Petrography and mineralogy of archaeological finds from Al Zubarah, Qatar
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INTRODUCTION

The once prosperous and flourishing merchant and pearling town of Al Zubarah, situated at the upper NW coast of the Qatar peninsula and founded about 1760 AD by the Bani Utba tribe from Kuwait, was gradually abandoned in the 2nd half of the 19th century and finally given up at the beginning of the 20th century. Apart from the removal of commodities which could be used for building and living at other places it was not destroyed but handed over to nature. The desert sand covered the partly ruined buildings and thus conserved the entire layout and fabric of the town. Since 2009 the University of Copenhagen in partnership with Qatar Museums is excavating and conserving some areas of the over 60 hectares large site. The abundance of archaeological finds comprising among other items porcelain and celadon from China, pottery from India and silver coins from the Austrian-Hungarian Empire attests to the wealth gained from pearl fishing and the world-wide trade links of merchants from Al Zubarah. The excavated implements and articles of daily life convey pictures of the bustling life in workshops and houses. Quite a number of tools, for instance rotary querns, pounders, whetstones and diving weights, were made from natural stones or minerals (Figure 1).

Figure 1: Natural stone implements: 1 quartzite diving weight, 2 hematite diving weight, 3 altered gabbro pestle, 4 barite diving weight, 5 altered peridotite hammer, 6 quartz sericite schist whetstone

Chemical and petrographical analyses

Table 1: Chemical and mineralogical composition of 5 (out of 14) rock samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Na₂O</th>
<th>K₂O</th>
<th>MgO</th>
<th>CaO</th>
<th>MnO</th>
<th>Fe₂O₃</th>
<th>Fe₂O₃tot</th>
<th>Al₂O₃</th>
<th>SO₃</th>
<th>TiO₂</th>
<th>FeO</th>
<th>CI</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Granite</td>
<td>1.64</td>
<td>7.65</td>
<td>1.20</td>
<td>0.52</td>
<td>-</td>
<td>1.74</td>
<td>11.58</td>
<td>75.36</td>
<td>0.00</td>
<td>0.27*</td>
<td>100.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>02 Harzburgite</td>
<td>-</td>
<td>-</td>
<td>42.54</td>
<td>1.80</td>
<td>-</td>
<td>0.96</td>
<td>11.86</td>
<td>42.30</td>
<td>-</td>
<td>0.55*</td>
<td>100.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 Gabbro</td>
<td>2.58</td>
<td>2.67</td>
<td>5.38</td>
<td>9.47</td>
<td>-</td>
<td>15.36</td>
<td>10.11</td>
<td>54.10</td>
<td>0.03</td>
<td>-</td>
<td>100.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Basalt</td>
<td>2.92</td>
<td>4.27</td>
<td>2.43</td>
<td>2.02</td>
<td>0.27</td>
<td>13.67</td>
<td>11.68</td>
<td>49.35</td>
<td>1.39</td>
<td>-</td>
<td>96.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Porphyry</td>
<td>1.46</td>
<td>9.59</td>
<td>1.59</td>
<td>5.70</td>
<td>-</td>
<td>12.65</td>
<td>3.93</td>
<td>63.37</td>
<td>1.01</td>
<td>-</td>
<td>100.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The quantitative mineral composition of the rocks was calculated from the combination of the qualitative phase and quantitative chemical data. For example, the calculation produced the following result for sample 01 Granite (contents in mass%): K-feldspar 41, albite 15.5, quartz 35, biotite 6.9, hornblende 1.6.

Figure 2: Handspecimen, thin section & QEMSCAN image of sample 10 (Gabbro)

Discussion

As far as the mafic to ultramafic rocks are concerned, the ophostyles in Oman and UAE are potential sources for peridotite, gabbro and basalt. Some of the outcrops are situated close to the coast of the Gulf of Oman, and it is conceivable that rock material was taken on board as ballast. Some of the gabbroic rocks have undergone intensive low-grade metamorphic alteration (saussuritization). Probably the altered gabbro was easier to work on because this material was also frequently used for tool-making. The most likely hematite supplier seems to be Iran which is still one of the biggest iron ore producers in the world. Small apatite crystals in some of the hematite samples can be distinguishing feature. Barite may also come from Iran. Large deposits are located in the Haji Abad regions in Kashan, Isfahan Province, and Yazd, Province Yazd. Besides the chemical and petrographical analyses the work draws on three important resources, namely visits to museums in Bahrain, Doha, Abu Dhabi and Muscat, that the literature about trading in the Gulf area and the published regional geology of the Arabian Peninsula.

References

Tobias Richter (2010), The Pearl divers of Qatar. Excavations at Al Zubarah, World Archaeology, Issue 40, 18 – 26