



Original Paper

Chemical-Mineralogical Analyses of the Exquisite Pottery of Life Cycle from Prehistoric Cemetery of Keshik in Sistan and Baluchistan, Southeast Iran



Yasin Sedghi^{*1}, Akbar Abedi², Mehdi Razani², Mohammad Heydari³

¹M.Sc. in Archaeometry, Faculty of Applied Arts, Tabriz Islamic Art University, Tabriz, IRAN

²Assistant Professor, Faculty of Applied Arts, Tabriz Islamic Art University, Tabriz, IRAN

³Archaeology Expert, Administration of Cultural Heritage of Sistan and Baluchistan, IRAN

Received: 04/03/2017

Accepted: 20/06/2017

Abstract

Notwithstanding the existence of such famous sites as Shar-i Sokhta from the Bronze Age, southeastern Iran represents a lacuna in Iranian archaeology. Chance discovery of the prehistoric, third millennium BC, site of Keshik in Nikshahr, Sistan and Baluchistan Province provides an opportunity to study new archaeological finds from this quarter of Iran. The main part of Keshik was a Bronze Age cemetery, which yielded important metal and ceramic objects, not to mention burial remains. The excavated assemblages included a distinct ceramic jar which warranted more detailed systematic observations by virtue of the symbolic motifs ornamenting its exterior surface. The jar has received the designation the Life Cycle because of these figurative designs arranged in six alternative panels which depict round the upper body of the vessel in a symbolic form the life cycle of a goat. The related panels show: 1) the figure of a goat native to Sistan, 2) the mating of goats, 3–5) the mother goat feeding her baby goat, which gradually grows up from the 3rd to 5th panel, and 6) the baby goat together with its mother. The major archaeological question with regard to this idiosyncratic vessel was its chemical-mineralogical characterization. Hence, a chip specimen was sampled to address such issues as its geological source, manufacturing techniques, firing and kiln conditions, local or foreign provenience, and the nature of pigments involved in the paint. To determine the crystalline constituents, different mineralo-chemical investigations were undertaken. The major phase compositions of the vessel's body as well as the pigments were determined using quantitative X-ray diffraction (QXRD), and scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDX). Also, the thin-section of the pottery was analyzed by optical microscopy techniques so as to petrographic identification of the minerals. The result of phase identification showed that the sample generally contains quartz, plagioclase, diopside, berlinite calcite, hematite, and enstatite as main crystalline phase constituents. Moreover, mineralo-chemical investigations demonstrated a regional alluvial soil origin related with the Keshik River, suggesting an indigenous provenience for the vessel. Further, the paste lacked any mineral variety. Firing in an oxidizing and reducing atmosphere was also evident given the carbon peaks and the poorly fired gray core of the thin-section. Analyses of the paint used in the decorative designs revealed the presence in the pigment of iron and manganese. The two elements were typically used because of their long-term sustainability and mineral base, and in combination with each other, they created a brown to black tone. In short, the study suggested that the so-called Life Circle jar was locally produced using the local clay on the potter's wheel, was fired at a temperature of 900-1000 °C in a closed oven under

* Corresponding author: yassinsedghi@gmail.com

oxidizing and reducing conditions, and was decorated with a paint containing iron and manganese pigments.

Keywords: Life Cycle Jar, Characterization, Bronze Age, Keshik Cemetery in Sistan and Baluchistan, XRPD, SEM-EDX, OPM.

Archive of SID