EXPERIMENTS IN VIKING POTTERY

An Experimental Analysis of Organic Temper in Viking Age Pottery

By: Jessica Neal with contributions from Anders Olesen

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Abstract

Locally made ceramic vessels from the Viking Age in Ribe, Denmark reveal small, pinprick sized holes left from matter that burned away during the firing of the vessels. These holes are thought to be left behind from organic tempers added to the ceramics along with other non-organic tempers. In order to investigate the use of organic temper in Viking Age ceramics, a variety of organic materials was added to experimental ceramic vessels and fired to investigate the type, size, and distribution of the holes left behind from different materials. Four different clay types were also used in the experiment, to determine if the amount of naturally occurring organic material in clays from south west Denmark is enough to leave behind holes in the vessel. The experimental vessels were compared to securely dated Viking Age vessels from the Ribe area. This study concludes that the holes visible in Viking Age pottery most closely resemble the experimental vessels to which only non-organic temper was added and the holes are likely the result of naturally occurring organic material in the clay.

1. **Introduction**

Temper, in its archaeological capacity, refers to materials added to clay used to make ceramic vessels or other ceramic materials. Temper can be added intentionally or be already present in naturally harvested clays. Although adding secondary material to the clay weakens it, it is also needed to reduce the shrinkage of the vessels during the firing and drying process as well as too aid in the workability of the clay, making it an essential aspect of ceramics production (Skibo et. al. 1989: 123). Almost any kind of material can be used as a temper, both organic and non-organic in various quantities and huge variations in temper have been seen around the world in all time periods of ceramic production. Organic tempers have been used in many societies and have been theorized to the produce lighter, less breakable vessels (Reid 1984).

Viking Age Ceramics from Ribe

Locally made ceramics from Ribe around the 8th century AD are characteristically rough, course vessels with little decoration and black fired at relatively low temperatures. Sherds of this locally produced and fired pottery have been found in excavations at the Viking age marketplace in central Ribe as well as around the greater Ribe area. These pieces contain non-organic tempers and some have small, pinprick sized holes that have been theorized could be the remains of organic temper.

Research Questions

The primary research question of this project is: Did the early period Vikings near Ribe add organic temper to the locally made pottery or was the organic material in pottery naturally occurring? This will be both an experimental and experiential project and to answer this question an archaeological experiment was planned to make a variety of ceramic pots with different tempers and clays. This requires both archaeological knowledge of Viking age ceramics as well as practical experience in making and firing ceramics. Once made, the experimental pots will be compared to securely date archaeological examples found in the Ribe marketplace and Ribe area, that are known to be locally produced. This experiment will test practicality of using organic tempers as well as compare the results of the experimental pots with organic tempers to archaeological vessels with visible holes.

2. **Experimental Archaeology** By Anders Olesen

Experimental archaeology is as old as the discipline of archaeology itself but the different definitions presented here will be limited to those formulated in the second half of the twentieth century. However this is not meant to be an exhaustive presentation of all definitions of experimental archaeology, rather it is a taste of different approaches to the term.

A brief description of the beginnings of experimental archaeology would be that early on especially Scandinavian archaeologist such as J. J. Worsaae, who conducted experiment about formation processes in an attempt to gain a better understanding on how animal remains enter into the archaeological record, adopted an comprehensive methodology that emphasized an interdisciplinary approach to experiments (Shimada, 2005:605). In 1961 Ascher defined experimental archaeology as being imitative experiments that aim to test beliefs about past cultural behavior (Ascher 1961:793). A good decade later Coles states that experimental archaeology, is a tool that can be used to make statements about some of the basic economic activities of ancient man (Coles 1973:18). In his mind it is primarily subsistence and technology that can be assessed for their development and competence. Ingersoll and Macdonald have a more elaborate definition in as such that they see experimental archaeology as a field of research that seeks to test, evaluate and explicate method, technique, assumptions, hypothesis and theories at any and all levels of archaeological research through control of as many variables as possible (Ingersoll & MacDonald 1977:xii). As such it is a more positivistic approach to the kind of research that can be done through experiment. They also aligned themselves more closely with the scientific research paradigm of the natural sciences.

In 1992 Skibo offered a definition that experiments are a fabrication of materials, behavior, or both, in order to observe one or more processes involved in the production, use, discard, deterioration or recovery of material culture (Skibo 1992:18). And Schiffer and his co-authors describe experimental archaeology as a method of studying processes through the control of relevant variables within a system (Schiffer et. al, 1994:198). In 1995 Ole Crumlin-Pedersen describes experimental archaeology as a tool for the researcher to analyze the full potential of a ship find and to test the quality of the archaeological record and the documentation in general (Crumlin-Pedersen 1995:303-304). In this article he opposes the approach to experiments that John Coates et.al (Coakes et.al. 1995: 293-301) present in the same journal calling their approach a starting point rather than a definitive answer. His main opposition to the rigorous scientific approach adopted from the natural science by Coakes and his co-authors, is that it doesn't encompass the entire range of experiment being conducted. Crumlin-Pedersen also emphasizes that experimental archaeology needs to be multidisciplinary since no one individual is sufficiently knowledgeable in all aspects of a subject (Crumlin-Pedersen 1995:303). Whether you adhere to one or the other of these definitions is of minor importance since they all, to some degree seek to understand the processes of making a tool or a ship. To some degree they also seek to understand behaviors that produce the archaeological record, even though they disagree upon which levels inference can be made. As stated above Coles only believed that inference on the most basic levels of the human existence could be achieved through experimental archaeology, while Ingersoll and MacDonald believed that hypothesis and theories at any and all levels of archaeological research could be tested through experimental archaeology.

A good experiment

Experimental Archaeology has for some time lived a life of its own cut off from the theoretical debate within mainstream Archaeology. There has been a gap between the theory of experimental archaeology and the actual projects being carried out. The gap being that while most questions being asked today are best investigated within a post-processual framework, the theory and methodology is processual. Rather than accepting that these types of experiments can't be called experimental archaeology the practitioners have attempted to develop a new theoretical foundation and methodology that is better suited for their aims. It is the opinion of the Authors that both the processual and the post-processual way of doing experiments is valid and that it is the research question that determines which approach should be followed. In the following both ways will be described.

When doing experiments within natural science and when applying the same principles to archaeology there are certain things that need to be thought through and formulated in your research design. The first thing to do is to formulate an acceptable research hypothesis. Meaning that the hypothesis or question that you seek to investigate through an experiment should be a statement that is possible to answer through the procedures that are available or that can be developed at present (Kirk, 2013: 1). What constitutes an acceptable research hypothesis might be quite clear in the natural sciences, but in many cases of experimental maritime archaeology that deals with not only quantifiable experiments, but also behavioral aspects of ancient cultures, the picture is less clear. John Coates and his Co-Authors represent the application of scientific method of enquiry to experimental archaeology. It consists of six stages which need to be followed. The first stage is the observation of, and enquiry into an event or phenomenon. The second stage is the formulation of a hypothesis to account for the observation, in whole or in part. The third stage is the testing of the hypothesis followed by the fourth stage where the experimenter evaluates the results of the test. The fifth stage is the presentation of the whole process for criticism. Finally in the sixth stage the experiment is assessed once again and further research is carried out. The quality of the process will be affected by different factors. One of these is the quality of the observation or in other words the evidence that is the foundation of the hypothesis. Another is the rigour with which evidence is interpreted and used as a basis for hypotheses. Yet another issue that is crucial to Coates et.al. is the clarity of the following publication. (Coates et.al. 1995: 294).

Allan D. Franklin defines three different kinds of good experiments – crucial, corroborative, and new phenomena experiments. Crucial experiments support an existing explanation over an alternate explanation, corroborative experiment supports the basic idea of a single theory. New phenomena experiments produces a result that is unexpected based on existing explanations or theories, and thus leads to the development of a new theory (Franklin,1981:367-369). Any experiment is about to what degree you wish to control the variables that influence an experiment. In a strictly positivistic experiment you wish to control as many variables as possible. This is a way of thinking about experiments that is in line with the processual archaeology of the 60’s and 70’s. As already mentioned a lot has happened in archaeology since then, and the questions that are investigated through experiment today have more in common with the post-processual archaeology. This lead Marianne Rasmussen to introduce the term “contextual experiment” (Rasmussen 2001:6). A contextual experiment is an experiment that loosens the grip on the variables. It provides arguments and inspiration and it can evaluate the relevance of widely accepted interpretations. The outcome of contextual experiments can seldom be repeated and the outcome can often be unexpected, leading to new theories of how things might have worked in prehistory. If we consider the definitions of the “New Phenomena” experiment as presented by A.D. Franklin it would seem that the type of experiment that Marianne Rasmussen is talking about fits very nicely with this category of experiments. In the Lejre – Land of Legends they distinguish between five categories of experiments, technological, short-term, process-oriented, long term and experiments that deal with taphonomic questions (Rasmussen 2001: 5). In her mind experimentation reveal new aspects of the material culture and encourages new question and experiment leading to a hermeneutic circle. The need to be able to evaluate the quality of your experiment is present in both types of experiments. The question then remains, how do you evaluate an experiment when the majority of your data isn’t quantifiable?

Anna S. Beck offers her view on how to evaluate contextual experiment (Beck 2011:190). In her opinion the evaluation should be based on three parameters. The first parameter is the purpose of the experiment. It should first and foremost be research, while she acknowledges that communicational and educational elements can be included. The second parameter is the self-reflexivity. By this she means self-critique and the awareness of the experimenter’s role in the experiment, which should be thoroughly documented and reported. The final parameter is the final report or publication. According to her, everything should be documented and reported, also the things that went wrong. If the results are not written down, they can only be characterized as personal experience, not as experiments (Beck 2011: 191). In that respect she actually agrees with John Coates and his co-author who also stress the need for publication, and that the failure to do so diminishes the overall value of the project, even though she disagrees with the positivistic approach to experiments that is presented by Coates et.al. (Coates et.al. 1995:299). Another way of assessing the quality of an experiment is to evaluate it just as you do with analogies in archaeology, by discussing the relation between the analogy and the archaeological material record (Rasmussen 2001:5). These are the two basic research modes, with two different approaches to variable control, one is the lab setting and the other is the natural field setting. So to summarize, controlled experiment, sometimes called the lab setting, give a high degree of control of variable and makes replication of the experiment possible, but also narrows the range of question that can be examined in this mode. Often these experiments focus upon the physical properties of materials. The contextual experiment, sometimes called the natural field setting, relaxes the control of variables in order to replicate prehistoric situations and investigated questions of a non-quantifiable nature. The move away from the lab and the lesser control of the variables that follows will decrease the ability of the contextual experiments to be repeated. There are issues with both modes of experimentation. Even though we today can control a wide variety of variables, can we assume at a prehistoric culture could exert the same amount of control that we can, and can we assume that the variables we are controlling played any part in the operation of a task by an ancient culture (Schenck 2011:89)? An issue concerning contextual experiments are that we cannot, with any degree of certainty, replicate an ancient environment or situation (Shenck 2011: 91). In the above some of the theoretical problem s of experimental archaeology has been presented. It has not been our aim to produce a comprehensive overview of all issues concerning experimental archaeology, only to highlight some of the issue. Furthermore it has not been our intention to judge whether one or the other approach is better, since we see them, not as in competition but as supplementing each other. Thus when choosing one of the two settings your choice should be determined by the research question, but a mixture of the two can in many cases prove to be fruitful (March & Ferguson 2010: 1-9).

3. The Experiment

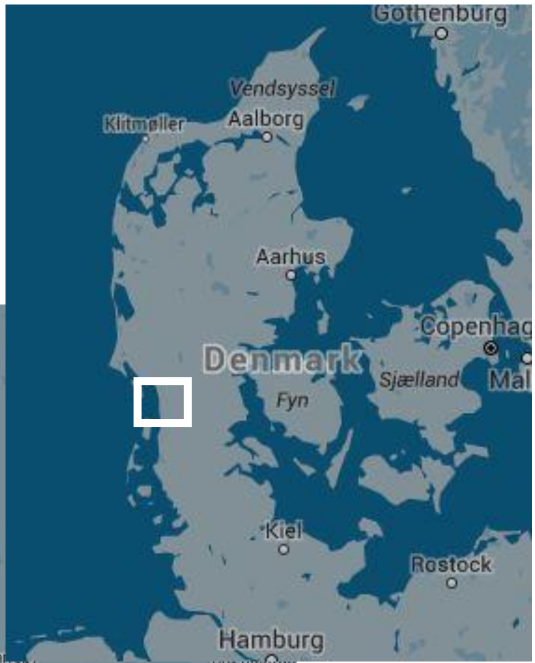
To begin the experiment, a small group was assembled to work on the project. This includes the author, a master's student of archaeology, Trine Thuet, an experienced potter and Viking reenactor, and Nina Lund, a professional potter with several years of experience with wood burning kilns. The combined knowledge of Viking age ceramics and ceramic making will allow for as close to an archaeologically accurate process as possible.

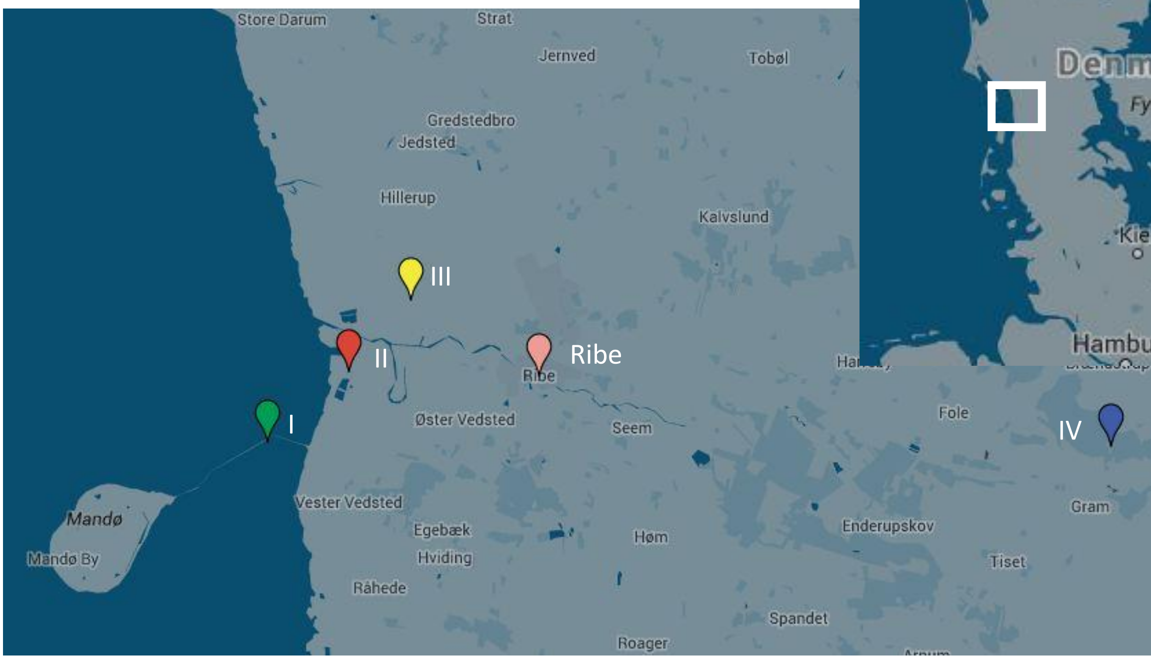
The experiment took place primarily at The Viking Center, in Ribe Denmark. Founded in 1992, The Viking Center is a Viking reenactment center that is both a tourist destination as well as a useful tool for experimental archaeologists. Several archaeological experiments have previously been undertaken at the center involving linen production, structure production, and ceramics.

The Clay

An important factor in the experiment was to find clays that would closely resemble what would have been available in the 8th and 9th centuries AD. The clays were naturally

Map showing the locations of the naturally occurring clay used for the experimental pots. Source: Google Maps





occurring, harvested by the potter, and were not cleaned, so that any naturally occurring organic occlusions remained in the clay.   Five types of clay were used for the experiments as seen in table X, labeled I-V. Type V is pure, rinsed clay used by professionals and artists. The clay is clean and free from any inclusions or imperfections. This type was used as the control group.

Types I-IV were all taken from naturally occurring clay deposits from around the greater Ribe area. The clays were harvested for the use of the project and with the aim of finding clays that would have been available during the Viking Period. Type I was taken from the Wadden Sea during low tide. This location as chosen for its rich natural marine clay deposit near Ribe. Clay type II was taken near the village of Okholm, an area which is known to have had local pottery production during the Viking Period (Feville et.al. 1998). Clay type III was taken near the Ribe Stream, which would have been a likely source for locals to collect clay. Finally, an inland clay source near the village of Gram was used from a large naturally occurring clay deposit.

These four clays were choose in the attempt to have a range of the general types of clay that would have been available to the Vikings, or are known in the archaeological record, to have been used by Vikings. This gives a broad range to examine naturally occurring organic inclusions in a broad range of locally available clay.

The Tempers

Nine types of temper were used for this experiment. There is no knowledge of what kind of organic material the Vikings would have use, so materials were selected based on what materials would have been easily available. The organic and non-organic tempers were each assigned letters to easily identify them.

Crushed Granite

Vessels from Viking Age Ribe contained some form of hard temper, often in the form of crushed granite. In this experiment, two different amounts of crushed local granite were used. Temper A used added 30 grams of the crushed granite to the clay. This amount was deemed to be too much, making the clay difficult to work with. Temper B, reduced the amount of granite to 20 grams, resulting in a much more workable clay . Temper A was not used in the experiment. Pots with temper B serve as a control group because no organic materials were added. Crushed granite was also added to some pots with experimental organic tempers, as needed to create a sturdy structure.

Crushed Pottery

Crushed pottery was chosen out of practical use. Broken pottery would have been readily available during the Viking Period and would serve a similar purpose as crushed granite. This temper is labeled Temper C.

Crushed Granite and Crushed Pottery

A mixture of 10 grams crushed granite and 10 grams crushed ceramic was created and labeled Temper K. The idea of this mixture, was to see how the appearance of crushed granite and crushed pottery looks after firing in the clay, and if they can be distinguished from one another.

Decayed Wood

Decayed wood was chosen as one of the experimental organic tempers. Labeled Temper D, 2.5 grams of decayed was added with 20 grams of crushed granite. The decayed wood was collected on site, and would have been readily available during the Viking Period.

Horse Manure

Locally collected horse manure was also used as an experimental organic temper. One gram of the horse manure and 20 grams of crushed granite were added to the clay mixture and l labeled Temper E.

Crushed Seashells

Labeled Temper H, crushed seashells from the local Wadden Sea were used as an experimental temper. Pottery from Northern Europe known as Muschelgrus is known from the general Viking Period. Muschelgrus pottery is quite distinctive, and although it was not known that local Ribe ceramics contained any seashells, it was chosen as an experimental temper to tests its workability effects on the clay as well as to see how it would appear in hand formed, local pots.

Cattail Fiber

Locally collected fibers from cattails were also used as an experimental temper. Labeled Temper L, one gram of the fiber was added along with 20 grams of the fiber to the various clays. It was quickly apparent that this was not an acceptable ceramic temper. The clay became difficult to work with and did not produce sturdy pots.

Wood Ash

Temper N consisted of 2.5 grams of wood ash mixed with 20 grams of crushed granite.

Charcoal

Similarly to Temper N, Temper O consisted of 2.5 grams of charcoal and 20 grams of crushed granite.

The Pots

Thirty-six pots were created for this experiment, one of each type of clay and temper. Although the aim of this study is to study local Viking Age ceramic, which included wheel-turned ceramics, it was decided to create simply shaped, hand formed vessels. The

The hand formed pots, in various states of drying.

experiment requires breaking the vessels after firing and cooling, in order to see the sides of the vessel, so there was no reason to make a time consuming, aesthetically pleasing form.

The pots were fired in a kiln that was created in 2013 at the Ribe Viking Center for the purpose of experimental archaeology. No local Viking Age kilns have thus been excavated, so an Iron Age Kiln was chosen as it possess the ability to fire pottery to a temperature similar to how Viking pottery would have been fired. The kiln is a replica of a kiln excavated in Hasseris, Denmark dating to 500 A.D. (Bjørn 1980: 58). It was found in a collapsed state, with several pots still inside, suggested it has collapsed during the firing process. Similar kilns have since been excavated in the Danish region including one in Schleswig dating to a couple of hundred years before the birth of Christ as well as one on the Danish peninsula of Tuse Næs on Zealand dating to the 1300s (Bjørn, 1980: 60). This represents a kiln that is sturdy and stable in design and in use for at least 2000 years.

The pots were fired in the summer of 2014, in a single batch, to ensure the experimental tempers were not affected by variations in the firing process. The pots were fired for approximately seven hours, when the kiln reached an approximate temperature of 818° Celsius. At this point the kiln was sealed, at the pots removed several days later after cooling.

The replica Iron Age kiln used for firing the pots.

4. Archaeological Comparisons

This experiment tests both the practical aspects of using organic temper as well as to compare the experimental ceramics to examples from Viking Age Ribe. Two site, ASR 7 and ASR 9 were chosen. Additionally, a site, ASR 583, was chosen as it is located only a few kilometers from Ribe and archaeological studies have found a large amount of locally made pottery from the Viking Age.

ASR 7

Archaeological site ASR 7 denotes an area of archaeological investigation from 1985-1986 in Sct. Nicolajgade 8 in central Ribe (Fransen and Jensen 2006: 9). The area excavated primarily dated to the Viking Age, mostly from the 700 hundreds (Frandsen 1989: 35). Numerous sherds of Viking Age pottery was recorded including pieces recorded as tempered with sand or granite and some sherds appeared to have holes left from organic inclusions in the pottery (Frandsen 1989:37).

This experiment focused particularly on pottery sherds from ASR 7, in order to compare the experimental pottery to the archaeological material that is described as having holes, possibly from organic material. As this is a short term experiment, not all pottery was thoroughly studied, but a sample of the material was used from ASR 7.

ASR 9

Archaeological investigation area ASR 9 Posthuset took place in central old time Ribe, in the area where a new post office was to be constructed. More than 16,000 sherds were recorded, including many locally made ceramics from the 8th and 9th centuries (Fevile and Jensen 2006: 132). Like ASR7, ASR 9 contained both hand and wheel turned Ribe locally made pottery. A sample of the local pottery was used for this experiment.

ASR 583

The village of Okholm is located approximately 8 kilometers southwest of Ribe. Several archaeological campaigns have excavate Early Viking Age sites and have yielded a wealth of locally made, wheel turned pottery, similar to the pottery found in the Ribe excavations' ASR 7 and ASR 9.

More than 380 fragments of this course, local pottery have been found in the area including 51 sherds that were found in a pit house settlement (Fevile et. al. 1998). The finds in Okholm strengthened the idea that people were locally producing pottery in and near Ribe during the early Viking Period. A study using magnetic susceptibility and thermoluminescence . This study revealed no differences in the clay of the thrown pottery and the local pottery, indicating they were made from the same clay source. Similarly the local pottery and the turned pottery from Okholm was made from the same clay. The sherds from Ribe and Okholm were not however, made from the same clay source. This suggest pottery was locally made in the Early Viking Age in Ribe and the surrounding area with local clay sources.

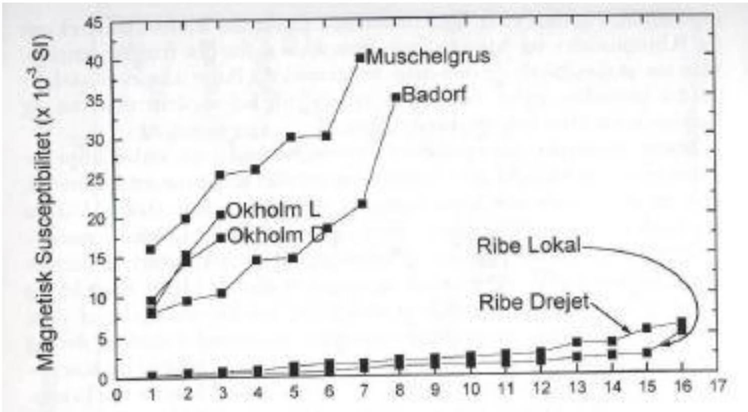


Chart showing the magnetic susceptibility of several ceramic types. The tests show no difference in the clay between local (lokal) and wheel-turned (drejet) pottery, concluding local wheel-turned pottery was locally produced in Ribe and Okholm between 720 and 750 AD. Source: Fevile et. al. 1998

5. Discussion

The Clay

The experimental pots were each labeled based on the clay type and temper type so they could be easily identified after firing. For example, a pot with clay from Gram with only crushed granite as a temper was labeled " IV B" signifying it was clay type IV with temper B. One pot was made for each clay type and each temper, this includes the rinsed clay with no natural impurities, to serve as a control group. In total 36 pots were fired.

Clay I was quickly deemed to be unusable by the potter as contained too much sand and was not elastic enough to form vessels, and no pots from this clay were fired. The remaining four clays were all suitable for ceramic works and use. Clay types II, III, and IV all revealed small holes, when mixed with only non-organic tempers, which could be seen both by the naked eye and with a small jeweler's microscope. No holes were visible in the pure clay, type V, indicating these holes were from the organic matter already present when harvested.

The Temper

Most of the experimental tempers used worked quite well, both while being formed and during the firing process. Once fired, the pots were all broken so that the inside of the vessels were visible and could be compared to broken sherds of pottery found in excavations.

Tempers B, C, and K, (crushed granite, crushed pottery, and a mix of to two) were all easy to work. They all survived the firing process well and resulted in sturdy, usable vessels. Some minuscule holes, about the size of a pin prick were visible with these tempers in the naturally harvested clay, but not with the rinsed clay, suggested these were the results of small organic pieces in the natural clays.

Temper E, the horse manure mixed with crushed granite, created a coarser pottery with many organic holes. Many small pinprick holes were apparent as well as larger holes up to a millimeter in size. In one pot, a distinctive, undigested grass blade was visible. The horse manure was workable and created a distinct "design" that would be easily recognizable.

Temper H, the locally collected mussel shells, proved to be problematic. The shells proved to be extremely difficult to crush into fine pieces. After a lot of physical exertion, the shells were crushed into pieces smaller than one centimeter. After firing, the shells were very visible in the pottery exterior and created very crumbly, unusable vessels. The experimental examples did not resemble anything close to the known pottery with shells contemporaneous with the Viking Period.

Temper L, the cattail fiber mixed with crushed granite quickly proved to be an unsuitable temper to use. Its stringy, fibrous nature was difficult to work with. Moreover, when it was fired, it left a distinct recognized aesthetic, not seen in Viking age pottery.

Temper D, decayed wood, was easy to fire and work with. Some small pinprick size holes were visible as well as small slightly larger holes, less a millimeter in diameter. Temper N, wood ash, was easy to work with and fired well. The ash disappeared in the firing process and left many very small "pinprick" type holes. Temper O, charcoal was similar in appearance to Temper D, decayed wood. Small holes were the organic material burned away ranged from less than one millimeter to pinprick size. These materials crushed to very tiny pieces, and it is likely that many of the holes left were too small to be visible with a small jeweler's microscope.

All of the natural clays (II-IV) showed small pinprick size holes, probably resulting from organic impurities present in the clay when harvested. Some of the organic tempers left clear and recognizable designs on the vessels, such as the horse manure. Other tempers would be difficult to recognize, such as the wood ash, probably because it is very fine. Still, some tempers, the decayed wood ash and charcoal, live slightly larger holes where the organic materials burnt away. This suggests, it might be possible to distinguish when larger organic tempers were added to clay.

Archaeological Comparisons

As described in chapter 4, three archaeological sites which yielded locally made Viking Age pottery during excavations were examined in order to compare the archaeological examples to the experimental pots.

Observations and Results of ASR 7 and ASR 9

A several day study of the hand turned ceramic material from ASR 7 was undertaken and compared to the experimental pots. Our method of study was to examine and compare the inclusions in both the experimental and archaeological ceramics using a small jeweler's microscope. Only the ceramic sherds that were from locally produced, hand turned were used for this experiment.

The overall impressions from physical observation, was that most of the pots contained mostly granite temper, with none appearing to have contained crushed pottery or sea shells. The archaeological sherds, were in general very roughly made and contained a higher composition of granite than we had used in our experimental pots. No clear pattern could be detected concerning the small holes that are theorized to have been from organic material. The holes were generally quite small, pinprick sized, and did not come from larger organic materials. It was not possible to distinguish which experimental clay types the pots resembled, as the experimental pots with different clay sources were mostly identical in appearance.

The hand thrown and wheel-turned pottery from the sites known to be made locally in Ribe most closely resembled the pottery with granite temper and no added organic temper. Most had tiny holes, reminiscent of the naturally occurring organic inclusions in the naturally harvested clay.

Observations and Results of ASR 583

The local, Viking Age, rough pottery has a wide variety of temper density but it all consists of granite and no other oblivious inclusions possibly. Some pots appear to resemble clay type II, in the sense that there is a few stones and lot of holes, but nothing appears to be added, other pots have an enormous density of granite making the exterior very rough. Overall a low variety of temper and the pots varied tremendously in the amount of granite added to the pots, with some having amount similar to our experimental pots, while others had much more. In comparison with the pots from ASR 7 and ASR 9 and locally made pots were much less uniform in terms of temper.

Some pinprick size holes were in the pottery, but these were mostly in low density and overshadowed the amounts of granite in the very course vessels. The low density and irregularity of the holes suggests that a consistent temper was not added, and are plausibly likely the result of naturally occurring organic inclusions.

6. Conclusion

The aim of this experiment was to create ceramic vessels with organic tempers and compare them with Viking Age vessels thought to contain organic temper in an attempt to understand if organic material was intentionally added to locally made pottery, or if the holes in the pottery are merely the results of naturally occurring inclusions. The practical results of the experiment showed what types of organic tempers were useful in making course pottery fired at low tempers, as local Ribe Viking Age pottery was known to be. When comparing the experimental pots to archaeological examples, the pots that most resembled the archaeological examples were the pots that contained no purposefully added or contained finer organic temper such as crushed coal or ash. This indicates that the local clays already contain a high level of organic material and that it is likely that the holes found in the local Ribe area pottery was from naturally occurring inclusions in the clay, but it is not possible from this experiment to rule out the use of organic tempers in the Viking pottery.

A further study should look at a wide variety of locally made ceramics from Ribe to determine the percentage of ceramics with holes. A precise understanding of how many ceramics contained organic material would further shed light on whether organic temper was intentionally added or naturally occurred.

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