Technology of Late Bronze Age-Early Iron Age Glass in the Mediterranean: Analytical Studies of Vitreous Materials from Lofkënd

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Introduction
The prehistoric village of Lofkënd is located in the Malakata region of Albania, south of the city of Përsh, near the modern village of Lofkënd. The village was excavated from 2004-2008 by the Cotsen Institute of Archaeology at UCLA, Institute of Archaeology in Ttirn, and the International Center for Albanian Archaeology. A total of 100 graves were discovered. The tombs was primarily found from the 14th c. BC to the end of the 9th c. BC, spanning the Late Bronze Age to Early Iron Age periods (Conat et al. 2009). Many of the graves contained multiple adults and infants interred with grave goods such as ceramic vessels, fibulae, ornaments and horsetails.

Tumulus of Lofkënd during excavation (L). A burial with various grave goods (R)

Vitreous beads were found in 4 graves dating to the 13th-12th c. BC and were positioned on or around the skull of the deceased. This is the group of beads (10 glass and 1 faience) that are the focus of this research project.

Objectives
- Apply a multi-analytical approach, using more precise and innovative techniques to determine the composition of the Lofkënd beads and source the raw materials used.
- Identify the primary production region(s) for the beads—whether from Egypt and the Near East (Shorthand 2012), or if they can be related to Bronze Age production centers in northern Italy (Bull 1992) or Greece (Sukman and Henderson 2006).
- Use archaeological data to answer questions about trade to southeastern Albanian and technological innovations or continuity during the transition from the Late Bronze Age to Iron Age.

Materials and methods
- Beads were examined using optical microscopy to create a bead typology (Buck 1974).
- Qualitative elemental analysis was conducted using a Bruker Tensor III-V handheld XRF under various acquisition parameters: no filter, 40Kv, 1 μA, Vacuum, 180°; Si filter, 40Kv, 1.6A, 180°; Cu filter, 15Kv, 1.5μA, Vacuum, 180°.
- Six samples from white decorative lines were analyzed with a Rigaku R-Axis Spider X-ray diffractometer (5(0)Kv/40μA, Cu target, 900μ).

Table of results

<table>
<thead>
<tr>
<th>Bead No.</th>
<th>Date</th>
<th>Material</th>
<th>Color</th>
<th>Decoration</th>
<th>Back Classification</th>
<th>XRF Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>177-6/12035</td>
<td>12th c. BC</td>
<td>Glass</td>
<td>Opalescent</td>
<td>None</td>
<td>36.5Kv 40μA</td>
<td>Mg, Al, K, Ca, Ti, Fe, Cu, Ni, Zn, Si, Sn, Pb, Sn, Cu, Tl, Br, Sr, Th, Sn, Rd</td>
</tr>
<tr>
<td>177-7/12035</td>
<td>11th c. BC</td>
<td>Glass</td>
<td>Deep blue</td>
<td>None</td>
<td>36.5Kv 40μA</td>
<td>Mg, Al, K, Ca, Ti, Fe, Cu, Ni, Zn, Sn, Pb, Cu, Tl, Br, Sr, Th, Sn, Rd</td>
</tr>
<tr>
<td>177-8/12035</td>
<td>10th c. BC</td>
<td>Glass</td>
<td>Deep green</td>
<td>None</td>
<td>36.5Kv 40μA</td>
<td>Mg, Al, K, Ca, Ti, Fe, Cu, Ni, Zn, Sn, Pb, Cu, Tl, Br, Sr, Th, Sn, Rd</td>
</tr>
<tr>
<td>177-9/12035</td>
<td>10th c. BC</td>
<td>Glass</td>
<td>Opalescent</td>
<td>None</td>
<td>36.5Kv 40μA</td>
<td>Mg, Al, K, Ca, Ti, Fe, Cu, Ni, Zn, Sn, Pb, Cu, Tl, Br, Sr, Th, Sn, Rd</td>
</tr>
<tr>
<td>177-10/12035</td>
<td>9th c. BC</td>
<td>Glass</td>
<td>Deep green</td>
<td>None</td>
<td>36.5Kv 40μA</td>
<td>Mg, Al, K, Ca, Ti, Fe, Cu, Ni, Zn, Sn, Pb, Cu, Tl, Br, Sr, Th, Sn, Rd</td>
</tr>
</tbody>
</table>

Conclusions
- Most of the glass beads were colored using an Fe-based-collorant, regardless of the final color of the bead.
- Two blue glass beads were found to be colored with Cu [T77-4/12035] and T77-6/12035 [12035].
- The white decoration on the beads is due to antimony, primarily calcium antimonate.
- The faience bead contained Sn, Pb and Pb in the blue-green glaze suggesting the use of lime as the colorant (Shorthand 2012).

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Future Work
- Identify trace elements in the alkaline and Ca-silicate using LA-ICPMS to obtain compositional information and determine their origin.
- Source the glass in the glass using SIMS to identify primary production regions.
- Some beads are severely deteriorated, though they're from the same burial context as better preserved beads. LA-ICPMS will be useful to see if the alkali and/or carbonate used relate to the deterioration/preservation observed.

References

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