The use of X-ray Diffraction techniques to characterize ceramic fragments in the disturbed Santa Bárbara archeological site in Jayuya, Central Puerto Rico.

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• Characteristics of the Santa Bárbara site
  – No stratigraphic relationships between the different pottery fragments are encountered due to human disturbance and natural occurring slope movement
• The pottery fragments of the Santa Bárbara site are being studied by the Centro Cultural Jayuyano Alberto Suárez Martínez Inc.

• One of the objectives is to carry out a typological and mineralogical analysis of paste and temper of the encountered pottery fragments
  – Typological description based on observation of the pottery fragments
  – Mineralogical analysis carried out using X-Ray Diffraction (XRD) on the powdered fragments
  – Microscopic description of thin sections of the fragments to identify the minerals in the fragments will be carried out later
• Typological description:
  – Texture an nature of the composing elements
  – Techniques of manufacture and decoration
  – Color of the paste
  – Response to firing
• On the basis of these observations the fragments were placed into 6 large groups subdivided into 24 subgroups
Groups based on typological description

- **Group A**: Quartz rich (CUA) Quartz either transparent or milky as the principal component (8 subgroups)
  - SB-C-183
  - SB-C-152
  - SB-C-522
  - SB-C-154
  - SB-C-534
Groups based on typological description

- **Group B**: Coarse (GRU) small rock fragments > 2mm predominate, although in general accompanied by very fine grains, very little quartz, extremely irregular fractures (5 subgroups)
  - SB-C-285
Groups based on typological description

- **Group C**: Very fine-grained (GMF), temper not identifiable with a hand lens. Rarely small isolated rock fragments (4 subgroups)
  - SB-C-268
  - SB-C-602
Groups based on typological description

- **Group D**: Bubble-like pores (BURB) ranging in size from less than 0.5 mm to 2 mm. Very rare occurrence of crystalline quartz (2 or 3 subgroups)
  - SB-C-489
Groups based on typological description

- **Group E**: Compact (COM). Solid paste; temper and clay well united. Occurrence of brown-reddish particles. No crystalline quartz. Very dark paste either due to composition or firing (2 subgroups)
  - SB-C-1637
Groups based on typological description

- **Group F**: Brown (MAR), Principal temper white milky and opaque grains (0.5 to 2 mm) (Kfsp, plagioclase). Few crystalline quartz. (3 subgroups)
  - SB-C-114
  - SB-C-148
Groups based on XRD analysis

SB-C-114

Group 1

Qtz: quartz
Kfs: K-feldspar (orthoclase)
Plag: plagioclase (labradorite)
Groups based on XRD analysis

Group 3

Qtz: quartz

Plag: plagioclase (albite)
Groups based on XRD analysis

SB-C-1637 Group 8

Qtz: quartz
Plag: plagioclase
Kaol: kaolinite
Groups based on XRD analysis

• With only a few exceptions the groups, distinguished based on visual classification of components and the potter techniques used, could be correlated with one single group based on XRD results
Groups based on XRD analysis

<table>
<thead>
<tr>
<th>XRD analysis</th>
<th>Visual classification and techniques used</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Qtz-Kfsp-Plag (labradorite)</td>
<td>MAR: brown CUA+: Qtz is principal component</td>
<td>The MAR sample contains a lot of Qtz, but the color of the paste, the spatula technique and fracture suggest a separate group</td>
</tr>
</tbody>
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### Groups based on XRD analysis

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<td>2: Qtz-Plag (albite)–Kaol</td>
<td>GMF fine-grained</td>
<td>Possible same raw material that was ground to become finer in order to produce a different quality of pottery</td>
</tr>
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<td>3: Qtz-Plag (albite)</td>
<td>GMF very fine grained showing an excellent manufacturing technique</td>
<td>This sample was analyzed before a visual description was made</td>
</tr>
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<td>4: Qtz-Plag (albite-labradorite)-Amphibole</td>
<td>CUA quartz bearing</td>
<td>Spatula technique excellent, color of paste uniformly black; surface coloring one outside and a different one inside. Preparation and firing show great care</td>
</tr>
<tr>
<td>5: Qtz-Kfsp Plag (albite) Amph</td>
<td>CUA quartz bearing</td>
<td>Spatula technique less careful, color of paste not uniform. Composing grains not uniformly distributed</td>
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<td>6. Qtz-Plag (andesine)-clay-amphibole-mica</td>
<td>MAR: brown</td>
<td>These three groups correlate well with three pottery groups distinguished on the basis of visual description</td>
</tr>
<tr>
<td>7. Qtz-Kfsp</td>
<td>PORO with holes as little bubbles</td>
<td></td>
</tr>
<tr>
<td>8. Low intensity X-rays, not very crystalline. Kaolinite?</td>
<td>COMP solid paste, well joint temper and paste, looks glassy</td>
<td></td>
</tr>
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</table>
Summary & Conclusions

• This is a progress report of our attempts to correlate pottery types with their mineralogical composition
• A number of the pottery types distinguished correlate directly with composition
• Needed are thin section for microscopic description of the minerals and textures
• Needed are better analyses to identify the types of clay in the paste
• The mineral associations encountered in the pottery fragments do not represent naturally occurring assemblages, and as a result the compositions can not be correlated with possible source material
Acknowledgements

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