALHA77005 (Fig. 1b) contains abundant K,Fe-sulfate. We note that our ALHA77005 sample is larger than our LEW88516 sample so that relative volumetric abundances of secondary minerals are still unclear. The suite of secondary phases in ALHA77005 (Figs. 1, 2) is not common in other SNCs. The Mg, Fe-phosphate (Fig. 1b) and silica granules (Fig. 2a) may be equivalent to similar phases found in the EETA79001 shergottite, however, and low-Al clay is a component of Nakhla [2]. The Ca-sulfate in LEW88516 is similar to that seen in other SNCs but the Na-sulfate has not previously been identified in an interior sample of any other SNC; we note that Na-sulfate (e.g., thenardite) is known as a native mineral in Antarctic soils. Ca-sulfate and sialic rust (poorly crystalline iron oxyhydroxide rich in Si and Al) are also typical of Antarctic weathering products [8] so that caution must be exercised in their interpretation here. Additional application of microstratigraphic controls [1-4] will be used to distinguish terrestrial from extraterrestrial salts and clays.

References: [1] Gooding J. L. et al. (1988) *Geochim. Cosmochim. Acta, 52,* 909-915. [2] Gooding J. L. and Wentworth S. J. (1991) *Lunar Planet. Sci. XXII,* 461-462. [3] Gooding J. L. et al. (1991) *Meteoritics, 26,* 135-143. [4] Wentworth S. J. and Gooding J. L. (1993) in preparation. [5] Gooding J. L. (1992) *Icarus, 99,* 28-41. [6] Lindstrom M. M. et al. (1992) *Lunar Planet. Sci. XXIII,* 783-784. [7] Smith J. V. and Steele I. M. (1984) *Meteoritics, 19,* 121-133. [8] Gooding J. L. (1986) *Geochim. Cosmochim. Acta, 50,* 2215-2223.

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Figure 1. Vesicular maskelynite in interior of (a) LEW88516 and (b) ALHA77005. A = maskelynite; B = phosphate-maskelynite mixture; C = K, Fe-sulfate.

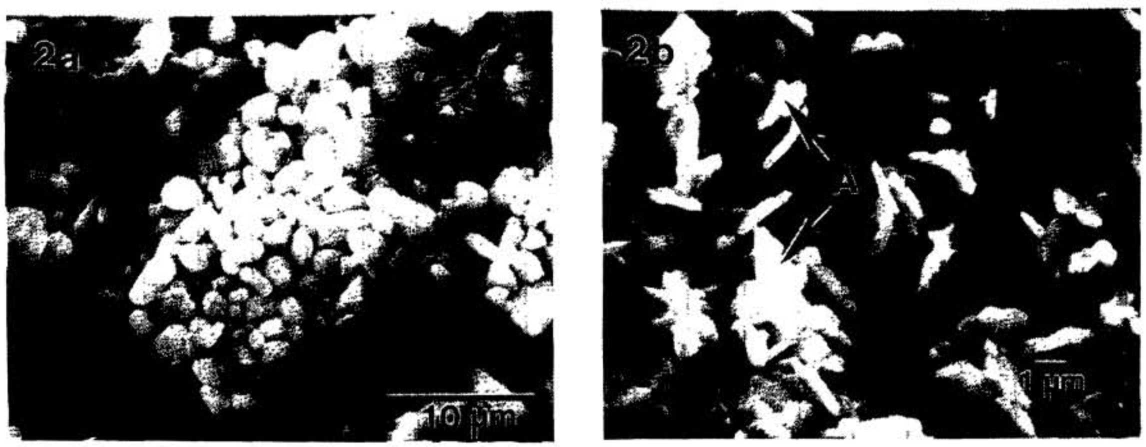

Figure 2. (a) Silica granules and (b) low-Al silicate clay (A) on pyroxene substrates in ALHA77005 interior.

Table 1. Secondary minerals in shergottite interior samples

Secondary Mineral	LEW88516	ALHA77005
Ca-sulfate	yes	
Na-sulfate	yes	
Sialic rust	yes	
K, Fe-sulfate		yes
Mg, Fe-phosphate		yes
Aluminosilicate clay		yes
Silica		yes

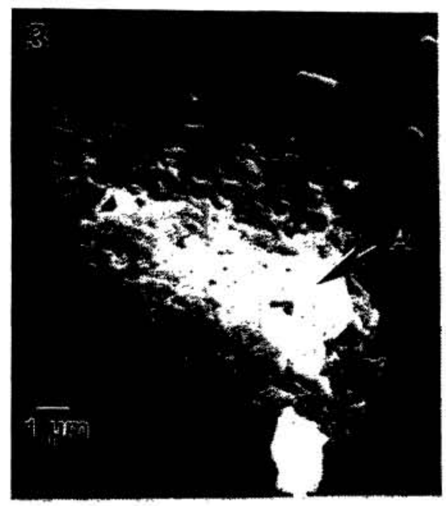

Figure 3. Na-sulfate (A) on maskelynite substrate in LEW88516 interior.