



Spectroscopic characterization of recently excavated archaeological potsherds of Taquara/Itararé tradition from Tobias Wagner site (Santa Catarina – Brazil)



Thiago G. Costa ^{a,*}, Marcelino D. de M. Correia ^a, Lucas Bond Reis ^b, Sailer S. dos Santos ^c, Juliana Salles Machado ^{b,d}, Lucas Bueno ^b, Isabela da Silva Müller ^b

^a Laboratory of Materials, Atelier for the Conservation-Restoration of Movable Cultural Heritage, Fundação Catarinense de Cultura (Santa Catarina Culture Foundation), 88025-200 Florianópolis, SC, Brazil

^b Laboratório de Estudos Interdisciplinares em Arqueologia, Universidade Federal de Santa Catarina, Brazil

^c Laboratório de Materiais Inorgânicos, Departamento de Química, Universidade Federal de Santa Maria, 97105-900 Santa Maria, RS, Brazil

^d Museu de Arqueologia e Etnologia, Universidade de São Paulo, Brazil

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ABSTRACT

Ceramic fragments provide one source of information for archaeologists about the way of life of different ancient population groups, especially concerning cultural identity, social organization and economics. By using scientific techniques of analysis, it is possible to elucidate the process of pottery production, as well as the specificities of the material used. In this paper, archaeological potsherd samples of the Taquara/Itararé Tradition collected in the research in Tobias Wagner site (TWG) were analyzed by spectroscopic methods and their micromorphology elucidated by electron microscopy. Semiquantitative elementary analysis using EDS showed that the elements in high content in the samples are Al, Si and Fe while in a lesser amount we found K and Ti. The sample TWG 219.8.2 presented accurate features of Zr, which may be a marker associated with the site where clay was collected. The main minerals that constitute the analyzed ceramics are kaolinite, quartz and haematite, and TiO₂ in the form of anatase present in the samples just in small quantities. The micromorphology of all samples is demonstrated to be very similar, presenting a heterogenic form with little particles of different geometries. With these results, it is estimated that the firing temperature of the fragments was at the most 850° C.

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1. Introduction

Ceramic vestiges found in archaeological sites are frequently considered as materials that identify the horticulture and/or the agriculture practice by ancient population. In the course of the process of ceramic manufacture, the artisans have to make choices, concerning the clay used, antiplastic agent additional to paste, potsherds manufacture techniques, firing, decoration, etc., which are carried out considering as well as the cultural aspects as performance characteristics. This set of choices specifies the operative chain of ceramics production and it can offer important information for the knowledge of ceramics cultural repertory, allowing a better comprehension of its production technology and its changes during time (Van Der Leeuw, 1993; Orton et al., 1993).

Through the ceramic vestiges analysis, it is possible to obtain information about the technology used on its production and application by a specific cultural group. For a better comprehension about this particular productive process it is necessary to conciliate both the result from archaeological analysis focused on technologic characteristics of

production, including technique features related to raw materials, related to processing forms, to the choices of performance, construction and use of ceramics vestiges – including vestiges' morphologic and formal aspects, as well as the physicochemical analysis.

Therein, with the aim to a better comprehension of the manufacture process and structural characteristics of the ceramics vestiges from Taquara/Itararé¹ Tradition collected in Tobias Wagner² archaeological

¹ Taquara/Itararé Tradition ceramic is associated to pre-Itararé occupation developed by groups speaking the Jê family language. In the south of Brazil, in general, these groups consist on the ancestral from indigenous groups Kaingang and Xokleng. Nowadays, these population live in indigenous lands nestled in the plateau and mountains in the states of São Paulo, Paraná, Santa Catarina and Rio Grande do Sul.

² The group from Laboratório de Estudos Interdisciplinares em Arqueologia (LEIA) from Universidade Federal de Santa Catarina (UFSC), coordinated by professor Dr. Lucas Bueno, had three excavation stages in Tobias Wagner archaeological site between 2014 and 2015. Three pit houses and a feature on surface (denominated Area 1) had interventions, totalizing 10,25m² of area excavated from superficial plane. Through the excavation, eight stratum which form the site were identified. In seven of them they were collected archaeological vestiges. In general, the material found consist on archaeobotanical vestiges (charcoal, seeds and pinewoods node), lithic (chipped, polished and pecked ones) and ceramic fragments associated to Taquara/Itararé Tradition. One charcoal sample collected on Area 1 was dated in 300 ± 30 A. P (Beta-410430).

* Corresponding author.

E-mail address: atecor@fcc.sc.gov.br (T.G. Costa).

site, nestled in the south of Brazil, they were employed as part of this research spectroscopic analysis as FTIR, μ -Raman and EDS, as well as scanning electron microscopy for the morphologic study. It is important to say that it is a set of techniques widely adopted to characterize these artifacts and the correlation with its respective manufacture (Manoharan et al., 2015; Manoharan et al., 2007; De Benedetto et al., 2002; Shillito et al., 2009); then, it is possible to emphasize that studies of this type are widely complex and only the use of different analytic techniques can provide a suitable result (Silvano et al., 2003).

2. Materials and methods

2.1. Excavation and sample's collection

Tobias Wagner archaeological site (TWG), nestled in Lomba Alta, countryside of Alfredo Wagner, state of Santa Catarina, Brazil, under coordinates UTM 22J 658458/6932788 (WGS84), is formed by 18 pit houses (Fig. 1). It presents yet features and occurrences on surface. The vestiges are dispersing on an area of approximately 2000 m². Part of the site is covered by Atlantic Forest, and on the rest there is *pinuselliottii* plantation. The ceramic vestiges were found too fragmented and they were collected in profundity of 1,30 m in the archaeological record of a pit house (E01). All samples are come from strata 02 and 03, which consist on the base of the pit house (E01) – context of ancient occupation of this space. These vestiges were collected, packed individually, tagged and carried to laboratorial analysis. It can be observed on Fig. 2 a photograph of each of the fragments collected and analyzed.

2.2. Fourier transform infrared spectroscopy – FTIR

The infrared spectra were collected in the equipment JASCO, an spectrometer model FTIR-4100 with 4 cm⁻¹ resolution, in pastilles of KBr in which approximately 5 mg of each sample was homogenized for analysis, and they were performed in the minimum three different places in each sample to confirm the results, and all the spectrum were collected with 64 scans.



Fig. 2. Ceramic samples collected in Tobias Wagner site – TWG.

2.3. Micro Raman spectroscopy – μ -Raman

Samples were spread on a mirror glass plate and analyzed with a Bruker Senterra micro-Raman spectrometer. The best spectra were collected using 532 nm wavelength line with 10 mW of illumination power. The exposure time was 10.0 s and 5 coadditions were taken. The macro configuration generated very bad spectra, so an aperture of 50 μ m was used to get real confocal measurements of isolated grains. The scattered beam was collected by an Olympus 50 \times objective.

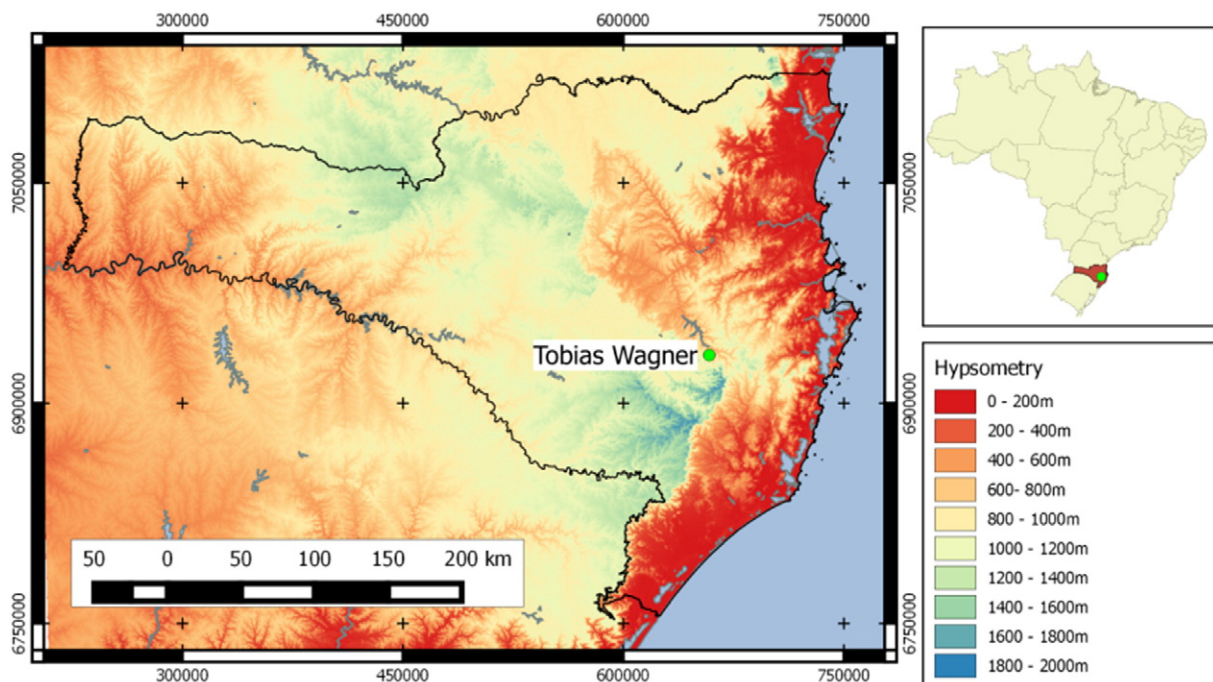


Fig. 1. Map with Tobias Wagner archaeological site location in the state of Santa Catarina and in Brazil.

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