

**POTTERY SEQUENCE OF 7000 YEARS:  
ARCHAEOOMETRICAL STUDY OF POTTERY FINDS FROM  
VÖRS, MÁRIAASSZONY-SZIGET**

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**PhD dissertation summary**

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Budapest  
2009

## **Introduction**

In the past few decades interest has been drawn to the archaeometric analysis of pottery as a complement to traditional archaeological interpretation. The important aim of getting to know ceramic production technologies may only be achieved by looking beyond relative chronologies based on vessel-forms and simple models of change, to a detailed analysis of pottery production and consumption. In doing so, scientific analysis – mostly based on petrographic, geochemical and mineralogical methods -- plays an important role. In the past ten years important results have been achieved in Hungary as well.

This thesis deals with the archaeometrical analysis of the pottery assemblage of a multi-period archaeological site, Vörs, Máriaasszony-sziget (ARADI, 1992; KALICZ et al., 1998, 2002). The site lies in Southwest Hungary, near Lake Balaton, where the exceptionally favourable environmental endowments of the territory offered an ideal setting for habitation: 8 distinct periods are separated on the basis of traditional archaeological methods. Following archaeological investigation 6 periods were selected for detailed archaeometrical study: Starčevo culture (Early Neolithic), Lengyel III culture (Early Copper Age), Furchenstich pottery culture (Middle Copper Age), Kostolac culture (Late Copper Age), Kisapostag culture (Early Bronze Age), La Tène culture (Late Celtic/Early Roman Age). 105 pottery samples from the 6 periods were selected for archaeometrical study. 31 samples from coeval nearby sites, together with local sediments were also analysed for comparison.

## **Aim of the research**

The aim of the research was to answer the questions of what? how? and where? (ORTON, 2009), in connection with the pottery assemblage, that is to obtain information on

- 1) what kind of raw materials were used by ancient potters,
- 2) how did pottery making recipes change throughout the 7000 thousand years of the site,
- 3) what is the provenance of the pottery finds/raw materials.

As in the beginning of the program there were hardly any pottery analysis data on Prehistoric pottery available to make comparisons, it was also an aim of the project to provide reference material for the future analysis of Transdanubian Prehistoric pottery.

Another aim was to elaborate a provenancing method for multi-period sites, based on petrography and geochemistry, in territories where -- for example in the Carpathian Basin – potential raw materials having no distinctive petrographic composition occur in wide areas.

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## Methodology

### Petrography

Petrographic analysis was carried out at the Department of Petrology and Geochemistry of Eötvös University on an ALPHAPHOT-2 polarizing microscope. Composition and fabric analysis was done on 136 pottery and 3 raw material samples. For the investigation 30µm thick thin sections were prepared. On 58 selected representative pottery samples quantitative analysis (volume percent) of the temper grains was performed.

### Geochemical analysis

In order to define major and minor element composition of the pottery and raw material samples X-ray Fluorescence Analysis (112 pottery and 7 raw material samples) and Instrumental Neutron Activation Analysis (68 pottery and 6 raw material samples) were performed. X-ray Fluorescence Analysis was carried out at the Department of Geochemistry of the University of Tübingen (Germany). Measurements were made by Heinrich Taubald and Farkas Pintér, on a Bruker AXS S4 Pioneer equipment, using Rh anode.

Neutron Activation Analysis was carried out by Márta Balla and Zsuzsa Molnár at the the Institute of Nuclear Techniques (INT) at the Budapest University of Technology and Economics.

The incrustation material of the so called incrustated ceramics (inlaid with, typically, calcareous material) was analysed at the Department of Petrology and Geochemistry of Eötvös University by Gálné Sólymos Kamilla. Backscattered electron images were made using an AMRAY 1830 I/T6 equipment with an (BEI) EDAX PV 9800 energy dispersive spectrometer.

#### Analysis of mineralogical composition

Potential raw materials and pottery samples together with the incrustation material of incrustated pottery were analysed at the Institute for Geochemical Research, Budapest. Measurements were carried out by Mária Tóth on a Philips PW 1730 type, Bragg-Brentano x-ray powder diffractometer. Whole pottery analyses were performed on powdered samples, and selected samples were subjected to ethylen-glycol treatment. 8 so called sandwich ceramics, 4 incrustation material and 5 raw material samples were analysed.

### Results

1. Petrographic investigation revealed that in the assemblage from Máriaasszony-sziget there is a pottery group which can be described with uniform fabric and non-plastic inclusions (made of silty, fine sandy clay raw material) being present in all the examined cultures/periods. Geochemical analysis strengthened the hypothesis that this type of pottery represents local (near-site) 'basic' raw material that was used and tempered differently during the 7000-year-long life of the settlement.

2. The change in pottery making recipes during the 7000-year-long life of the multi-period site Vörs, Máriaasszony-sziget could be followed:

- In Early Neolithic Starčevo culture the 'basic' raw material was tempered with vegetal material,
- in Early Copper Age Lengyel III culture, Middle Copper Age Furchenstich culture, Late Copper Age Kostolac culture and Early Bronze Age Kisapostag culture with grog or with carbonate or quartz sand,
- and in Late Iron Age La Tène culture with carbonate sand.

3. By using geochemical and statistical analysis it was proved that differences in tempering discussed above reflect the use of different pottery making recipes, not different origin.

4. Comparison with local raw materials revealed that ancient potters did not obtain their raw material at the site itself, but most probably used a nearby clayey material having a similar geochemical composition to that of the Upper Pannonian clay at Battyánpuszta, although non-calcareous.

5. In the case of one Early Bronze Age pottery (2000A7É8) non-local origin of the pottery, suggested by archaeological interpretation, was proved. In the case of other four samples non-local origin was identified: vegetal tempered Early Neolithic Starčevo pottery (53/26), grog tempered Early Neolithic Starčevo pottery, grog tempered Early Copper Age Lengyel III pottery (43/02), La Tène pottery (51/05) tempered with graphite bearing metamorphic rock fragments. In the case of three other pottery samples -- 51/31 La Tène pottery containing sponge spicules in great amounts, carbonate sand tempered La Tène pottery 51/27, the 51/19 La Tène pottery made of well elaborated levigated raw material -- non-local origin was suggested.

6. Technological investigations showed that in the case of the so called incrustated ceramics (inlaid with, typically, calcareous material) of Late Copper Age and Early Bronze Age, the incrustation material is made not only of calcite but bone as well.

7. Firing conditions of the so called “sandwich” ceramics (fast heating rate, short soaking time, low maximum firing temperature (700—800°C)) were determined.

8. The research provided reference material for the future investigation of Transdanubian Prehistoric pottery.

## **Conclusion**

Based on the results of the research it can be stated that comparative petrographic and geochemical analysis of pottery samples from a multi-period archaeological site can lead to good results in provenance analysis even in territories where geologically distinctive formations are not on the surface.

## **Papers and abstracts written in the framework of the Ph.D. research**

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