73216

Impact Melt Breccia
St. 3,162.2 g

INTRODUCTION

73216 is a tan to olive gray (5Y5/1) tough breccia collected near the rim-crest of a 10-m crater. It is an impact melt breccia (originally described as metaclastic) that has a homogeneous groundmass and about 5% lithic clasts. The sample is subrounded and 7 x 5 x 3 cm. It has many zap pits on most sides (Fig. 1) and a thin glass film occurs as a small patch on one face. A few percent cavities, some spherical, others slit-like are present (Fig. 2) and some of these are crystal-lined. Following early allocations from chipping, the sample was sawn and broken for more detailed study in 1989.

PETROGRAPHY

No description of the groundmass has been published. It appears to be a crystalline impact melt containing angular mineral and Ethic clasts, with the thin sections showing a fairly dark, fine-grained groundmass. It was described by Wolfe et al. (1981) as having a fine-grained granoblastic matrix.

A variety of small clasts were selected and studied by a group organized by L. Taylor (Neal et al., 1990 e,d; 1992; Eckert et al., 1991 b,c; Neal and Taylor, 1991). Neal et al. (1990 d) and Eckert et al. (1991 b) reported mineral composition data on four highlands clasts (a troctolite, an anorthosite, a noritic anorthosite, and a gabbroic anorthosite) and a high-Ti basalt clast (Table 1; Fig. 3). Neal et al. (1990 e) and Neal and Taylor (1991) reported whitlockite analyses from three of these clasts. Eckert et al. (199 lb) interpreted the anorthosite ,57 as being monomict igneous with a striking cumulate texture and the noritic anorthosite ,36 also as igneous cumulate. They and Neal et al. (1992) interpreted the high-Ti basalt ,38 as being a plagioclase-rich polymict impact melt, and the troctolite ,42 similarly, because it has radiating acicular plagioclase in a melt matrix. The mineral compositions of four clast fall in the field of the

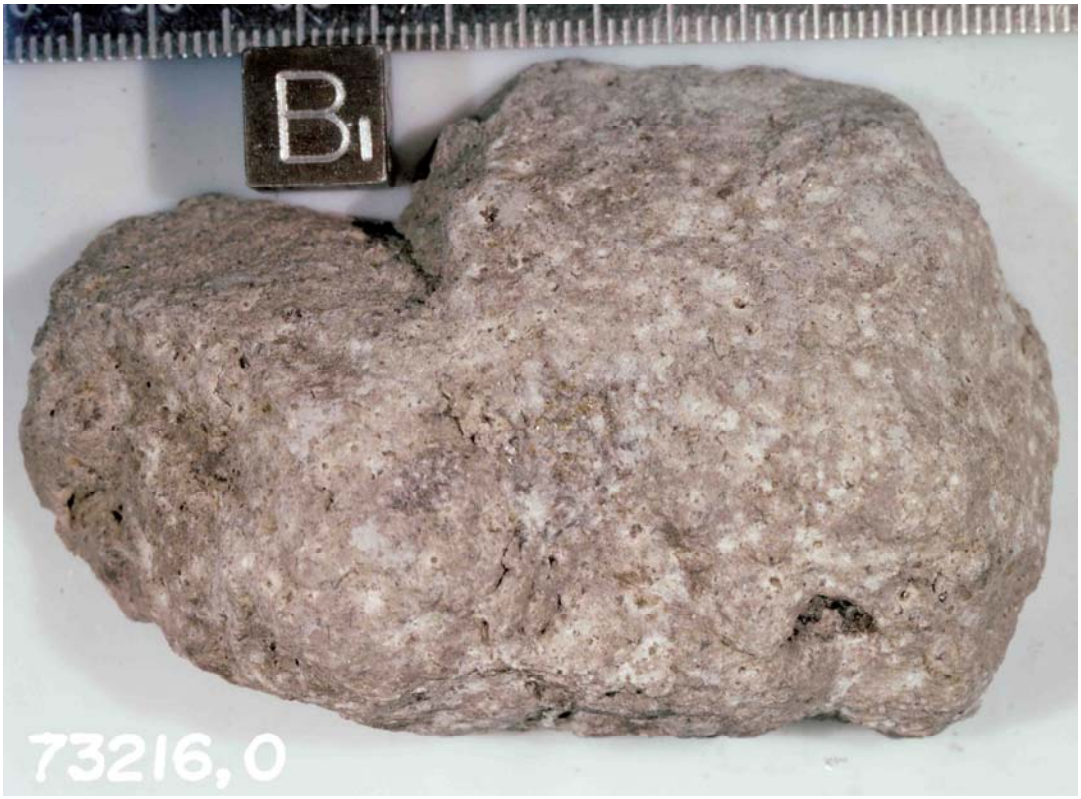

Figure 1: Unsawn face of butt end 73216,0, prior to breaking, showing patina and zap pits Cube is 1 centimeter. S-89-46682.

Figure 2: Sawn face of butt end 73216,0, prior to breaking. The surface shows the generally homogeneous nature of the groundmass, and the presence of small clasts and vesicles. Smallest scale divisions in millimeters. S-89-46683.

Mg-suite pristine rocks of the highlands; the anorthosite ,57 falls between the Mg-suite and the ferroan anorthosites. Neal et al. (1992) referred to the gabbroic anorthosite ,49 as a norite and to the noritic anorthosite ,36 as an anorthosite.

Studies of the whitlockites and numerical modeling of their origin are presented in Neal et al. (1990 e) and Neal and Taylor (1991). The whitlockite compositions strongly influence the rock compositions, despite their small abundances. Models of metasomatism are preferred by the authors as being most consistent with the observations.

CHEMISTRY

Some chemical data by neutron activation for the five bulk clasts were presented (not tabulated) in Eckert et al. (1991 b,c) and Neal et al. (1992). (Their sample numbers correspond with the petrographic descriptions as follows: ,36 =,66; ,38=,67; ,42=,68; 49=,69„57=,70). All samples contain Ir and Au, including the anorthosite interpreted as monomict (pristine igneous) by Neal et al. (1992). They suggest the possibility of vapor transport of siderophiles during impact melting. This sample is the only one with low REEs and a positive Eu anomaly. The (noritic) anorthosite,66 had matrix chips included in the analyzed sample and has light rare earth elements about 30 x chondrites; it is feldspathic. The troctolite impact melt has light rare earth elements about 100 x chondrites with a negative Eu anomaly, as do the high-Ti basalt and the gabbroic anorthosite (norite), suggesting that they are polymict.

PROCESSING

Original allocations were minimal and made by picking. In 1989, the sample was sawn to produce two butt ends: ,0 (Fig. 1, 2) being about twice the size of ,30. End ,0 was broken into two subequal parts and ,30 into two non-equal parts.

During this processing samples of the five clasts were taken for petrographic and chemical work. End ,0 is now about 46 g and its broken subsample ,55 about 49 g. End ,30 is now about 40 g and its broken subsample ,45 about 9 g.

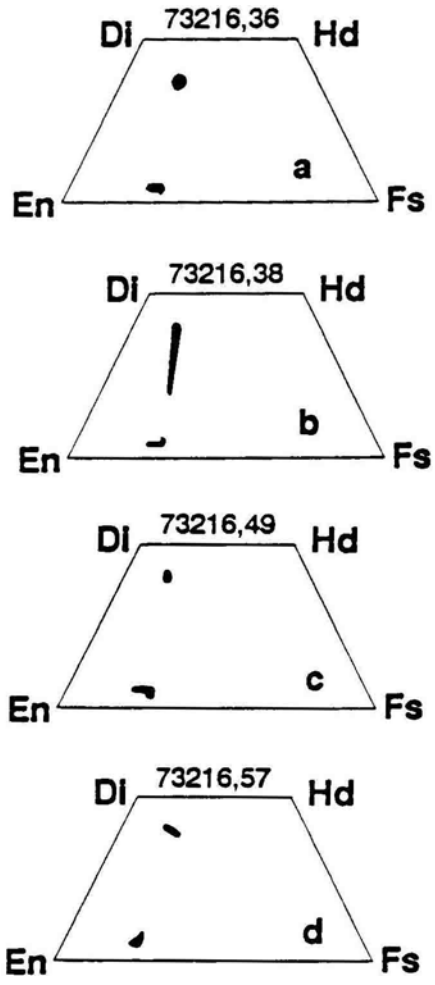

Figure 3: Pyroxene quadrilateral for four clasts in 73216 a) noritic anorthosite ,36, b) high-Ti(?) impact melt,38, c) gabbroic anorthosite. From Neal et al. (1990d).

Table 1: Summary of mineral compositions in five clasts from 73216. From Neal et al. (19904).

	OLIVINE	PLAG.		PYROXENE			ILM	ARM
	Fo	An	Ab	Wo	En	MG#	MG#	MG#
73216,36	—	87-98	1-10	4-39	46-72	73-78	20-23	—
73216,38	68-71	83-95	4-13	4-39	46-76	74-80	22-26	—
73216,42	66-68	77-93	6-11	———			23-31	45-48
73216,49	68-70	82-97	3-16	3-40	46-75	73-79	30-31	46-59
73216,57	—	93-98	1-7	3-41	46-73	74-79	—	—