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Between cooking and knapping in the southern Caucasus: Obsidian-tempered ceramics from Aratashen (Armenia) and Mentesh Tepe (Azerbaijan)

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ABSTRACT

Obsidian-tempered ceramics represent a typical production of the Chalcolithic period in the southern Caucasus. Previous studies have already assessed the viability of LA-ICP-MS analysis to identify the provenance of the obsidian temper contained in the ceramic paste. In this article the results of the analyses of the obsidian-tempered ceramics and of the obsidian lithic artefacts from the sites of Aratashen (Armenia) and Mentesh Tepe (Azerbaidjan) are compared. The aim of this comparison is to define analogies and differences in the modalities of acquisition of the obsidian as they are revealed by ceramic and lithic production at two sites that were localised at different distances from primary and secondary sources of obsidian. The results of this comparison allowed us to highlight different modalities of provisioning and exploitation of the same raw material by knappers and potters.

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1. Introduction

The Chalcolithic period in the southern Caucasus – the region comprising the modern states of Georgia, Azerbaijan and Armenia – can now be firmly placed, in absolute chronological terms, between the fifth and mid-fourth millennia BC. Although its chronology is well defined, the Chalcolithic period is still one of the least understood in terms of the region's social and cultural development.

Scholars have agreed that a specific material culture assemblage emerged at a particular moment of the Chalcolithic period: the so-called Sioni cultural complex, named after the eponymous site of Sioni in southern Georgia, that comprises a specific set of architectural and ceramic traditions (Kiguradze, 2001; Kiguradze and Sagona, 2003; Lyonnet, 2017a). As for the ceramic traditions, they include the vegetal-tempered pottery, but several authors (e.g., Lyonnet, 2012, 2017a, 2017b) have also pointed out the presence of another type of ceramic production with highly specific technical, morphological and decorative features (Fig. 1: a). This pottery is characterised by obsidian temper in the paste (Fig. 1: b-d), on smoothed or burnished surfaces, and very specific decorative repertoires including incisions and comb-impressions applied exclusively on the rim (Kiguradze, 2001; Kiguradze and Sagona, 2003; Sagona, 2014). In reference to the morphological repertoire, several sites record a clear preference for necked jars.

"Sioni ware" is the label suggested by some authors for this type of ceramics (Sagona, 2014: 30), after the Georgian site where it was first discovered and where it is also particularly abundant. The practice of adding obsidian to ceramic paste may not be surprising in the southern Caucasus if we consider that this region has one of the largest concentrations of obsidian sources in the world. So far, more than 20 obsidian outcrops comprised of 14 geochemical groups have been identified in Armenia and Georgia, not counting several secondary deposits, and these figures are even higher if we

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Fig. 1. a) Obsidian-tempered ceramics from the site of Sioni (Georgia) (photo by G. Palumbi with courtesy of M. Menabde); b, c, d) cross-sections of obsidian-tempered ceramics from the site of Aratshen (Armenia) (photo by B. Gratuze).

also consider the numerous obsidian sources of eastern Turkey such as those in proximity of the Lake Van and in the regions of Kars and Erzurum (Chataigner and Gratuze, 2014a, 2014b) (Fig. 2). The chemical identification of these sources allowed authors to create a database (Blackman et al., 1998; Chataigner and Gratuze, 2014a, 2014b), and it is used here for determination of the provenance for obsidian artefacts and pottery temper.

Going back to the obsidian-tempered ceramics, while the availability of obsidian in the region may have encouraged the exploitation of this raw material for the production of a very specific type of pottery, the fact that obsidian-tempered ceramics was systematically produced at a given moment during the Chalcolithic period could point to an intentional and meaningful choice by the potters.

Research on the obsidian-tempered ceramics of the southern Caucasus is still in its initial stages; however, in a previous work which focused on the obsidian-tempered ceramics of Aratashen in Armenia, we argued that the provenance of obsidian inclusions in the ceramic paste could be established, and that obsidian sourcing models could be used by analysing the ceramic temper (Palumbi et al., 2014). In this paper, we continue to investigate the heuristic value of analyses on obsidian-tempered ceramics with the aim of reconstructing the patterns of provisioning and exploitation of this volcanic glass at the Chalcolithic sites of Aratashen (Armenia) and Mentesh Tepe (Azerbaidjan), by comparing data from ceramics and lithic artefacts.

Aratashen and Mentesh Tepe are located in different ecological regions and at various distances from primary and secondary sources of obsidian, and these differences may have affected the modalities of procurement, exploitation and use of obsidian in the framework of the chipped stone and pottery productions. In this study, we will explore the level of interdependence between lithic and ceramic productions as interacting parts of the same technical systems (Lemonnier, 1986) that were partially or fully dependent on the provisioning of the same raw material, i.e., obsidian.

2. Methods

The analysis of obsidian inclusions was carried out at the Centre Ernest-Babelon of the IRAMAT (CNRS/Université Orléans) using Laser Ablation - Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS). The standard analytical protocol developed for obsidian analysis has been adapted to the very small size of obsidian inclusions by reducing the diameter of the ablation pits to the interval between 40 μm and 80 μm. In order to avoid overshooting the thinnest inclusions, the laser pulse frequency was reduced to 5 Hz, and the analytical time was reduced from 70 to 55 s (15 s for pre-ablation and 40 s for analysis), according to the protocol already tested in previous works (Palumbi et al., 2014). Despite these precautions, thinner inclusions were occasionally overshot. In this case, a calculation protocol was developed to measure the concentrations of obsidian inclusion separately from the ceramic paste. Finally, when the inclusions were too thin, the ablation was conducted in raster mode on its surface.

The obsidian-tempered ceramics from Aratashen and Mentesh Tepe were sampled according to two different procedures. In the case of Aratashen, where sherds could be taken to the laboratory, the sampling of inclusions was carried out together with the analysis. In the case of Mentesh Tepe, obsidian inclusions at first were sampled *in situ* by removing them from the clay paste; and afterwards analysed in the laboratory.

In order to improve the sampling protocols for obsidian inclusions and to test the representativeness of the analysis considering possible bias in the sampling of inclusions induced by their size, colour, density and orientation, we also set up an experimental session consisting of the manufacture of five clay briquettes tempered with obsidian from three different sources. The experimental session was conceived as a “blind” test as the analyst of the obsidian inclusions (Bernard Gratuze) was unaware of the provenance of obsidian temper and of the relative proportions of obsidian from each source added by the potter (Giuseppe Pulitani) to the clay briquettes. The five briquettes were tempered with obsidian from three sources: Arteni, Tsaghkunyats, and, Sevkar-Syunik (Fig. 3). Three briquettes were tempered with obsidian from a single source, and the other two contained a mixture of obsidian temper. In one case, it was composed of crushed obsidian from the sources of Arteni (50%) and Tsaghkunyats (50%) (briquette A-B, Fig. 4); in the second case, the mixture was composed in equal measure (33,3%) of obsidian from all three sources (Arteni, Tsaghkunyats and Sevkar-Syunik) (briquette A-B-C, Fig. 4). For the briquette with obsidian from two sources, the analysis of ten inclusions could only reveal the qualitative composition of the obsidian temper but not a reliable quantitative proportion of the obsidian temper (Fig. 4). In the case of the briquette tempered with obsidian from three sources, analysis of 30 inclusions was necessary to get the quantitative proportions of temper (Fig. 5). This trial allowed us to determine that no less than 30 inclusions need to be analysed in order to get a composition of the obsidian-temper in each sherd, and that the statistical reliability of these analyses increases with the number of analysed inclusions.

At Aratashen, 123 obsidian inclusions in 14 ceramic sherds were analysed, corresponding to an average of nine inclusions per sherd (up to 27 inclusions in a sherd). At Mentesh, 78 obsidian inclusions in 47 ceramic sherds were analysed; in most cases, only one inclusion was examined, and the maximum number was nine per sherd. These two procedures correspond to two different sampling methods that we can define as sherd-intensive for Aratashen and sherd-extensive for Mentesh Tepe (Fig. 6).

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