LUNAR BORON: A PRELIMINARY STUDY
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Only about 60 lunar rock analyses for boron have been published. We have begun a study of B distribution in lunar rocks and present the first prompt gamma activation analysis results, on a small group of samples chosen to represent several rock-types. The duplicate values represent the results from two irradiations of each sample, which consisted of ~2g chips and fines: the results assume that $^{10}B/^{11}B$ is similar to terrestrial values, which appears reasonable (1).

<table>
<thead>
<tr>
<th>Sample</th>
<th>ppm B</th>
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<tbody>
<tr>
<td>12005 olivine basalt</td>
<td>0.61, 0.30</td>
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<tr>
<td>70017 ilmenite basalt</td>
<td>1.54, 0.95</td>
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<tr>
<td>15086 soil breccia</td>
<td>5.35, 5.01</td>
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<tr>
<td>14301 Fra Mauro breccia</td>
<td>22.7, 23.0</td>
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<tr>
<td>14310 Fra Mauro feldspathic basalt</td>
<td>16.5, 16.2</td>
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<tr>
<td>65015 Poikilitic melt</td>
<td>10.7, 11.0</td>
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<tr>
<td>sheet rock</td>
<td></td>
</tr>
</tbody>
</table>

Accuracy was appraised by analysing standard reference sample SY-3 and NBS SRN 1571: results obtained were 120 and 34 ppm B respectively, where recommended values are 110±10 and 33±3. Precision (1 s.d.) is 3-5% for concentrations over 10 ppm, but is poorer at lower levels.

The two mare basalts have low B contents, similar to earlier analyses (2-7), and similar to the freshest terrestrial basalt: the lowest basaltic B values occur in unaltered MORB, which contains 0.2-2 ppm (8,9), and terrestrial aqueous alteration leads to higher values.

Microbreccia 15086 is a "first generation" breccia (10,p478) but contains more B than is to be expected if made up of unprocessed mare basalt materials: more such breccias need analysis to see if this behaviour is typical.

The remaining three samples are KREEP-rich to varying degrees. All are enriched in B by an order-of-magnitude or more, relative to mare basalts or terrestrial fresh basalts. Our value for 14301 agrees well with the 25 ppm found by Rose et al. (11). Others have found similar high values (12, 13). Lithium is also enriched in KREEP-bearing samples, though not to the same degree as B, and much less than other compatible elements.

Terrestrial B geochemistry is largely dominated by borate solubility in water. Further study of analyzed samples will help delineate B behaviour in the dry moon.

References