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The ceramics of the Malpaís of Zacapu during the Early and Middle Postclassic periods (900-1450 AD)

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Introduction

- Ceramic sherds belonging to two archaeological sites dated from the Early and Middle Post-classic periods (900-1450 AD) and situated on the Malpaís of Zacapu, in the Mexican state of Michoacán (Fig. 1), have been investigated by a combined multi-analytical approach.
- The ceramic material has been excavated within the framework of the Uacúsecha project (directed by G. Pereira, CNRS/MAE/CENCA) and belongs to two historical phases: the Palacio phase (900-1200 AD) and the Milpillas phase (1200-1450 AD).
- They represent a long period of cultural changes which led to the creation of the centralized Tarascan state, in the middle of the 14th century. While at the Palacio period painting decoration on ceramics was rare (Fig. 2), the Milpillas pots regularly exhibited a polychrome white and red painting associated to negative decoration (Figs. 4 and 5).

Fig. 1 - Location of Malpaís of Zacapu at Michoacán, Mexico.

Experimental

- µ-XRF was performed using Tomando M4 from Bruker, equipped with a Rh tube with a poly-capillary lens and a SDD detector with energy resolution of 142 eV for Mn-Kα. Analysis were carried out at 50 kV; 300 μA under 20 mbar vacuum conditions.
- BSEM-EDS using a Hitachi S3700N interfaced with a Quanta EDS microanalysis system. The Quanta system was equipped with a Bruker AXS XFlash 6 silicon drift detector (129 eV spectral resolution at FWHM/MKo). Standardless PZAF quantitative elemental analysis was performed using the Bruker ESPIRIT software. The operating conditions for EDS analysis were as follows: BSEM mode (BSEM), 20 kV accelerating voltage, 10 mm working distance, 120 μA emission current. The detection limits for major elements (+Na) were in the order of 0.1 wt%.
- Raman analyses were undertaken using a Horiba Jobin Yvon XploRA spectrometer operating at 785 nm. Scattered light was collected by a 100 x objective with a pinhole of 300 μm and an entrance slit of 100 μm, and dispersed onto an air-cooled CCD array of an Andor Idux detector by a 1200 lines/mm grating. Raman microscopy was performed in a range of 100-1800 cm⁻¹. The identification of pigments was made with Spectral IQ™.

Results

Palacio phase (900-1200 AD) – El Palacio archaeological site

Conclusions

- This study is the first one taking into account material from Michoacán. It brings valuable information on various levels. Energy dispersive (XRF and SEM+EDS) and Raman spectroscopic analysis indicate the use of amorphous Carbon, Hematite and Magnetite based pigments. The presence of Magnetite and Carbon black suggests a firing under a reducing atmosphere (which confirms the characteristics of the paste that indicate a reducing firing and an oxidizing cooling for the Milpillas phase).
- Titanium oxides in the form of Anatase were also detected on the ceramic surface from Milpillas phase, evidencing the use of a firing temperature below 900° C (13).
- Back-scattered Electron Microscopy EDS mapping revealed how the pigments are not evenly distributed within the painted slip but occur in grains and patches.
- In comparison, the imported ceramic is different. A Bromine-based pigment could have been sourced from the sea. It raises questions on the variability of supply of raw materials between the region of origin of this sherd and those produced near the Malpaís of Zacapu.

References


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