The phytolith analysis of ceramic thin section. A brief introduction

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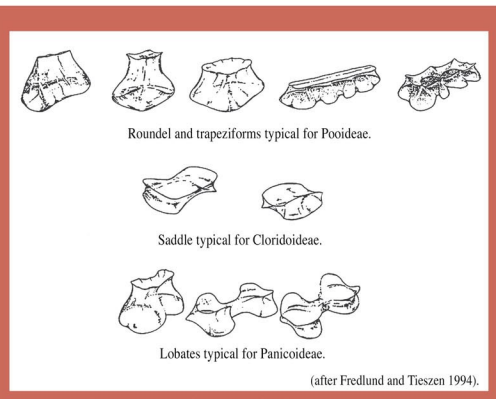

Fig. 1 Morphologies typical for the grass subfamilies.

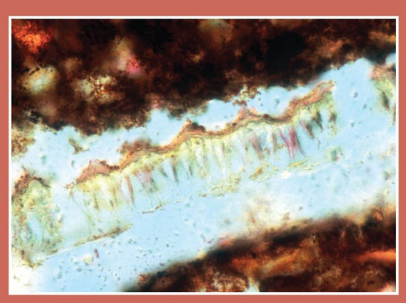

Fig. 2 ed-Dur. Rice phytolith within voids (x400).

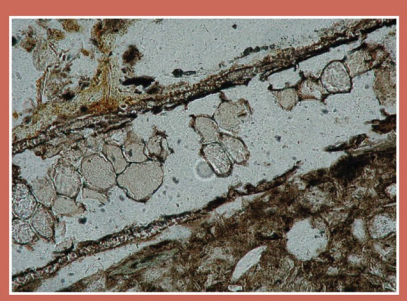

Fig. 3 Szarvas 8. Polyhedral phytoliths (x400).

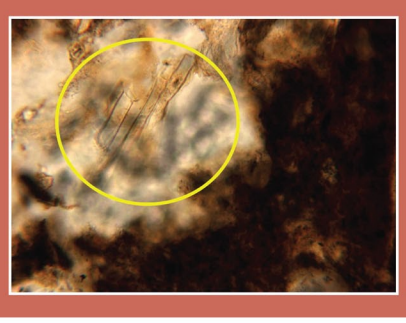

Fig. 4. Bernier. Epidermal cells (x400).

Introduction

Phytoliths are inorganic remains of botanical origin. While they present various chemical compositions, calcium oxalate ($CaCO_3$) and opal (SiO_2) phytoliths are the most frequent ones reported in the literature.
The opal phytoliths originate from intra-, inter-, or cell wall mineralization. Their morphology differs according:

a) to the plant organ
b) to the botanical taxa (Fig 1)

Opal phytoliths have been recorded in thin sections of ceramics coming from the Gulf (ed Dur, Umm al-Qaiwain, U.A.E) (Fig. 2), central Europe (Szarvas 8, Hungary) (Fig. 3) and northern France (Bernier, Valencienne) (Fig. 4). They were also observed in material originating from Central Africa.

Addressing the signification of phytoliths recorded in ceramic thin sections calls for a descriptive protocol. The present contribution intends:

a) to introduce such a protocol;
b) to illustrate the results one might expect by recalling part of the study of the ed Dur site.

The protocol

- *The description*

At least one line of the widest width and the longest length of the section are scanned at magnifications x250, x400 and x1000.

- *Recording the observations:*

Four indexes are to be considered:

- the Phytolith Absence/Presence (A/P).
Are phytoliths recorded or not?
- the morphotype index (M).
Which morphotypes are observed?
- the Conservation index (C).
Are the phytoliths well preserved or not? Three preservations states are *a priori* defined:
1. The phytoliths are perfectly preserved;
2. The phytoliths are damaged but their morphology remains identifiable;
3. The morphology is not recognisable anymore.

- The Distribution index (D).
Indicates if the phytoliths are distributed in the fired ceramic matrix or in the pores of the pasta.
Phytoliths from the fired matrix are understood as natural inclusions of the clay.
The presence of phytoliths within the pores is explained by the decomposition of the plant material used as temper.

The ed Dur case study (Umm al-Qaiwain, U.A.E.).

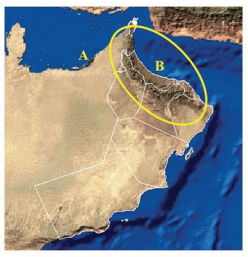

Fig. 5. Localisation map. (A): ed Dur
(B): the Semail Ophiolite Complex.

Ed-Dur is located on the southern side of the Arabian Gulf (Fig. 5, A).

In a first stage, 148 sherds were submitted to petrographical and chemical analysis. It provided the basis for the selection of 81 representative thin sections for phytolith analysis.

For the posherds originating from the Omani Semail Ophiolite complex (Fig 5, B), the study:

1. establishes the presence of identifiable phytoliths (Fig. 6);
2. identifies a Graminae, *Sporobolus sp.* (Fig. 7 & 8).
Sporobolus being a common of a typical feature of the landscape (fluvio-lacustrine sabkhas), it reinforces the identification of the regional origin for some groups;
3. notes differences in the distribution of the phytoliths (table 1):

- palm phytoliths characterise the fired fabrics of only 2 ceramic groups (OVTW & COW). It suggests the clay probably originate from at least two areas within the Omani mountains.
- the *Sporobolus* phytoliths are recorded in the pores of 3 of the ceramics groups (OVTW, COW & CYPSW).
This distribution proposes that while some pottery groups share a comparable source of clay, the pottery processing might differs.

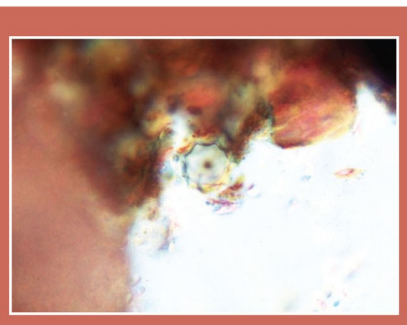

Fig. 6. Local Production. Palmae phytoliths (x1000).

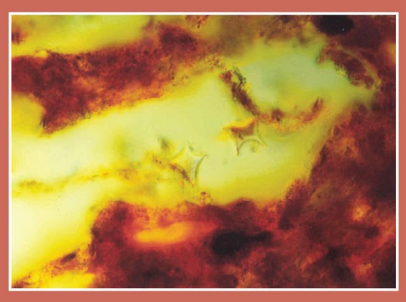

Fig. 7. Local Production. Rounded trapezoids (x1000).

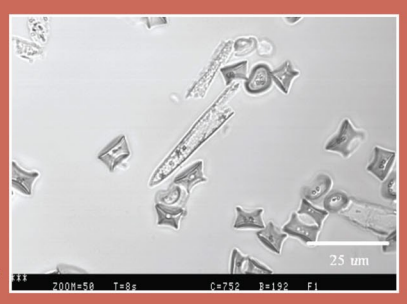

Fig. 8. Rounded trapezoid extracted from *Sporobolus sp* reference material (picture by T. Ball) (x400).

Ceramic Groups	Fired Matrix	Pores
OVTW	Palm	Sporobolus
COW	Palm	Sporobolus
CYPSW	-	Sporobolus
CPBW	-	-

Table 1: Phytolith distribution within the fired fabric and pores of the pottery originating from the Semail Ophiolite Complex.

Conclusions

The phytoliths analysis of potsherd thin section helps refining results gained by the petrographic and chemical analysis. As so, it successfully contributes to archaeological and archaeoenvironmental research.

References:
De Paepe, P., Rutten, K., Vrydaghs, L. and Haerinck, E. 2003. Petrographic, chemical and phytolith analysis of late pre-islamic ceramic from ed-Dur, Um el-Kawein (U.A.E.). In: Potts, D., Hasan Al Naboodah, H. and Hellyer, P. (eds.): Archaeology of the United Arab Emirates. Proceedings of the First International Conference on the Archaeology of the United Arab Emirates. 207-229.

Vrydaghs, L., De Paepe, P., Rutten, K. and Haerinck, E in press. A space of exchanges. Phytolith analysis of ceramic thin sections from ed-Dur (Umm al-Qaiwain, U.A.E.). In: Madella, M. and Savard, M. (eds) Ancient plants and People. Contemporary trends in archaeobotany. Arizona University Press.

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