SURVEY OF CLASTS IN HOWARDITE GROSVENOR MOUNTAINS 95574. Barbara A. Cohen, Institute of Meteoritics, University of New Mexico, Albuquerque NM 87131.

Introduction: Igneous products from the differentiated asteroid Vesta include ferroan basalts as eucrites and orthopyroxene cumulates as diogenites. More magnesian primary melts are postulated to have formed [1] but have not been found in the meteorite collection. Howardites are polymict breccias representing the regolith of the HED parent body that may contain remnants of such melts as clasts. Candidate basaltic clasts were studied by [2] but were concluded to be impact products of the bulk regolith.

Rather than appearing as large clasts, primary basalts may be represented by small pieces, each having an incomplete mineral assemblage, such as has been shown in the polymict ureilites [3, 4]. A survey of many small clasts can identify populations of materials that may represent primary basalts.

Technique: Combined element X-ray maps were used to identify clasts >80 m in size within thin sections of four howardites (GRO 95574, QUE 97001, QUE 94200, and EET 87513). Individual clasts were characterized using the SEM and EMP. Mineral compositions were obtained using a 20-nA focused beam and bulk analyses using defocused beam techniques. Here we report quantitative major-element results on some clasts from GRO 95574, which has not been previously described in the literature.

Results: Most high-Mg grains in the breccia are isolated olivine grains (Fo_{72-74}) where association with neighboring minerals cannot be definitely assigned. These clasts are probably derived from diogenitic material [5].

One clast consists of many small (10 m), euhedral olivine crystals (Fo_{82}) in a glassy to cryptocrystalline feldspathic groundmass ($An_{88}Ab_8Or_4$) containing crystallites. The olivine crystals are strongly zoned to Fe-rich compositions in thin rims. This clast also contains several irregular, glassy, more Fe-rich inclusions on which olivine has nucleated. The olivine in this clast (as well as in one other isolated olivine grain) is much more magnesian than typical diogenitic material. The combination of high-Mg olivine with bytownitic plagioclase does not correspond with characteristics of known diogenite or eucrite groups. The mixture of mineral characteristics, the presence of a glassy plagioclase groundmass, and anhedral included clasts make it probable that this clast is an impact melt.

All the pyroxene-bearing clasts found so far consist solely of pyroxene and plagioclase are consistent with an origin in basaltic eucrites. Plagioclase is sodic ($An_{93}Ab_7$); pyroxene is euhedral with well-developed exsolution lamellae of augite ($Wo_{22-40}En_{35-33}Fs_{43-27}$) and low-Ca pigeonite ($Wo_4En_{37-42}Fs_{58-55}$). Individual pyroxene grain Fe/Mg ratios are constant but Fe/Mn varies over a wide range (0 – 300) within each grain, indicating extensive metasomatism in the majority of these clasts.

Discussion: No primary magnesian basalt assemblages have yet been identified in GRO 95574. We will continue to look for such clasts in this and other undescribed howardites.

References: [1] E. Stolper 1977. *Geochim. Cosmochim. Acta* 41:587-611. [2] D. W. Mittlefehldt and M. M. Lindstrom 1997. *Met. Planet. Sci.* 61:453-462. [3] B. A. Cohen and C. A. Goodrich 2003. Abstract #1518. 34th Lunar Planet. Sci. Conf. [4] B. A. Cohen et al. 2004. *Met. Planet. Sci.*, in press. [5] D. W. Mittlefehldt et al. 1998. Chp. 4 in *Planetary Materials*, ed. J. J. Papike.