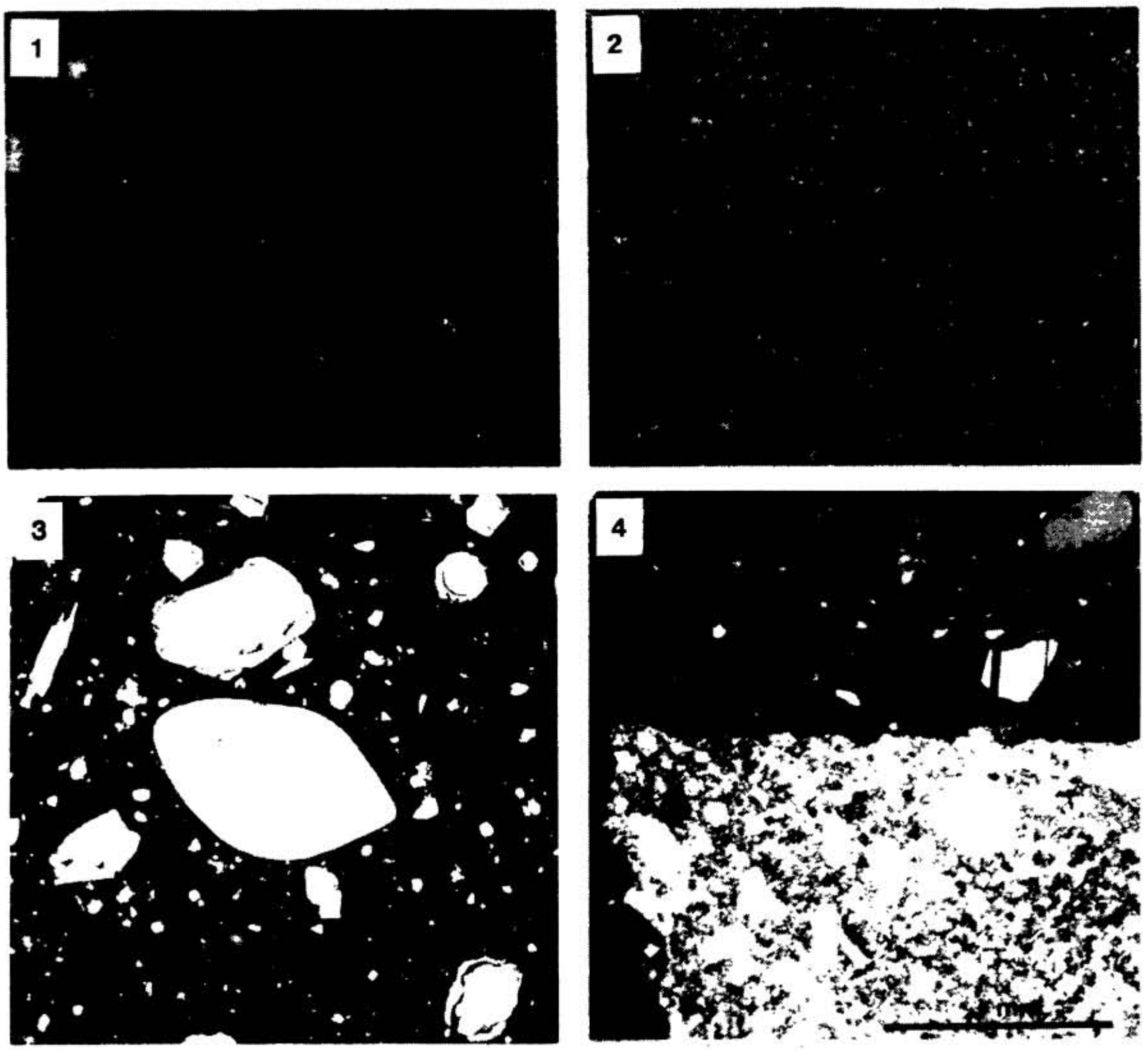
APOLLO 17 OL-PLAG VITROPHYRES, 76035, AND THE SERENITATIS MELT SHEET: ANOTHER BRICK IN THE WALL. Graham Ryder, Lunar Curatorial Laboratory, Northrop Services, Inc., P.O. Box 34416, Houston, Texas 77034

Impact melt fragments consisting of olivine microphenocrysts and plagioclase laths set in glass or cryptocrystalline material (Fig. 1) are ubiquitous in Apollo 17 highlands soils (1). These ol-plag vitrophyres are consistent petrographically: ~50% near-opaque glass; ~30% plagioclase laths 10-30 µm long which do not form a network; and ~20% olivine microphenocrysts, euhedral to subhedral. Olivines are mainly 10-20 µm, less commonly 50 µm in diameter. The vitrophyres appeared to be more mafic than typical rocks assumed to be Serenitatis impact melts (1), so I inspected all available Apollo 17 rock thin sections to ascertain if any were similar, so that a chemical analysis could be made. One sample, 76035, previously unstudied, has a similar texture and mineralogy (Figs. 2-4). An INAA analysis for trace elements (R. Seymour, analyst) and a microprobe fused bead analysis for major elements (Table 1 and Figure 5) show that 76035, and by extrapolation the ol-plag vitrophyre particles, are in fact identical in composition with typical Serenitatis impact melts as represented by the Station 6 boulders (2).



FIGURES 1-4. Photomicrographs (1) 73141,63-54 ol-plag vitrophyre (RFL). (2) 76035,27 (RFL). (3) 76035,27 (partly XPL), scale as (4) showing large rounded plagioclase clast. (4) 76035,26 (partly XPL) showing large angular clast and small rounded clast.

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TABLE 1

	76035 (this study)	St. 6 Boulder (2)
SiO_2	46.8	46.2
TiO_2	1.6	1.5
Al_2O_3	17.3	17.9
Cr_2O_3	.21	.18
$Cr_2O_{3\,I}$	.18	
FeO	8.5	9.1
FeO_I	8.6	
MgO	12.5	12.3
CaO	11.5	11.2
Na_2O	.84	.69
Na_2O_I	.88	
K_2O	.30	.26
La	32.2	31.5
Ce	89.6	82.7
Nd	59	53.4
Sm	14.9	14.8
Eu	1.95	1.95
Tb	3.4	-
Yb	11.0	10.6
Lu	1.63	1.46

	76035 (this study)	St. 6 Boulder (2)
Sc	15.0	-
Co	21.6	-
Zr	430	491
U	1.5	1.54
Th	4.63	5.41
Rb	5.4	6.15
Sr	150	175
Cs	.29	.20
Ba	430	350
Ta	1.37	-
Hf	11.0	12.4

Oxides Wt%; others ppm.
76035: oxides fused bead except subscripted I, INAA. All others INAA.

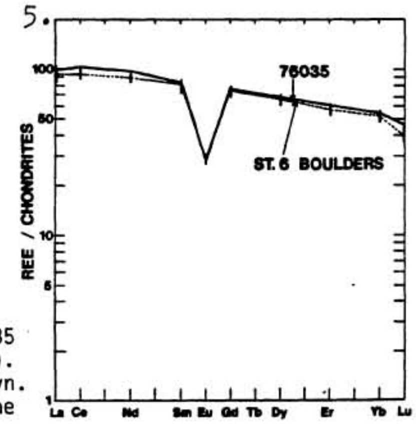
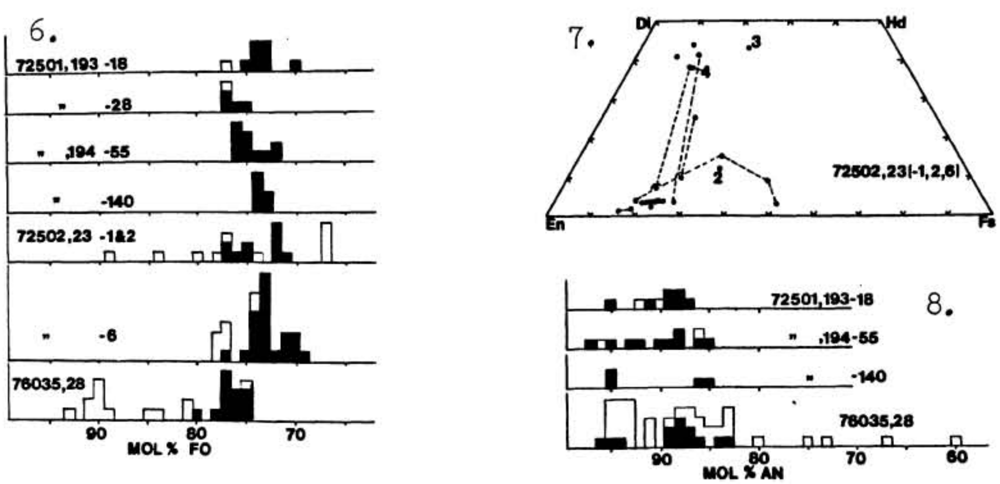


FIGURE 5. REE-plot for 76035 and St. 6 Boulders after (2). Vertical marks are 1 st. devn. of Boulder samples around the average.

Comparison of the mineral and textural data for samples with the products of dynamic crystallization on a similar composition (3) demonstrate that the vitrophyres cooled more rapidly (>10^0 C/hr) through the pyroxene crystallization interval than those common ophitic or poikilitic rocks containing pyroxene oikocrysts; olivine failed to react out and pyroxene did not grow. Cooling was rapid enough to indicate a location close to the margin of a sheet or pool. Despite this more rapid cooling, the mineral clast population (Figs. 6-8) is as refractory as in coarser-grained Serenitatis melt sheet samples (2, 4) and more refractory than the melt phases. Pyroxene clasts were found in only three particles (Fig. 7) and are common only in one of them. (The compositions of some of them suggest an extrusive origin.) Plagioclases have a wide compositional range, but no wider than in coarser rocks (2, 4). Grain shapes are extremely varied, from well-rounded to angular (Figs. 3, 4). The rounded ones (Fig. 3) are similar to those observed in those beads prepared for microprobe analyses which are incompletely fused, i.e. produced well above the liquidus. It takes only a few seconds at temperatures a hundred degrees or so above the liquidus to completely melt small (∿ mm-sized) clasts. The evidence from the ol-plag vitrophyres, 76035, and the other Serenitatis melt sheet samples would suggest that nearly all assimilation takes place at superliquidus temperatures, but even then might be biased towards the assimilation of the less-refractory materials. Many of the clasts must have been incorporated into the melt after it had been cooled close to liquidus temperatures by the heating and fusing of cold clasts (2). These late-incorporated clasts then do not necessarily carry information about rocks close to the source of the melt itself.



FIGURES 6-8. Minerals in ol-plag vitrophyre fragments and 76035. ol,plag: open symbols clasts, closed symbols melt phases. pyroxenes, all clasts. Tie lines connect analyses on same grain, numbers are # of analyses on a single grain.

REFERENCES: (1) Ryder G. (1981) Lunar Planet. Sci. XII, 918-920. (2) Simonds C.H. (1975) Proc. Lunar Sci. Conf. 6th, 641-672. (3) Thornber C.R. and Huebner J.S. (1980) Proc. Conf. Lunar Highlands Crust, 233-252. (4) Dymek R.F. et al. (1976) Proc. Lunar Sci. Conf. 7th, 2335-2378.