

64539 – 17.8 grams

64545 – 14.1 grams

64546 – 12.8 grams

64547 – 10.9 grams

64549 – 6.5 grams

46555 – 5.3 grams

64556 – 5.1 grams

64557 – 4.8 grams

64558 – 3.1 grams

Dilithologic Breccia



Figure 1: Photo of 64546 (typical of station 4 breccias). Scale in cm/mm. S72-55357

Introduction

64539 – 64558 were collected as rake samples from station 4, on the slope of Stone Mountain, Apollo 16 – see section on 64501. They have the appearance of 64535 – 64537 from the same bag.

Petrography

According to Phinney and Lofgren (1973) and confirmed by Ryder and Norman (1980) these rake samples can be grouped together. They each have a

chalky white portion and a dark aphanitic portion characteristic of the light and dark lithologies of 64535 collected from the same location. These rocks are highly fractured and it is probable that the samples broke during collection or the return trip. Phinney and Lofgren noted that these sample have very sharp boundaries between the light and dark material and that the dark material has a basaltic texture (figure 2).

The white portion of these samples was originally a coarse-grained anorthositic norite, but it has been highly shocked (see thin section photomicrographs included here and in section on 64535).

Gooley et al. (1973) reported on the composition of metallic iron particles in 64546.

Chemistry

The composition of some of these sample was determined by broad beam electron probe analysis by McKinley et al. (1983). The trace elements were determined for 64546 (table 1) and are quite high. Presumably this is for the dark material, because the light material is almost all plagioclase. Note the very high Ni, Ir and Au content. Thus the dark material is an impact melt.

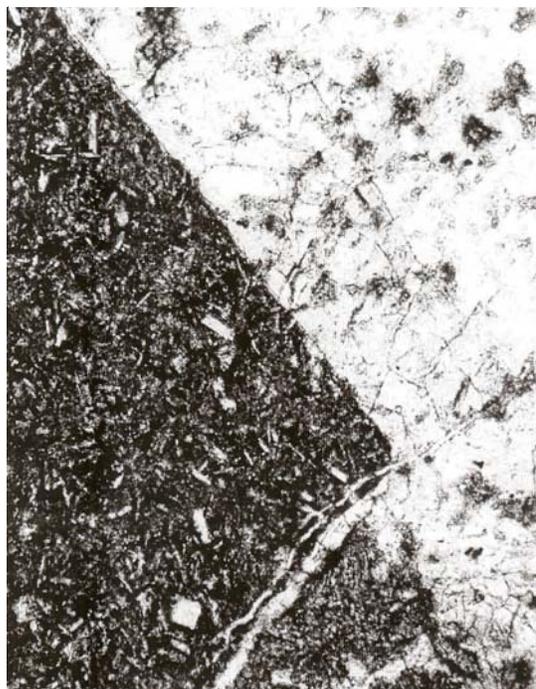
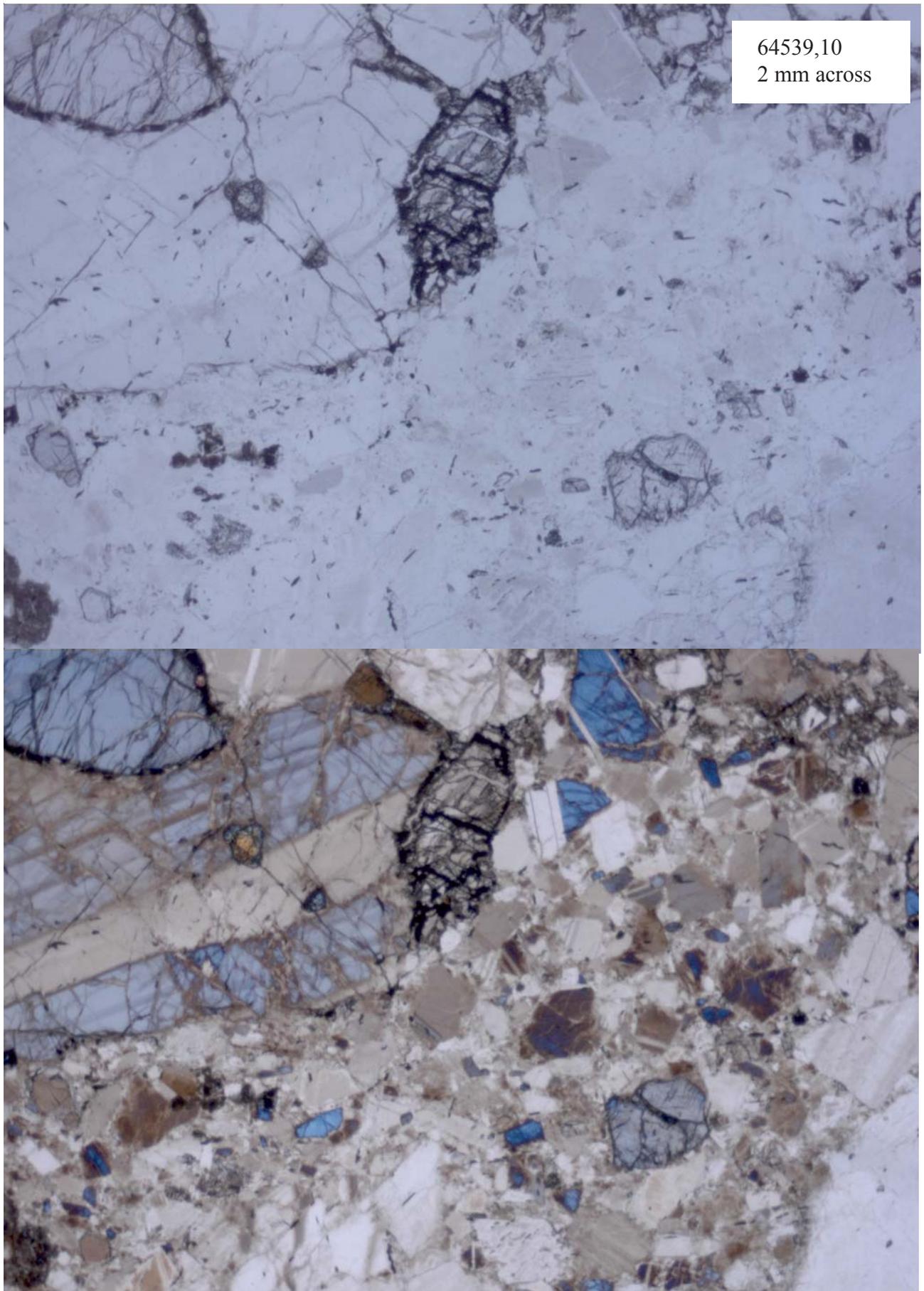


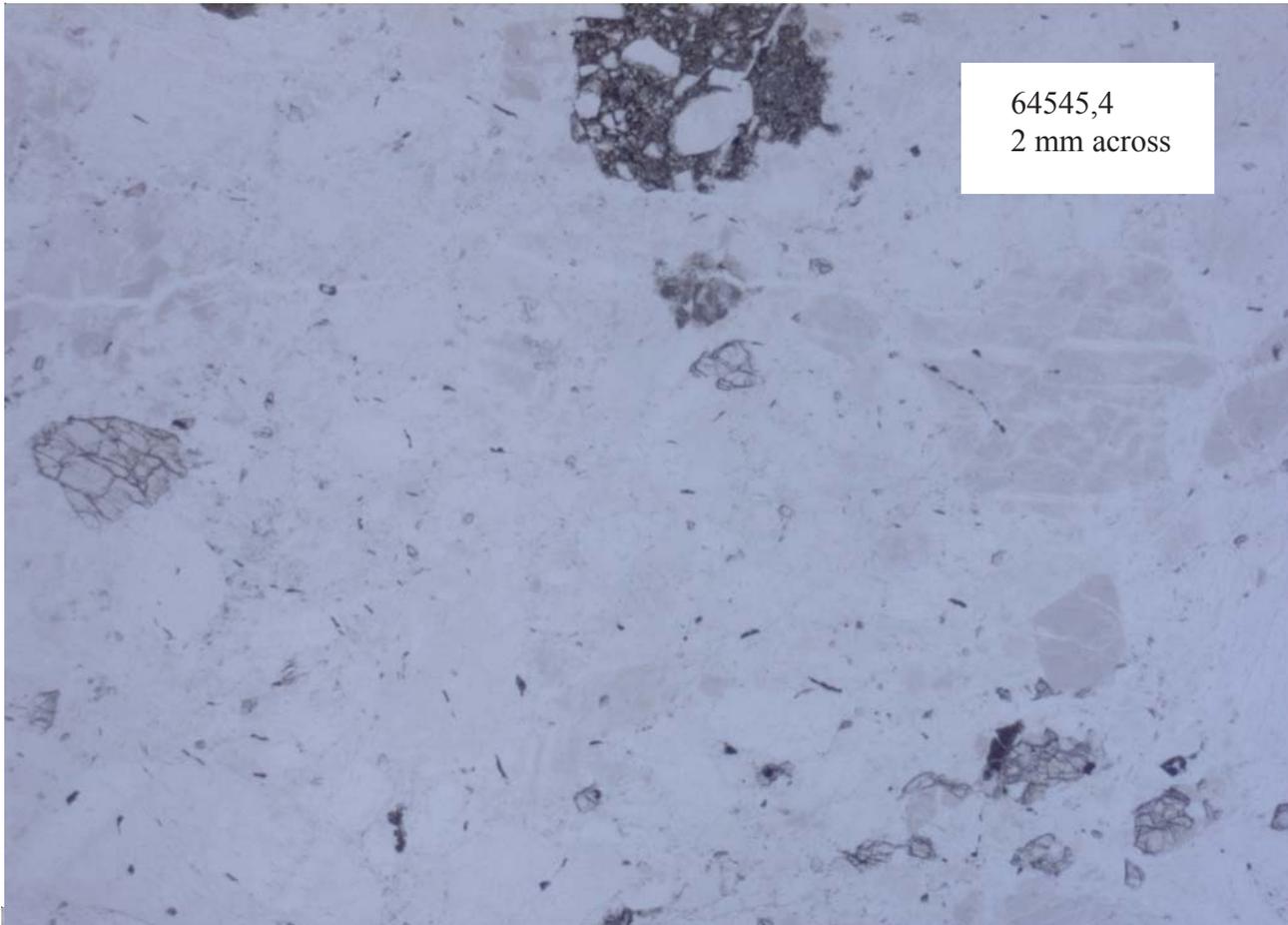
Figure 2; Photomicrograph of thin section 64546,4 showing sharp “contact” between light and dark regions. Width of field is 2 mm.

Processing

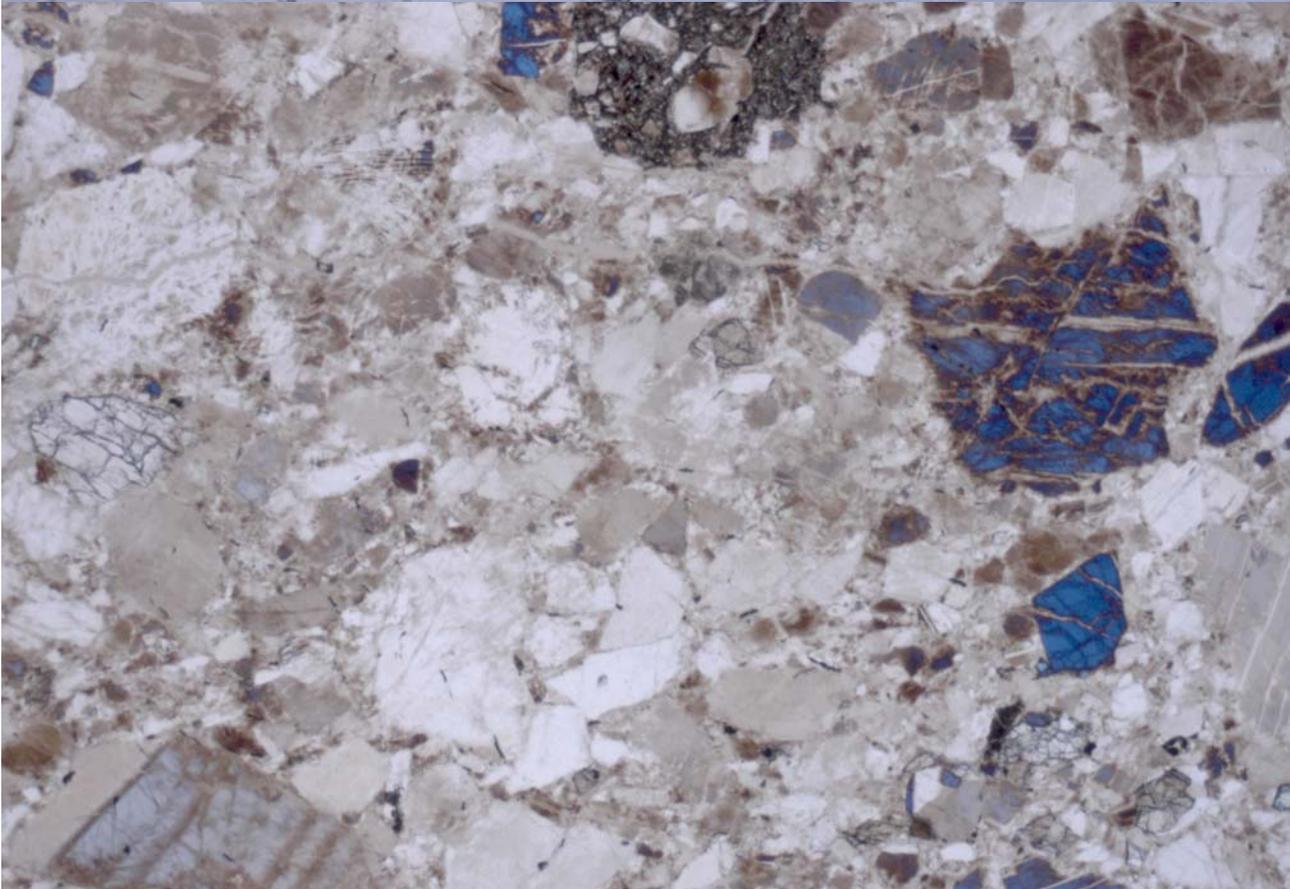
| | # thin sections |
|-------|-----------------|
| 64539 | 6 |
| 64545 | 7 |
| 64547 | 1 |
| 64549 | 1 |
| 64555 | 1 |
| 64556 | 3 |
| 64557 | 1 |
| 64558 | 3 |

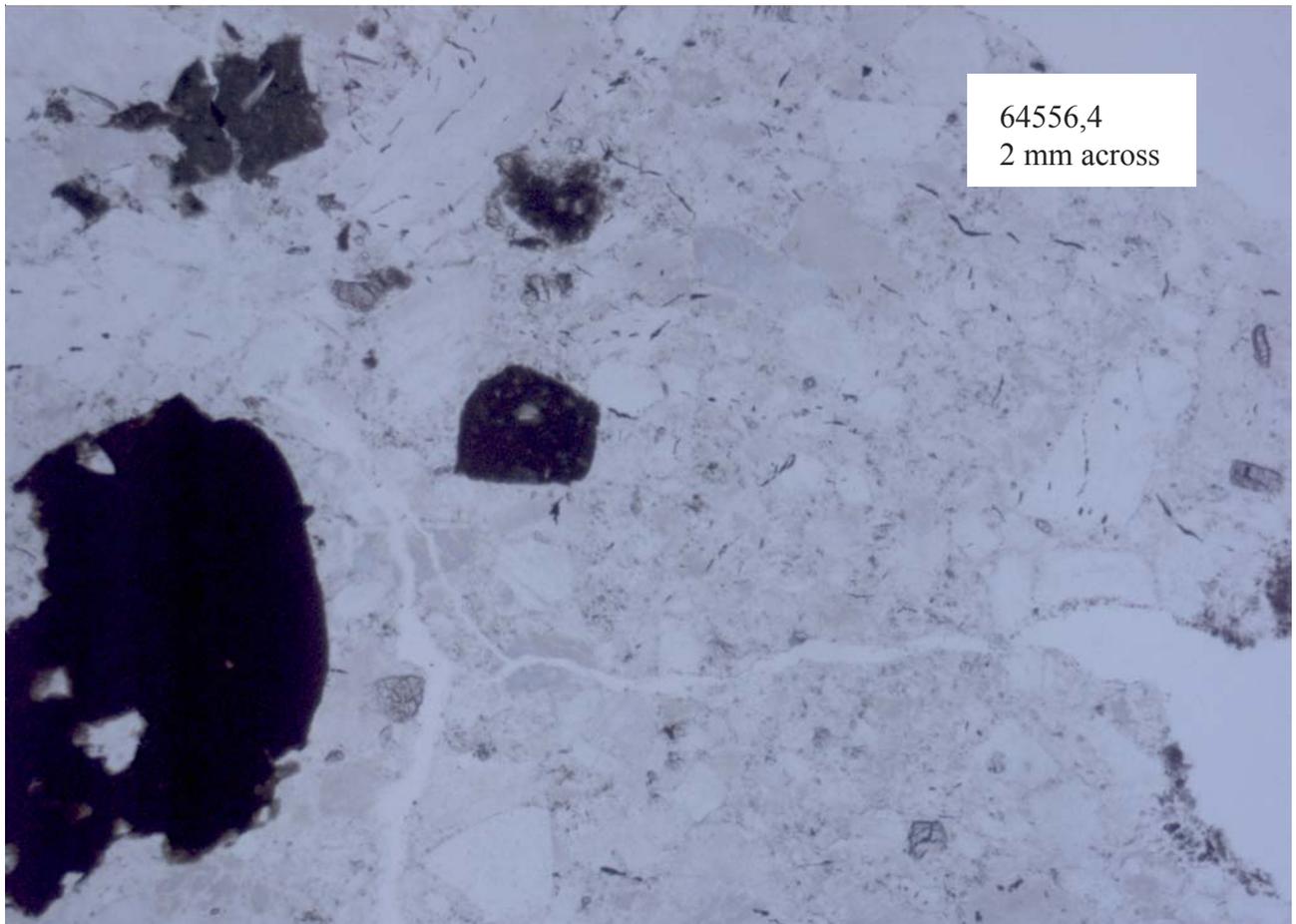


64539,10
2 mm across

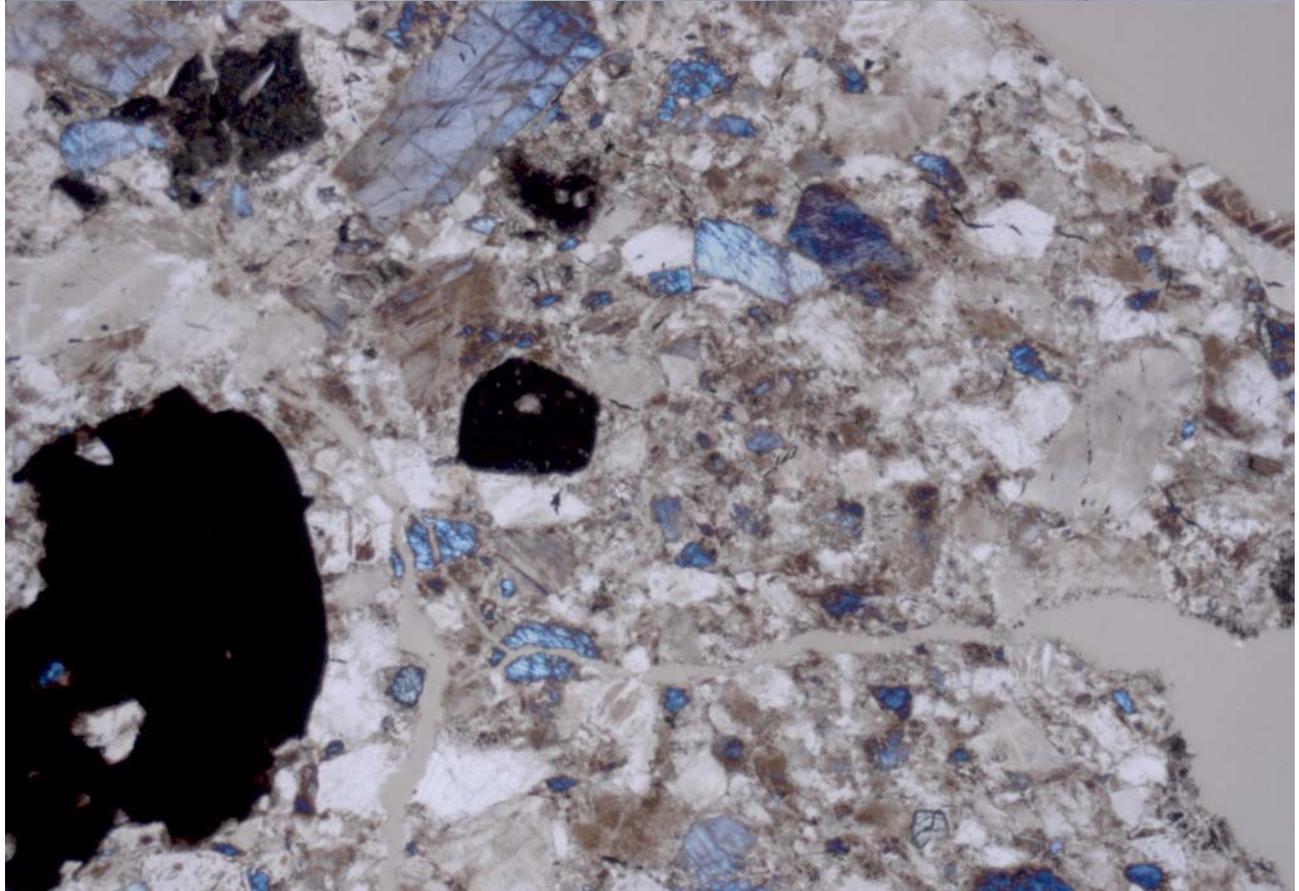


64545,4
2 mm across





64556,4
2 mm across





64558,1
2 mm across



Table 1. Chemical composition of 64546

| reference | McKinley83 | |
|--------------------------------|------------|-----|
| <i>weight</i> | | |
| SiO ₂ % | | |
| TiO ₂ | 0.8 | (a) |
| Al ₂ O ₃ | 21.3 | (a) |
| FeO | 8.3 | (a) |
| MnO | 0.086 | (a) |
| MgO | 10.8 | (a) |
| CaO | 12.5 | (a) |
| Na ₂ O | 0.53 | (a) |
| K ₂ O | 0.16 | (a) |
| P ₂ O ₅ | | |
| S % | | |
| <i>sum</i> | | |
| Sc ppm | 10.7 | (a) |
| V | 27 | (a) |
| Cr | | |
| Co | 68 | (a) |
| Ni | 1140 | (a) |
| Cu | | |
| Zn | | |
| Ga | | |
| Ge ppb | | |
| As | | |
| Se | | |
| Rb | | |
| Sr | | |
| Y | | |
| Zr | | |
| Nb | | |
| Mo | | |
| Ru | | |
| Rh | | |
| Pd ppb | | |
| Ag ppb | | |
| Cd ppb | | |
| In ppb | | |
| Sn ppb | | |
| Sb ppb | | |
| Te ppb | | |
| Cs ppm | | |
| Ba | 300 | (a) |
| La | 27.8 | (a) |
| Ce | 70 | (a) |
| Pr | | |
| Nd | 42 | (a) |
| Sm | 12.8 | (a) |
| Eu | 1.57 | (a) |
| Gd | | |
| Tb | 2.48 | (a) |
| Dy | 15.4 | (a) |
| Ho | | |
| Er | | |
| Tm | | |
| Yb | 8.4 | (a) |
| Lu | 1.23 | (a) |
| Hf | 8.9 | (a) |
| Ta | 1.1 | (a) |
| W ppb | | |
| Re ppb | | |
| Os ppb | | |
| Ir ppb | 25 | (a) |
| Pt ppb | | |
| Au ppb | 25 | (a) |
| Th ppm | 4.1 | (a) |
| U ppm | 1.2 | (a) |
| <i>technique:</i> | (a) INAA | |

References for 64539, 64545 etc

Butler P. (1972a) Lunar Sample Information Catalog Apollo 16. Lunar Receiving Laboratory. MSC 03210 Curator's Catalog. pp. 370.

Gooley R.C., Brett R. and Warner J.L. (1973) Crystallization history of metal particles in Apollo 16 rake samples. *Proc. 4th Lunar Sci. Conf.* 799-810.

Korotev R.L. (1994) Compositional variation in Apollo 16 impact melt breccias and inferences for the geology and bombardment history of the central highlands of the Moon. *Geochim. Cosmochim. Acta* **58**, 3931-3969.

LSPET (1973b) The Apollo 16 lunar samples: Petrographic and chemical description. *Science* **179**, 23-34.

LSPET (1972c) Preliminary examination of lunar samples. In Apollo 16 Preliminary Science Report. NASA SP-315, 7-1—7-58.

McKinley J.P., Taylor G.J., Keil K., Ma M.-S. and Schmitt R.A. (1984) Apollo 16: Impact sheets, contrasting nature of the Cayley Plains and Descartes Mountains, and geologic history. *Proc. 14th Lunar Planet. Sci. Conf.* in J. Geophys. Res. **89**, B513-B524.

Phinney W. and Lofgren G. (1973) Description, classification and inventory of Apollo 16 rake samples from stations 1, 4 and 13. Curators Office.

Ryder G. and Norman M.D. (1980) Catalog of Apollo 16 rocks (3 vol.). Curator's Office pub. #52, JSC #16904

Sutton R.L. (1981) Documentation of Apollo 16 samples. In Geology of the Apollo 16 area, central lunar highlands. (Ulrich et al.) U.S.G.S. Prof. Paper 1048.

Warner J.L., Simonds C.H. and Phinney W.C. (1973b) Apollo 16 rocks: Classification and petrogenetic model. *Proc. 4th Lunar Sci. Conf.* 481-504.

Table 2. Chemical composition of 64545 etc

| | 64545 | 64546 | 64547 | 64549 | 64556 | 64558 |
|--------------------------------|------------|-------|-------|-------|-------|-------|
| <i>reference</i> | McKinley83 | | | | | |
| <i>weight</i> | | | | | | |
| SiO ₂ % | 46.1 | 46.3 | 46 | 46.6 | 46.4 | 46.4 |
| TiO ₂ | 1 | 0.77 | 0.84 | 1.08 | 0.65 | 0.84 |
| Al ₂ O ₃ | 21.1 | 21.86 | 22.15 | 21.22 | 22.4 | 23.3 |
| FeO | 6.37 | 5.5 | 5.89 | 6.38 | 5.47 | 5.86 |
| MnO | 0.07 | 0.07 | 0.11 | 0.09 | 0.08 | 0.07 |
| MgO | 11.2 | 11.8 | 10.8 | 10.7 | 11.2 | 9.1 |
| CaO | 13 | 12.7 | 13.1 | 12.9 | 12.7 | 13.3 |
| Na ₂ O | 0.5 | 0.49 | 0.6 | 0.52 | 0.55 | 0.55 |
| K ₂ O | 0.24 | 0.19 | 0.14 | 0.22 | 0.22 | 0.21 |