**71556** – 29.1 grams
**71557** - 40.35 grams
**71509** – 1.7 grams
**71549** – 7.9 grams
Ilmenite Basalt


Figure 1: *Photo of 71556. Cm scale. S73-33453*

## Introduction

These small samples are plagioclase-poikilitic ilmenite basalts (Warner et al. 1978).

71525 - 71596 etc. are rake samples collected as part of a comprehensive sample at station 1, taken near Steno Crater, Apollo 17. They include numerous small ilmenite basalts.

## Petrography

71556, 71557, 71549 and 71509 are coarse-grained basalts where large plates of plagioclase poikilitically enclose crystals of pyroxene, olivine and ilmenite (figures 6 and 7). Some areas have subophitic texture with intergrown plagioclase and pyroxene. Olivine grains are found in groups. Tranquilityite, armalcolite, Cr-spinel, rutile, zirconolite, baddelyite, sphene and silica are reported (Warner et al. 1978).

The pyroxene compositional zoning is similar in these coarse-grain basalts (figures 4a, b, c, d).

**Mineralogical Mode**

| | 71556 | 71557 | 71549 | 71509 |
|---|---|---|---|---|
| Olivine | 0.6 | 0.9 | 0.9 | 1.8 |
| Pyroxene | 47 | 48.7 | 50.2 | 46.8 |
| Plagioclase | 36.3 | 31 | 30 | 32.3 |
| Opaques | 13.9 | 16.6 | 16.5 | 16.8 |
| Silica | 2.1 | 2.1 | 1.9 | 1 |
| Meostasis | 1.1 | 0.8 | 0.5 | 1.3 |

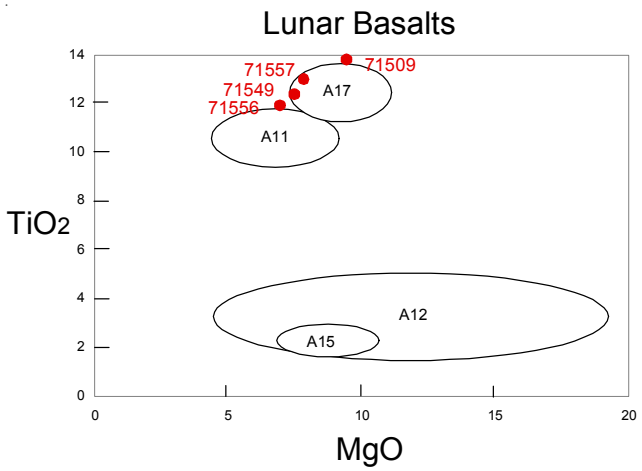



*Figure 2: Composition of 71556 and related rocks.*

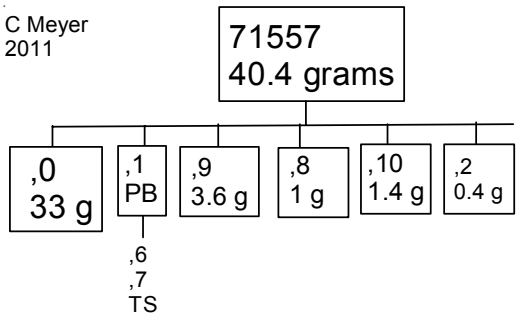

*Figure 3: Photo of 71557. S73-31810*

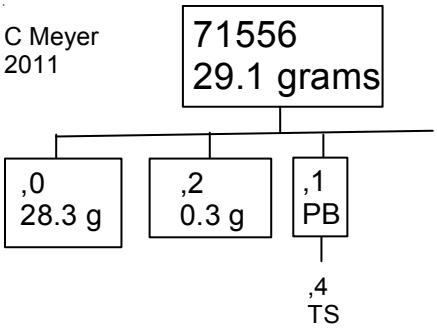
## Chemistry

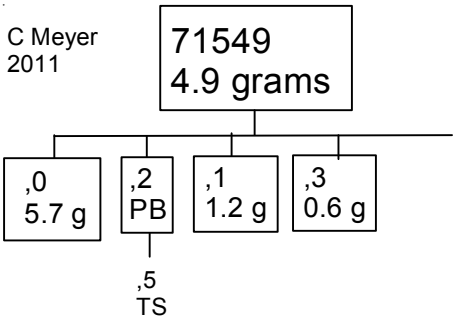
Warner et al. (1975) and Murali et al. (1977) reported chemical analyses (table 1 – 4)(figures 2 and 5).

## Radiogenic age dating

None



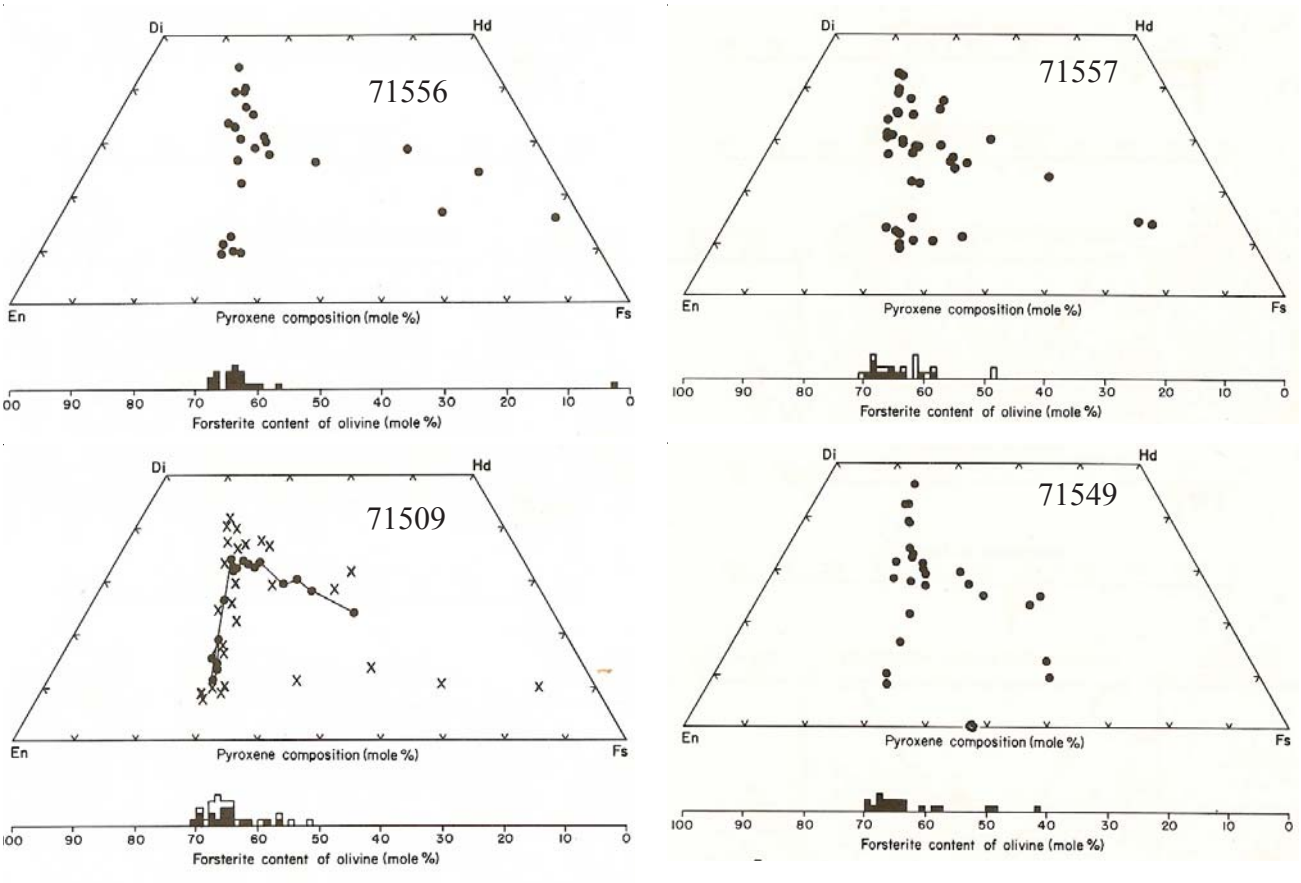
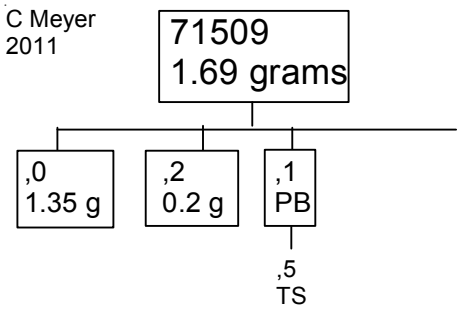



*Figure 4: Composition of pyroxene and olivine in 71556 and reatled samples.*



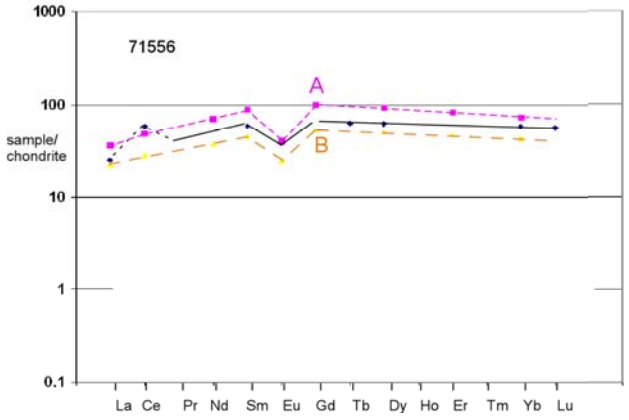
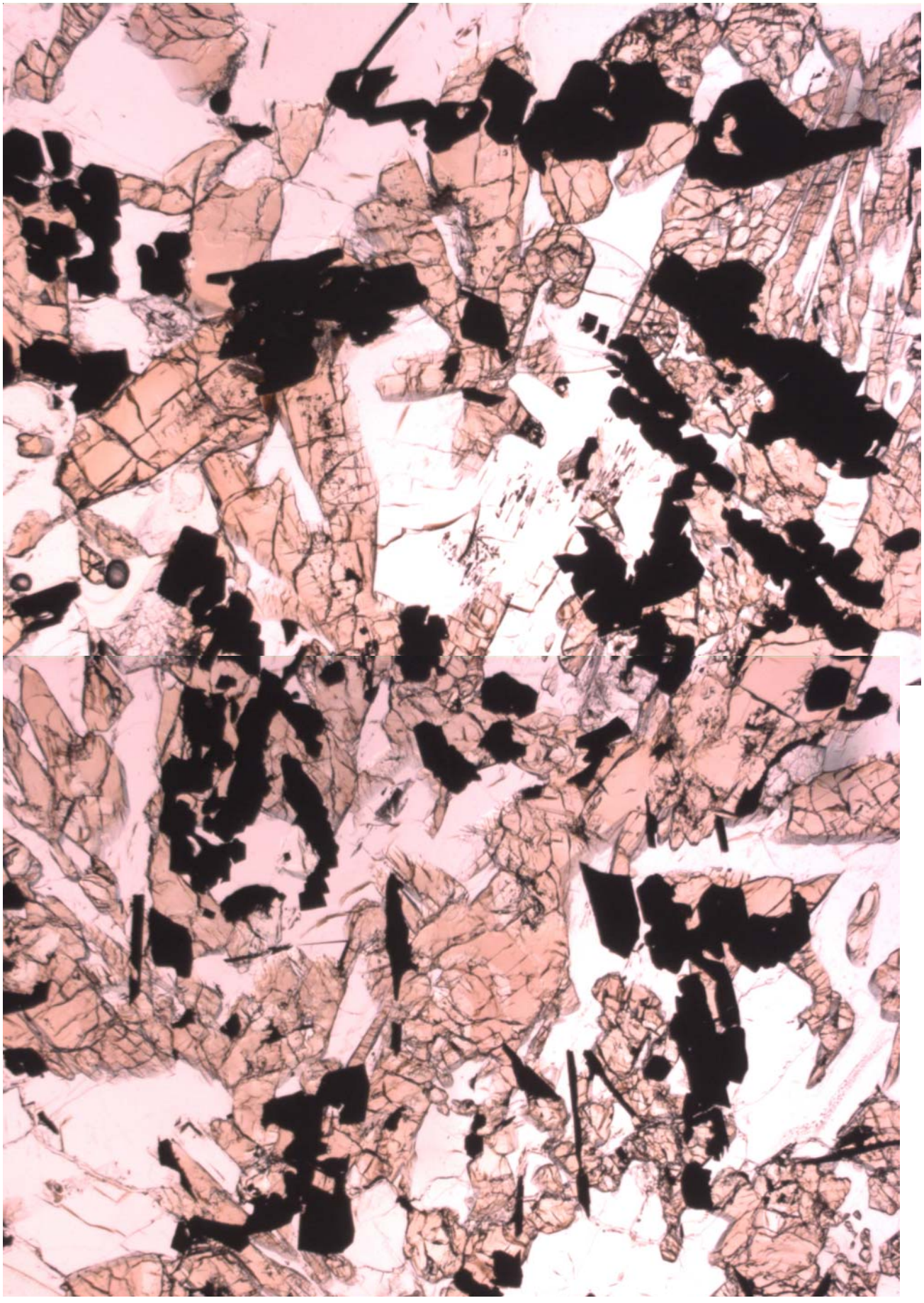




*Figure 5: Normalized rare-earth-element diagram for 71556 and type A and B basalts.*



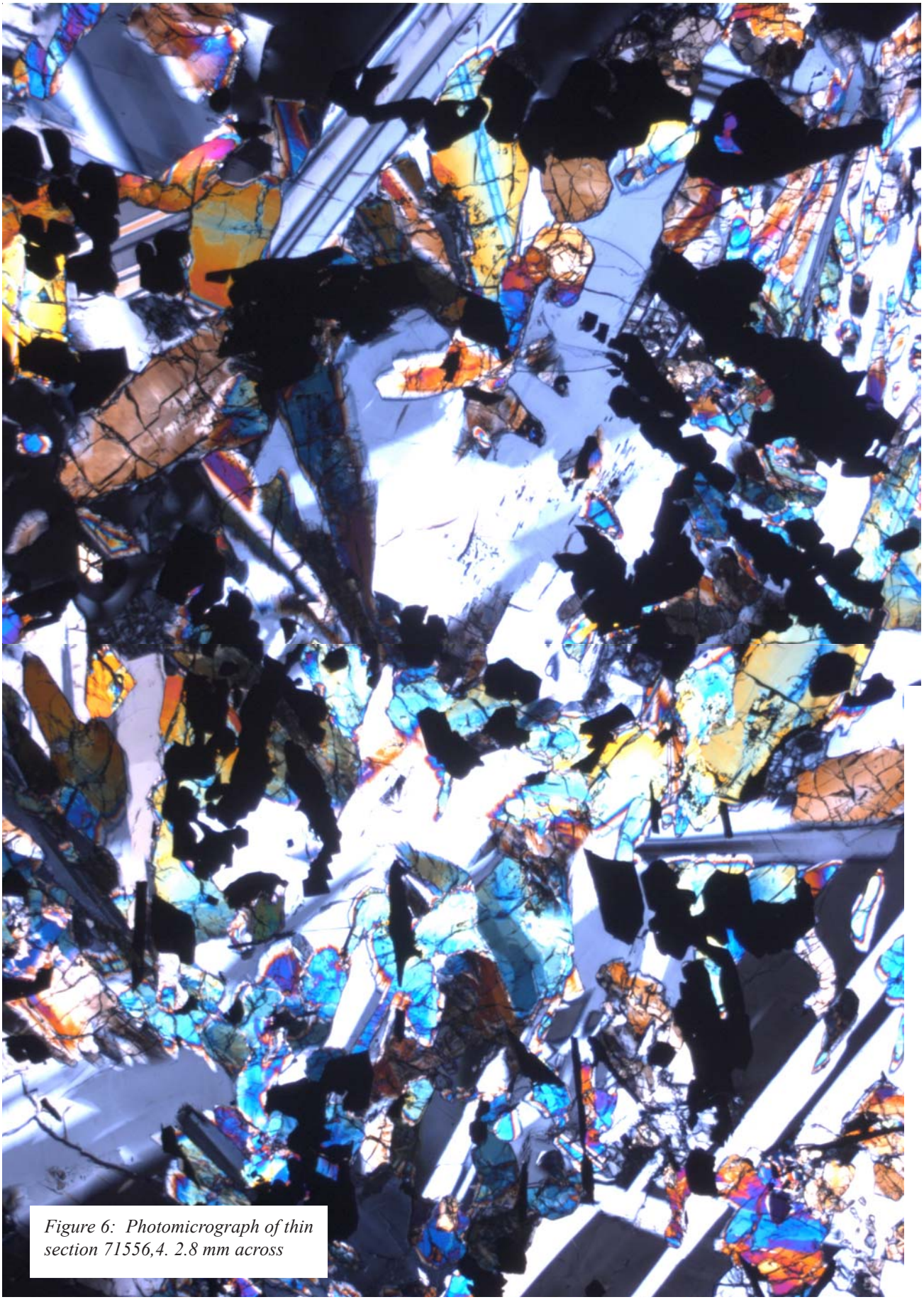
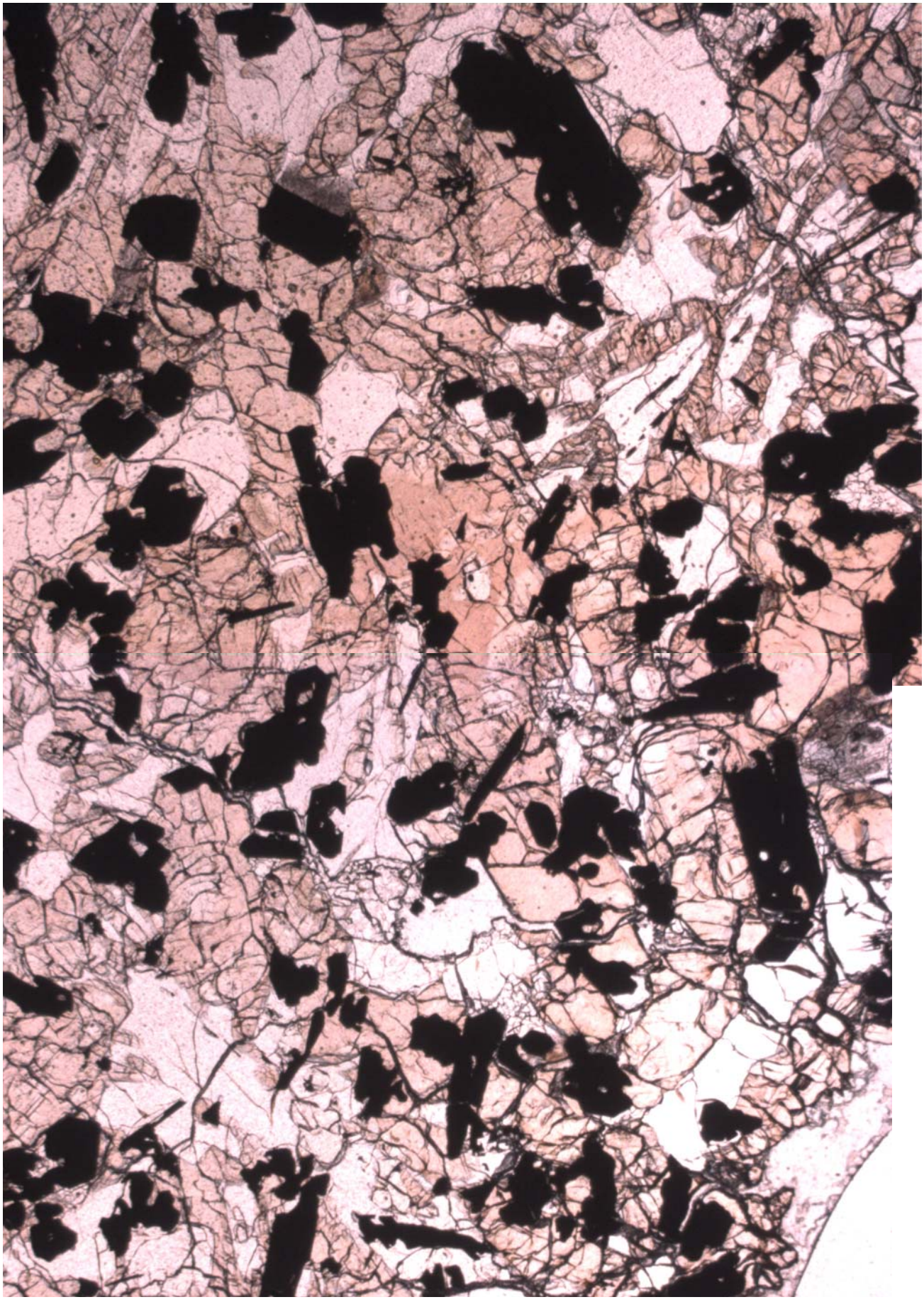


*Figure 6: Photomicrograph of thin section 71556,4. 2.8 mm across*



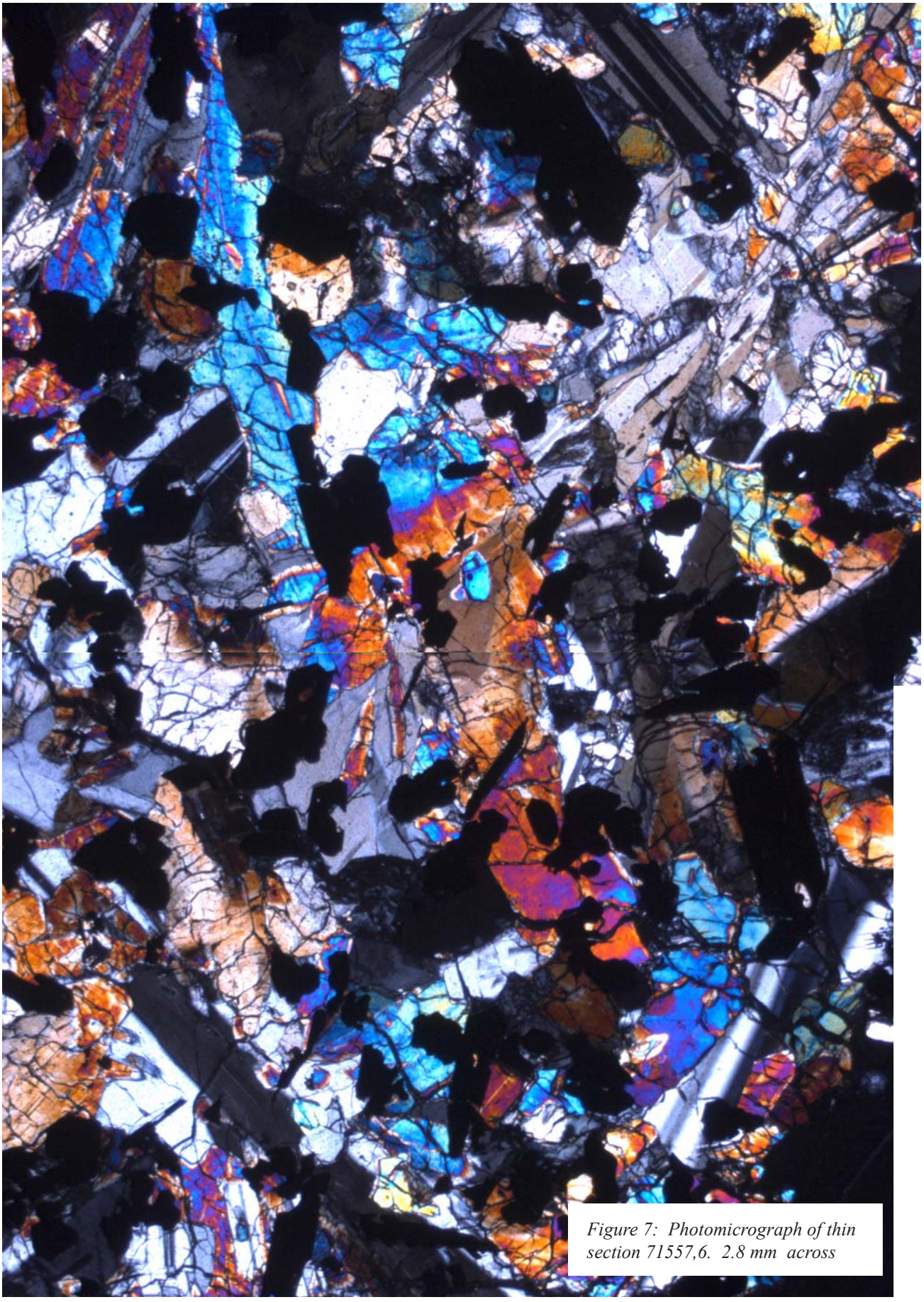


*Figure 7: Photomicrograph of thin section 71557,6. 2.8 mm across*

## Table 1. Chemical composition of 71556.

| | | |
|---|---|---|
| *reference* | Murali77 | |
| *weight* | Warner78 | |
| SiO2 % | | |
| TiO2 | 11.7 | (a) |
| Al2O3 | 10 | (a) |
| FeO | 19.9 | (a) |
| MnO | 0.24 | (a) |
| MgO | 7.5 | (a) |
| CaO | 10.5 | (a) |
| Na2O | 0.45 | (a) |
| K2O | 0.056 | (a) |
| P2O5 | | |
| S % | | |
| *sum* | | |
| | | |
| Sc ppm | 70 | (a) |
| V | 74 | (a) |
| Cr | 2429 | (a) |
| Co | 17 | (a) |
| Ni | | |
| 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 | | |
| La | 5.8 | (a) |
| Ce | 35 | (a) |
| Pr | | |
| Nd | | |
| Sm | 8.6 | (a) |
| Eu | 2.11 | (a) |
| Gd | | |
| Tb | 2.3 | (a) |
| Dy | 15 | (a) |
| Ho | | |
| Er | | |
| Tm | | |
| Yb | 9.4 | (a) |
| Lu | 1.37 | (a) |
| Hf | 8.3 | (a) |
| Ta | 1.7 | (a) |
| W ppb | | |
| Re ppb | | |
| Os ppb | | |
| Ir ppb | | |
| Pt ppb | | |
| Au ppb | | |
| Th ppm | | |
| U ppm | | |

*technique: (a) INAA*

## Table 2. Chemical composition of 71557.

| | | |
|---|---|---|
| *reference* | Warner 78 | |
| *weight* | Warner75 | |
| SiO2 % | | |
| TiO2 | 13 | (a) |
| Al2O3 | 9.3 | (a) |
| FeO | 19.1 | (a) |
| MnO | 0.235 | (a) |
| MgO | 8.5 | (a) |
| CaO | 10.5 | (a) |
| Na2O | 0.41 | (a) |
| K2O | 0.057 | (a) |
| P2O5 | | |
| S % | | |
| *sum* | | |
| | | |
| Sc ppm | 80 | (a) |
| V | 120 | (a) |
| Cr | 3476 | (a) |
| Co | 19.3 | (a) |
| Ni | | |
| 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 | | |
| La | 4.8 | (a) |
| Ce | 24 | (a) |
| Pr | | |
| Nd | | |
| Sm | 7.5 | (a) |
| Eu | 1.72 | (a) |
| Gd | | |
| Tb | 1.8 | (a) |
| Dy | 13 | (a) |
| Ho | | |
| Er | | |
| Tm | | |
| Yb | 7.2 | (a) |
| Lu | 1.1 | (a) |
| Hf | 6.8 | (a) |
| Ta | 1.7 | (a) |
| W ppb | | |
| Re ppb | | |
| Os ppb | | |
| Ir ppb | | |
| Pt ppb | | |
| Au ppb | | |
| Th ppm | | |
| U ppm | | |

*technique: (a) INAA*

## Table 3. Chemical composition of 71549.

| | | |
|---|---|---|
| *reference* | Murali77 | |
| *weight* | | |
| SiO2 % | | |
| TiO2 | 12.2 | (a) |
| Al2O3 | 8.3 | (a) |
| FeO | 20.2 | (a) |
| MnO | 0.239 | (a) |
| MgO | 8.1 | (a) |
| CaO | 10 | (a) |
| Na2O | 0.4 | (a) |
| K2O | 0.061 | (a) |
| P2O5 | | |
| S % | | |
| *sum* | | |
| | | |
| Sc ppm | 81 | (a) |
| V | 108 | (a) |
| Cr | 3236 | (a) |
| Co | 19 | (a) |
| Ni | | |
| 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 | | |
| La | 5.5 | (a) |
| Ce | 40 | (a) |
| Pr | | |
| Nd | | |
| Sm | 8.2 | (a) |
| Eu | 1.95 | (a) |
| Gd | | |
| Tb | 2.2 | (a) |
| Dy | 14 | (a) |
| Ho | | |
| Er | | |
| Tm | | |
| Yb | 8 | (a) |
| Lu | 1.23 | (a) |
| Hf | 9 | (a) |
| Ta | 0.92 | (a) |
| W ppb | | |
| Re ppb | | |
| Os ppb | | |
| Ir ppb | | |
| Pt ppb | | |
| Au ppb | | |
| Th ppm | | |
| U ppm | | |
| *technique:* | *(a) INAA* | |

## Table 4. Chemical composition of 71509.

| | | |
|---|---|---|
| *reference* | Warner75 | |
| *weight* | | |
| SiO2 % | | |
| TiO2 | 13.7 | (a) |
| Al2O3 | 7.3 | (a) |
| FeO | 20.6 | (a) |
| MnO | 0.258 | (a) |
| MgO | 10.1 | (a) |
| CaO | 9.6 | (a) |
| Na2O | 0.314 | (a) |
| K2O | 0.054 | (a) |
| P2O5 | | |
| S % | | |
| *sum* | | |
| | | |
| Sc ppm | 95 | (a) |
| V | 160 | (a) |
| Cr | 4427 | (a) |
| Co | 25 | (a) |
| Ni | | |
| 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 | | (a) |
| La | 5.3 | (a) |
| Ce | | |
| Pr | | |
| Nd | | |
| Sm | 8.5 | (a) |
| Eu | 1.62 | (a) |
| Gd | | |
| Tb | | |
| Dy | 15 | (a) |
| Ho | | |
| Er | | |
| Tm | | |
| Yb | 9.3 | (a) |
| Lu | 1.2 | (a) |
| Hf | | |
| Ta | | |
| W ppb | | |
| Re ppb | | |
| Os ppb | | |
| Ir ppb | | |
| Pt ppb | | |
| Au ppb | | |
| Th ppm | | |
| U ppm | | |
| *technique:* | *(a) INAA* | |

Table 5: Armalcolite in 71509, 71557.
(Warner et al. 1976)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| TiO2 | 71.8 | 72.1 | 72.2 | 72.2 | 72.4 | 71.7 | 71.5 | 71.5 | 70.6 |
| Al2O3 | 1.88 | 1.59 | 1.42 | 1.33 | 2.15 | 2.05 | 1.75 | 2.25 | 1.75 |
| Cr2O3 | 1.88 | 1.85 | 1.72 | 1.84 | 1.76 | 1.78 | 1.77 | 1.67 | 1.43 |
| FeO | 15.9 | 16 | 17.3 | 18.1 | 15.7 | 15.9 | 15.9 | 16.4 | 17.8 |
| MgO | 6.8 | 6.7 | 7 | 6.5 | 7.2 | 7 | 7 | 6.9 | 6.2 |
| CaO | 0.3 | 0.39 | 0.55 | 0.3 | 0.63 | 0.68 | 0.34 | 0.5 | 0.74 |
| ZrO2 | | | | | 0.03 | | 0.08 | 0.08 | 0.08 |
| V2O3 | | | | | 0.23 | 0.23 | 0.21 | 0.23 | 0.19 |

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