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Raman spectroscopy, XRF, SEM-EDS and powder X-ray diffraction characterization of Amazonian indigenous archaeological ceramics

Gerson A. C. Lopes (PG)[1,2*], Javier A. Ellena (PQ)[1], Kléber O. Souza (PQ)[3], Daniel Atencio (PQ)[4], Marcelo B. Andrade (PQ)[1].

g.anderson@ifsc.usp.br

[1]Instituto de Física de São Carlos, USP; [2]Laboratório de Física, UEAP; [3]Centro de Estudos e Pesquisas Arqueológicas do Amapá, UNIFAP; [4]Instituto de Geociências, USP.

Palavras-chave: *Cultural heritage, Amapá ancient people, Crystallography, Mineral composition.*

Highlights

This study presents a vibrational, chemical and structural characterization of indigenous ceramics from Amapá, Amazon, Brazil and aims for further discussion on the technology used by ancient people from Brazil's North Region.

Abstract

Amazonian archaeological studies have grown in the last decades. However, most studies do not focus on vibrational, chemical and structural analyses. Raman spectroscopy, combined with other techniques such as XRF, SEM-EDS and powder X-ray diffraction, are important to provide composition data of these ceramics, specially on its mineral composition. These analyses allow further discussion on the process of fabrication of the ceramic pieces, the type of heating and temperature reached and the possible source for the raw materials.

Four ceramic pieces from Ilha Mirim archaeological site, Macapá-AP, were analyzed by several techniques (Fig. 1). XRF data indicated as main elements present Si, Al, Fe, Ti and K. Other presences were Mg, P, Ca, S, Zr, Ce, V and Ba. Powder X-ray diffraction indicates the main crystalline phases as quartz, ilite (mica group) and albite (feldspar group). SEM-EDS indicates the presence of Si, Al, Fe, Ti, Ca and K, and showed evidence on the presence of fibers.

Raman spectra of the samples were compared with RRUFF database using CrystalSleuth software, and the samples showed to be heterogeneous, presenting three different regions with main colours: black, white, and red. Black region showed to be hematite (Fig.2). White and Red regions, in turn, showed no direct correspondence, possibly due to heterogeneity or fluorescence, and are still being analyzed.

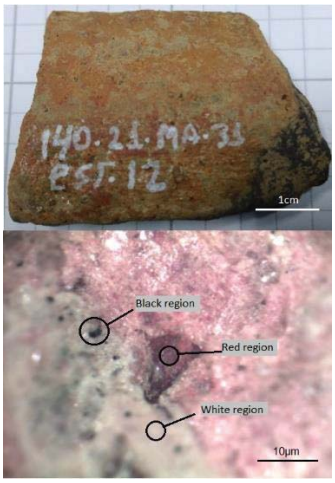

Figure 1: Different regions in ceramic sample

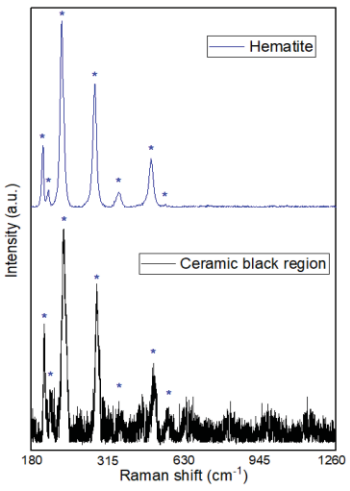

Figure 2: Raman spectra of the black region of ceramic.

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