64567 – 13.8 grams
64569 - 14.3 grams
Poikilitic Impact Melt Breccia

**Figure 1:** Photo of 64567. Scale in mm. S72-55386

**Figure 2:** Photo of 64569. Scale in mm. S72-55366

**Mineralogical Mode**
by Simonds et al. (1973)

<table>
<thead>
<tr>
<th></th>
<th>64567</th>
<th>64569</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>69%</td>
<td>57</td>
</tr>
<tr>
<td>Pyroxene</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Olivine</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Opaque</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Lunar Sample Compendium
C Meyer 2012
**Introduction**

64567 and 64569 are rake samples from station 4 on the slope of Stone Mountain – see section on 64501. They are dark coherent aphanitic samples with a few vesicles (figures 1, 2, 8 and 9). They are unusual in that they have abundant olivine oikocrysts and are relatively mafic. They include relict clasts of anorthite, and have relatively high Ni, Ir and Au contents. 64567 has been dated at about 3.97 b.y. – which is distinctly older than the canonical age of the Imbrium impact.

**Petrography**

Simonds et al. (1973) described the poikilitic rocks from Apollo 16, including 64567. 64567 and 64569 are distinct in that they have olivine instead of pyroxene as the dominate oikocryst. In any case the mafic minerals form a network of interlocking oikocrysts that enclose plagioclase chadocrys and xenocrysts (figure 4). Opaque and accessory minerals are usually found at the boundaries of the oikocrysts. Occasionally, there are small regions with subophitic texture (figure 3).

64567 and 64569 were classified as “VHA basalts” according to Hubbard et al. (1973), but this was disputed by Prinz et al. (1974) who showed that they were mixtures – now understood as “impact melts”, formed by large impacts in the highland crust.

KREEP-rich, poikilitic impact melt rocks from the Cayley Plains, such as 62235 and 65015, often have regions within them that naturally have subophitic (basaltic) texture (Reimold and Borchardt 1984).
64567 was reported to have “rust” (Phinney and Lofgren 1973; Hunter and Taylor 1981).

**Pyroxene:** The composition of pyroxene and olivine in 64567 and 64569 is given in figure (5).

**Chemistry**
The composition of 64567 and 64569 was determined by Hubbard et al. (1973), Wasson et al. (1977) and McKinley et al. (1983)(table1 and figures 6 and 7).

Wanke et al. (1976) discuss the composition of 64567 in terms of a mixture of KREEP, anorthosite and mysterious “primary matter” (figure 11). Compositional variation of Apollo 16 impact-melt rocks is also discussed by Korotev (1994).
Table 1. Chemical composition of 64567 and 64569.

<table>
<thead>
<tr>
<th></th>
<th>64567</th>
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<th>64567</th>
<th>64569</th>
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<tbody>
<tr>
<td>reference</td>
<td>Wiesman76</td>
<td>Hubbard73</td>
<td>McKinley83</td>
<td>Wesson77</td>
<td>Floran76</td>
<td>McKinley83</td>
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<td>weight</td>
<td>Hubbard73</td>
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<tr>
<td>SiO2 %</td>
<td>45.69 (b)</td>
<td>46.6 (d)</td>
<td>46.37 (a)</td>
<td>47.7 (d)</td>
<td>47.7 (a)</td>
<td>47.7 (d)</td>
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<tr>
<td>TiO2</td>
<td>0.7 (a)</td>
<td>0.72 (b)</td>
<td>0.91 (d)</td>
<td>1.03 (c)</td>
<td>0.94 (a)</td>
<td>0.54 (d)</td>
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<tr>
<td>Al2O3</td>
<td>21.62 (b)</td>
<td>23.1 (d)</td>
<td>22.5 (c)</td>
<td>20.8 (a)</td>
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<tr>
<td>FeO</td>
<td>7.08 (b)</td>
<td>5.2 (d)</td>
<td>8.52 (c)</td>
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<td>MnO</td>
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<td>0.08 (d)</td>
<td>0.1 (c)</td>
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<td>0.07 (d)</td>
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</tr>
<tr>
<td>MgO</td>
<td>11.5 (b)</td>
<td>10.1 (d)</td>
<td>11.8 (c)</td>
<td>11.25 (a)</td>
<td>12.6 (d)</td>
<td>12.6 (d)</td>
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<tr>
<td>CaO</td>
<td>12.52 (b)</td>
<td>12.9 (d)</td>
<td>12.4 (c)</td>
<td>12.35 (a)</td>
<td>11.5 (d)</td>
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<tr>
<td>Na2O</td>
<td>0.42 (b)</td>
<td>0.49 (d)</td>
<td>0.504 (c)</td>
<td>0.52 (a)</td>
<td>0.5 (d)</td>
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<td>K2O</td>
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<td>0.17 (b)</td>
<td>0.27 (d)</td>
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<td>P2O5</td>
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</tr>
<tr>
<td>S %</td>
<td>0.1 (b)</td>
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</tr>
</tbody>
</table>

Technique: (a) IDMS, (b) XRF, (c) INAA+RNAA

Figure 6: Normalized rare-earth-element diagram for 64567.

Figure 7: Normalized rare-earth-element diagram for 64569.
Radiogenic age dating
Turner and Cadogen (1975) dated 64567 by the Ar/Ar plateau technique, with an age of $3.97 \pm 0.05$ b.y. (figure 10). Nyquist et al. (1973) reported the Rb-Sr systematics.

Cosmogenic isotopes and exposure ages
Turner and Cadogen (1975) determined an exposure to cosmic ray of 370 m.y. by the $^{38}$Ar method (figure 10).
Other Studies

Pearce and Simonds (1974) determined the magnetic properties.

Processing

There are 4 thin sections of 64567 but only 1 of 64569.

References for 64567 and 64569


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


64567,8
2 mm across
64569,4
2 mm across