77517

Unique Fragmental Breccia
45.6 g, 4 x 4 x 3 cm (3 pieces)

INTRODUCTION

Rake sample 77517 is a light grey, fragmental breccia containing clasts of anorthosite, norite, troctolite (and possibly of spinel cataclasite) in a highly porous, poorly sintered matrix that is composed of fine-grained mineral clasts bound together by irregular, wispy overgrowths that form sinuous grain-to-grain contacts (Fig. 1). There is no glass in the matrix (Warner et al., 1978). Sample 77517 is exotic to the Apollo 17 site, containing mineral fragments of pink aluminous spinel, aluminous enstatite, and forsterite.

PETROGRAPHY

Warner et al. (1978) have studied breccia sample 77517. This sample is different from the crystalline matrix breccias. It is clast supported, rather than matrix supported. It is also different from the soil breccias because it does not have glass in the matrix.

Breccia 77517 consists of abundant mineral and lithic clasts in a porous, poorly sintered matrix. The mineral clasts are equant and subrounded (Fig. 2). Grain size is seriate, ranging from 400 to 20 µm. Of the >50 µm mineral clasts, plagioclase is ~55%, mafic minerals are ~40% (with more olivine than pyroxene), and pink spinel is 3 to 4%. Pink spinel grains range in size up to ~400 µm.

Lithic clasts (up to 1 mm) epnstitute ~20% of the breccia. They include very fine-grained breccia clasts and annealed anorthosite, norite, and troctolite (ANT) clasts. The range of mineral composition in the ANT clasts is plagioclase $An_{94-98,}$ olivine Fo_{72-81} , low-Ca pyroxene $Wo_{3-14}En_{57-82}$ Fs_{14-22}, and high-Ca pyroxene $Wo_{34-41}En_{44-50}Fs_{14-17}$ One clast (1.5 mm) has a basaltic texture with intersecting plagioclase laths (0.5 to 1 mm).

Warner et al. (1978) have speculated on the apparent deep-seated origin of the pink spinel-aluminous enstatite, forsterite, and anorthite assemblage. Herzberg (1978) and Baker and Herzberg (1980) have provided thermodynamic calculations to define the temperature and pressure conditions of such a mineral assemblage.

MINERAL CHEMISTRY

The compositions of minerals in 77517 are given in (Fig. 3). Warner et al. (1978) have a table of mineral

Figure 1: Photograph of 77517. Scale is 1 cm. S73-19404.

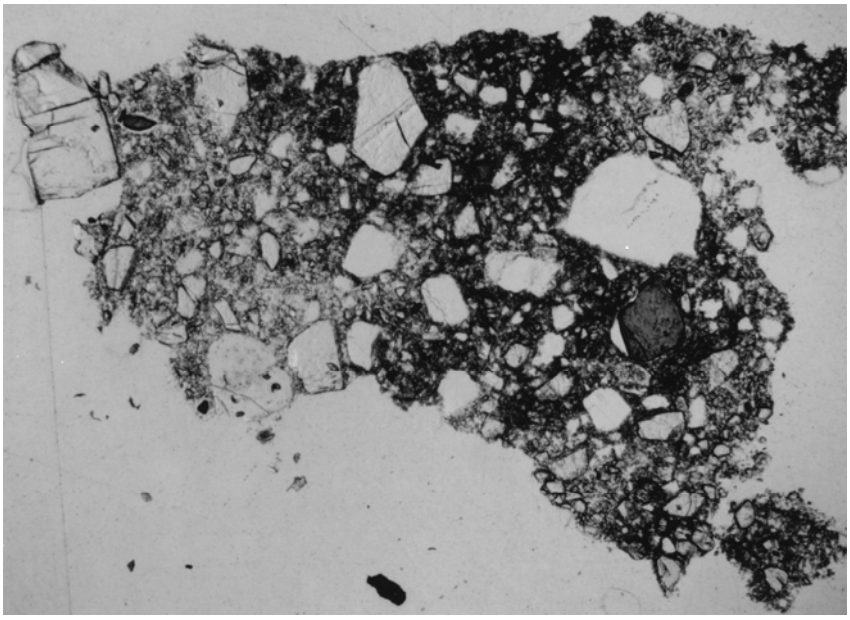

Figure 2: Photomicrograph of thin section 77517,22. Field of view is 3 x 4 mm.

analyses. The range of plagioclase composition is very restricted (An_{96-98}). Olivine mineral clasts range from Fo_{81-90} with the majority being Fo_{81-83}. Most pyroxene is orthopyroxene, ranging from $Wo_{1-5}En_{70-91}Fs_{8-26.}$ The most Mg-rich pyroxenes are also Al-rich, and may be related to the abundant Al-rich pink spinel in the same brecciated areas, but this cannot be ascertained because of the extreme brecciation.

WHOLE-ROCK CHEMISITRY

The composition of 77517 has, not been determined, probably because individual clasts need to be analyzed separately.

SIGNIFICANT CLASTS

Warner et al. (1978) report a clast assemblage corresponding to spinel cataclasite (i.e., aluminous enstatite + forsterite + plagioclase and aluminous spinel). The brecciated nature of this assemblage raises the question of whether or not it represents an equilibrium assemblage.

One glassy area of 600 µm was found to be ~77 $Si0_2$, 14% Al_2O_3, and 5% K_2O.

The clasts in this sample deserve more study.

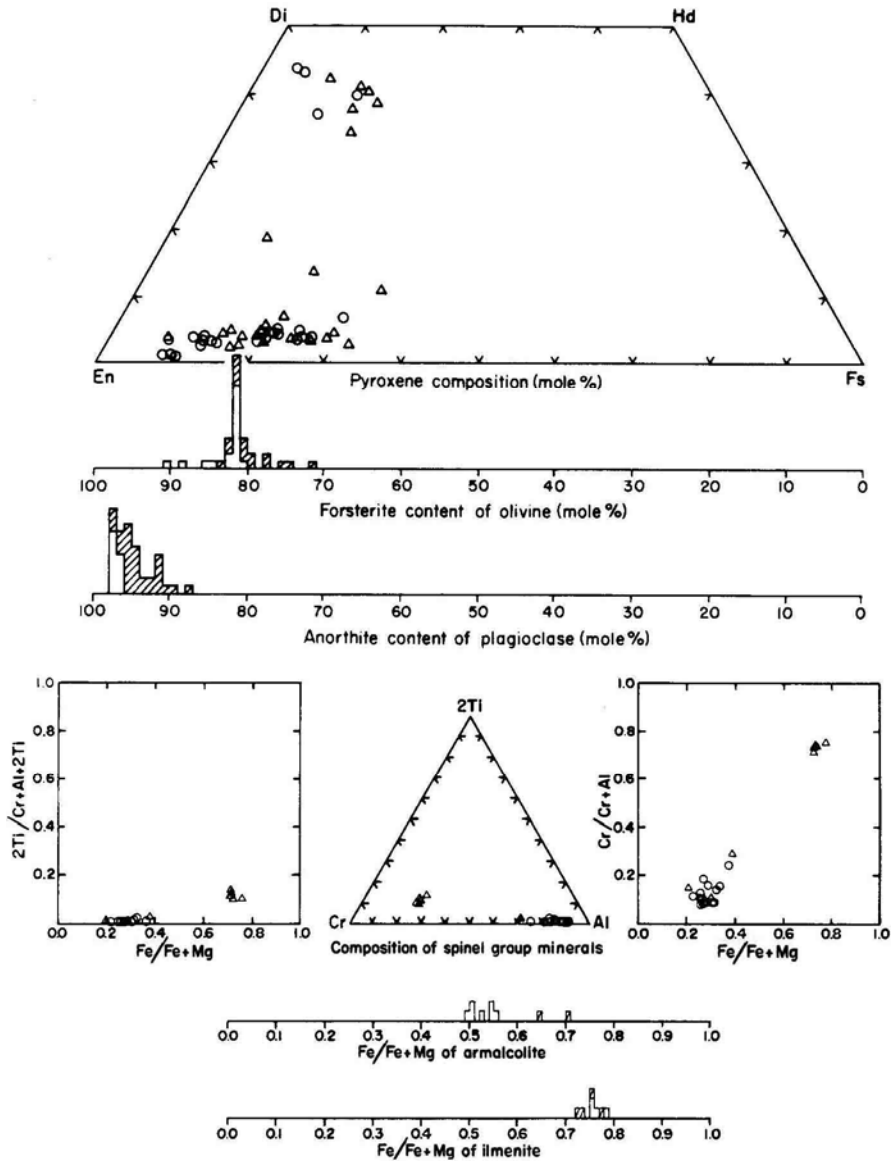

Figure 3: Pyroxene quadrilateral diagram and compositions for minerals in 77517. From Warner et al. (1978)