Experiments

Apparatus and starting material

Experiments have been performed at 2.5 GPa and at 800° C and 850° C on a representative gneiss from Drage, Stadlandet (Table 1). Experiments were conducted in a 1/2 inch piston-cylinder apparatus using talc-pyrox-graphite furnace assemblies and gold capsules. The use of these assemblies and gold capsules produce conditions around the Ni-NiO transition. Run durations were between 72-137 hours, depending on run conditions. The gneiss has an initial mineralogy of mainly quartz, biotite, phengite, garnet and plagioclase. We conducted the experiments using directly the powdered gneiss, which has ~ 1.74 wt% H₂O bound in hydrous minerals. We added 5 or 10 wt % H₂O to the experimental charges.

Analytical techniques

Capsules mounted in epoxy resin were polished for scanning electron microscopy (SEM) and electron microprobe analyses. Major elements of glasses were analysed with the following analytical conditions, accelerating voltage of 15 kv, sample current of 6 nA, counting time of 10 s on peak, and a defocused beam (10 µm). The H₂O contents of quenched glasses were determined using the by-difference method calibrated with a set of 4 rhyolitic hydrous glass standards whose H₂O contents (0-6.38 wt%) have been determined by either ion microprobe analysis or Karl Fisher titration (Scaillet et al., 1995; Martel et al., 1998; Scaillet and Evans, 1999).


Results

<table>
<thead>
<tr>
<th>Sample/Glass</th>
<th>NOG004-1</th>
<th>800/5</th>
<th>850/5</th>
<th>800/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment n°</td>
<td>norWM1</td>
<td>norWM3</td>
<td>norWM5</td>
<td></td>
</tr>
<tr>
<td>P (Gpa)</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td></td>
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<tr>
<td>T (°C)</td>
<td>800</td>
<td>850</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Added H2O (wt%)</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td></td>
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</tbody>
</table>

%fluid phase in exp.

<table>
<thead>
<tr>
<th>Major phases</th>
<th>gl, grt, bi, qtz, ky</th>
<th>gl, grt, qtz, ky</th>
<th>gl, grt, bi, qtz, ky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessory phases</td>
<td>rt, sa, ap, zr, plg</td>
<td>rt, alb, bi, cpx</td>
<td>rt, s, st, zr</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Major elements (wt%)</th>
<th>18</th>
<th>16</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiO2</td>
<td>68.53</td>
<td>72.57(39)</td>
<td>74.65(67)</td>
</tr>
<tr>
<td>TiO2</td>
<td>0.74</td>
<td>0.26(7)</td>
<td>0.25(4)</td>
</tr>
<tr>
<td>Al2O3</td>
<td>14.07</td>
<td>15.87(27)</td>
<td>14.64(53)</td>
</tr>
<tr>
<td>FeO</td>
<td>5.63</td>
<td>0.56(13)</td>
<td>1.42(15)</td>
</tr>
<tr>
<td>MnO</td>
<td>0.07</td>
<td>0.03(5)</td>
<td>0.04(7)</td>
</tr>
<tr>
<td>MgO</td>
<td>2.55</td>
<td>0.34(6)</td>
<td>0.68(7)</td>
</tr>
<tr>
<td>CaO</td>
<td>1.21</td>
<td>0.92(10)</td>
<td>1.04(9)</td>
</tr>
<tr>
<td>Na2O</td>
<td>2.22</td>
<td>5.41(29)</td>
<td>2.69(32)</td>
</tr>
<tr>
<td>K2O</td>
<td>3.32</td>
<td>3.90(27)</td>
<td>4.41(26)</td>
</tr>
<tr>
<td>Hydrous Total</td>
<td>100.25</td>
<td>92.05(55)</td>
<td>88.95(73)</td>
</tr>
<tr>
<td>H2O</td>
<td>6.16(54)</td>
<td>9.05(71)</td>
<td>10.51(69)</td>
</tr>
</tbody>
</table>

a sulphide
b alumino-silicate

Table 1 : Starting material composition and experimental glasses mineralogy and compositions. Partial melting rates were estimated by least square mass balance calculation above 38 % for all experiments.

Experimental textures

- File fig1suppmat attached aside -

Figure 1: back-scattered electron images of experimental result for NorWM5 at 800°C and 10 wt%. Bi1 and Bi2 respectively represent biotites with compositions similar and different from the starting material biotites.
### Natural leucosomes

<table>
<thead>
<tr>
<th>Location</th>
<th>NO10-16</th>
<th>NO10-23</th>
<th>NO10-27</th>
<th>NO10-43</th>
<th>NO10-45-1</th>
<th>NO10-45-2</th>
<th>NO10-51</th>
<th>NO10-55</th>
<th>NO10-60</th>
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<tbody>
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<td>005°31.941'</td>
<td>005°31.941'</td>
<td>006°25.467'</td>
<td>006°41.030'</td>
<td>006°41.030'</td>
<td>006°50.085'</td>
<td>006°44.385'</td>
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<td>Midsund</td>
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<td>006°41.030'</td>
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<tr>
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<td>62°41.303'</td>
<td>62°41.303'</td>
<td></td>
</tr>
</tbody>
</table>

| SiO2 | 74.91 | 64.75 | 69.77 | 74.23 | 74.53 | 74.67 | 69.62 | 75.55 | 74.16 |
| Fe2O3 | 1.66 | 0.17 | 1.27 | 0.54 | 0.13 | 0.54 | 4.75 | 0.96 | 0.68 |
| MnO | 0.03 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.06 | 0.03 | 0.01 |
| MgO | 0.29 | 0.02 | 0.23 | 0.06 | 0.05 | 0.10 | 2.72 | 0.28 | 0.09 |
| CaO | 2.31 | 5.90 | 2.96 | 4.11 | 4.90 | 4.24 | 2.81 | 2.78 | 2.98 |
| K2O | 5.75 | 6.30 | 8.30 | 4.48 | 3.08 | 4.16 | 0.95 | 3.49 | 5.44 |
| TiO2 | 0.13 | 0.02 | 0.15 | 0.04 | 0.02 | 0.06 | 0.67 | 0.08 | 0.05 |
| P2O5 | 0.06 | < d. l. | < d. l. | < d. l. | < d. l. | < d. l. | 0.16 | 0.07 | < d. l. |
| lO | 0.48 | 0.78 | 0.75 | 0.49 | 0.64 | 0.52 | 1.03 | 1.41 | 0.78 |
| Total | 99.76 | 99.57 | 99.88 | 99.75 | 100.17 | 100.23 | 99.48 | 100.20 | 99.20 |

Table 2: major elements analysis of natural leucosomes sampled in the WGR.