PETROLOGY OF THE APOLLO 15 APENNINE FRONT I: IMPACT MELT ROCKS;
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We have hand-picked a suite of highland rock fragments from Apennine
Front coarse fines to gain a better understanding of the petrology of the
highland rocks of the Apennine Front. Seventeen of the samples have been
identified as impact melts and are discussed here. Companion abstracts
report on plutonic rocks and KREEP basalts (1), and on the bulk chemistries
of the fragments (2).

Impact melt rocks constitute a very important component of the Apennine
Front, as shown by their abundance in the coarse fines, due in part to the
location of the Apollo 15 site between the Imbrium and Serenitatis basins.
A major highland objective of the A-15 mission was sampling of the Apennine
Front to collect ejecta and melts related to the formation of the Imbrium
Basin, and perhaps Serenitatis. Identification of melts from these events
would increase our understanding of the geology of the A-15 site, the sequence
of events at the site, and the composition of crustal target rocks at 3.9
b.y. Based on bulk chemistry Ryder and Spudis (3) have suggested some pos-
sible candidates from their groupings of impact melts, but materials from
these two major events have yet to be unambiguously identified. We would
like to know if A-15 melt rocks can be grouped petrologically and, if so,
how well the groups correlate with the chemically-defined groups.

The modal mineralogies of the samples are given in Table 1. Sample
15223,44 is a feldspathic melt mainly consisting of plagioclase laths and
mesostasis. The remaining samples are crystalline, either with poikilitic
textures or monomineralic clasts in a fine matrix of pyroxene, olivine, and
plagioclase. Pyroxene:olivine ratios, determined by electron microprobe,
 vary widely.

Pyroxene analyses for the samples thus far analyzed are summarized in
Fig. 1, olivine in Fig. 3. The bars below the quads indicate the range of
olivine compositions in each sample. With the exception of 15294,20, the
olivine and low-Ca pyroxene compositions in the samples are similar to each
other and to those found in some A-17 impact melts (4). Fig. 2 is a plot of
mg'(Mg/(Mg+Fe)) in olivine vs. mg' in pyroxene in the melt rocks. Five samples
plot very close together and must have crystallized from similar melts,
under similar conditions. Data for 15294,20 plot at higher mg' values.
This sample is a clast-rich poikilitic rock. Based on the Mg-rich pyroxene
and olivine compositions and the presence of Cr-pleonaste spinel in the
sample, it appears that relative to the other samples 15294,20 formed as a
result of impact of a magnesian (possibly troctolite) target and resulted
in a higher temperature melt (note Kg approaching 1). Plagioclase composi-
tions are illustrated in Fig. 4. Except for feldspathic melt 15223,44,
sample 15294,20 has the most feldspars in the range Ang3-Ang7, ranging down
to Ang4. There is fairly complete overlap of matrix and clast mineral com-
positions in these samples.

Ryder and Spudis (3) analyzed fourteen A-15 impact melt rocks and dis-
tinguished five groups on the basis of bulk chemistry. One of our samples,
15304,48 falls in their group B, which includes five samples that have such
similar compositions that they may represent a single event (3). On Fig. 2
15304,48 is one of the two samples that plots at slightly lower mg'. Further
analysis of all of our melt rock samples and comparison with the results of
(4) should give us a good approximation of the minimum number of large-
scale events that contributed impact melt to the Apennine Front.