Materials Choices in Utilitarian Pottery: kitchen wares in the Berbati Valley, Greece

Introduction
The most important properties of utilitarian pottery reside in the functional roles of form and material. Functions vary considerably in terms of intended and actual use (Skibo 1992, 35ff.) but mainly focus on food preparation, storage and transportation (Rice 1987, 208ff.). Within these roles cooking places some of the greatest demands on a ceramic body, which has to withstand repeated cycles of heating and cooling during use. In the archaeological and ethnographic records there are several examples of pottery production centres that acquired a reputation for producing good quality cooking ware, for example the central Mediterranean island of Pantelleria (Peacock 1982, 79-80, Montana et al. 2007) during the Late Roman period and Pabillonis in Sardinia (Annis and Jacobs 1989/90) in more recent times. Such centres often exported their products into surrounding regions, suggesting that cooking pot production either occupied a social niche, that technical capabilities were restricted, or that geologically specific raw materials were preferred, leading to resource specialisation (Rice 1987, 191). This paper considers some of the key issues concerning materials choices for cooking pots. It then discusses cooking pot production from two major centres in the Aegean, the island of Aegina where volcanic materials were exploited during the prehistoric to Classical periods and the potters of Siphnos who used metamorphic resources in the modern period. These materials are compared with the quartz-rich cooking ware found in regional survey and excavations in the Berbati Valley, Greece.

Properties of cooking ware
Pottery used for cooking is exposed to thermal shock when temperature gradients caused by rapid and/or localised heating generate stresses within the ceramic material. Repeated exposure to such stresses can ultimately cause a pot to fracture catastrophically. The problem may be exacerbated by vessel shape and wall thickness where they promote the development of steep thermal gradients, especially between external and internal surfaces. The effects of thermal shock can be reduced by using an appropriate combination of raw materials to harmonise the thermal expansion of components within a ceramic body (clay and inclusions) and by avoiding stress concentrations through use of rounded rather than angular pottery shapes (Tite and Kilikoglou 2002). Archaeological evidence nevertheless shows that these principles were not always followed in the past and that the other factors need to be taken into account (Woods 1986).

The interplay of physical properties and how they were perceived by the people making and using cooking pots is a complex issue. This is especially evident when using results from laboratory analyses to gain insight into traditional or ancient values and practices (Kilikoglou et al. 1998). In his study of southern Papuan pottery production Rye (1976) drew attention to potential stresses caused by differences in the thermal expansion of common inclusions compared with a ‘typical low-fired clay’, noting that minerals with low thermal expansion such as zircon, feldspar, augite and hornblende are most suitable, whereas quartz is undesirable for its high thermal expansion and crystalline inversion at 573°C. The thermal properties of these minerals can of course be determined by modern analytical techniques but Woods (1986) argued that choices of inclusion composition may relate more to the nature of local geology than thermal properties. In particular, she pointed out that since the prehistoric period in Britain quartz sand was widely used as opening
material despite its high thermal expansion and that if this had caused significant problems then potters would most likely have sought alternative materials. The strength of Woods’ argument lies in its focus on archaeological evidence rather than physical analysis, but equally it should not be assumed that ancient potters held no opinions about relationships between particular materials and the performance of cooking pots, whether based on empirical knowledge or metaphorical association.

The use of talc serves as an example. For modern fireproof wares Cardew (1969, 75) recommends a ‘cordierite body’, in which the mineral cordierite is synthesised at high temperatures, c. 1390°C, from a blend of talc, kaolin and alumina (Ansiferov et al. 1997). This choice is based on extensive laboratory analyses of the very low thermal expansion rates of the materials involved, including that of the clay component, in this case kaolin, which in itself has significant refractory properties. Although working at much lower temperatures (<1000°C) and without the facility of modern laboratory analyses talc is likewise seen as advantageous amongst traditional potters in the Andean region of Cuzco, where it forms the basis of a ‘cultural recipe’ for producing cooking ware (Sillar 2000, 76ff.). The communities of Machaca and Charamoray have a reputation for making good cooking pots using large quantities of talc, chosen in part because the platy particles permit thinner vessel walls. Talc is so strongly associated with high quality cooking ware that potters at Raqchi claim to be unable to make cooking pots because they lack the mineral. This claim appears to contradict local archaeological evidence, which includes cooking pots made of volcanic material similar to that used by modern Raqchi potters. Furthermore, potters at the nearby village of Araypalpa make satisfactory cooking pots using coarse, rounded grains of calcite and quartz rather than talc. This example shows that both potters and consumers can hold strong views on associations between specific raw materials and good cooking pots. These associations may arise from experience and be supported through modern materials analyses nevertheless other communities can deem alternative materials to be perfectly adequate.

Clearly there is more to the production of a traditional cooking pot fabric than just the composition of inclusions. In addition to heating effectiveness (Schiffer et al. 1994, Skibo 1994, and most recently Hein in the present volume), two significant physical properties are strength and toughness (Müller et al. 2010). In basic terms, strength is the ability to withstand stress without fracture initiation. Toughness is the ability to maintain structural integrity once a fracture has been initiated, as may occur with short-term stresses arising from thermal expansion and contraction. To some extent traditional potters can control these properties by manipulating the structure of pottery fabrics through their selection and processing of raw materials and in using low firing temperatures. Preferred fabric characteristics are the presence of very coarse inclusions, maximisation of porosity and a pottery fabric that is sintered but has limited development of a glassy phase with its accompanying rigidity (Cardew 1969, 77).

Inclusions and voids in a fabric generate boundaries at which the energy of a crack can be dissipated. Experimental studies (Kilikoglou et al. 1998) show that the quantity of inclusions (approximately 20% or more in the case of quartz) is critical for generating a network of microcrack damage zones throughout the vessel wall that can absorb the energy of a crack thereby increasing toughness at the expense of strength. The concentration and distribution of inclusions, voids and a glassy phase are therefore central to controlling the mechanical performance of cooking pot fabrics. Inclusion composition remains significant, however, as the degree of debonding between fabric components is a function of their respective coefficients of thermal expansion (Tite et al. 2001). Similarly, composition is a
determining factor in the shapes of particles and it has been shown by Müller et al. (2010) that strength is compromised less where platy rather than rounded inclusions are present. The development of microcrack damage zones explains why quartz could be so widely used in ancient cooking pots, as observed by Woods (1986), despite the high thermal expansion noted by Rye (1976); the thermal properties of quartz have to be considered in relation to the structural properties of the surrounding material.

Cardew (1969, 75 and 77) noted the importance of limiting development of a glassy phase within the fired clay body. In many cases it remains to be seen how far preferences for cooking pots from particular production centres might have been a reflection of the particular clays used rather than the properties of inclusions. Traditional pottery production at Vasanello in west-central Italy (Peña 1992) and at Pabillonis in southwest Sardinia (Annis and Jacobs 1989/90) offers some insights into this issue. At Vasanello potters made a range of utilitarian ware using four sources of clay, two of which are volcanic in character. One source (Source 3) in particular was preferred for cooking and heavy utilitarian wares. Raw material from this source is composed of alkaline volcanic inclusions in a natural mixture with non-calcareous sedimentary clay comprising poorly crystallised smectite, illite and kaolinite/halloysite clay minerals. Based on a range of mineralogical and chemical analyses Peña (1992) attributed its suitability for cooking ware to the absence of calcite and the abundance of silt to coarse sand-sized inclusions, specifically fine-grained quartz and coarser-grained sanidine feldspar, of which the latter is reported to have a similar thermal expansion rate to the clay. Similar raw materials were exploited at other potteries in the region, demonstrating a widespread and distinct preference for their use in making cooking ware. The presence of abundant inclusions is consistent with the damage zone model noted above for improving toughness. Large sanidine inclusions may be advantageous but this also depends on the thermal expansion properties of the fired clay component. It is also possible that the slightly higher proportion of kaolinite/halloysite noted in Source 3 clays compared with other sources benefitted the structural properties of the clay body at the firing temperatures used, which were estimated to be below 900°C.

A clay body incorporating quartz, feldspar and muscovite mica was used for cooking ware by the potters of Pabillonis. In this case, both potters and consumers considered the selection of raw materials to be critical for cooking pot production. Materials studies identified several factors that appeared to contribute to thermal shock resistance, including the elasticity of muscovite mica plates, the 20% proportion of temper, forming techniques and vessel shape and size. In addition, firing temperatures were kept below 900°C and experiments on a selection of clays indicated that while pottery could be produced at 500°C significant amounts of liquid did not form below 800°C, allowing sintering without the development of a glassy phase (Annis and Jacobs 1989/90).

The physical properties of inclusions are generally dictated by well defined mineralogy, but natural clays contain highly varied combinations of clay minerals and inclusions. These can be further complicated where potters have mixed raw materials from different sources whilst preparing a clay body. As a result, the firing properties of a clay body, as in the development of sintering and a glassy phase, may need to be evaluated in more specific terms to characterise the products of specialist producers. Indeed the varied compositions of natural clays (and the possible use of mixes) can make it difficult to be sure that materials collected through field prospection are indeed the same as those used by ancient potters. This problem is illustrated in analyses of red and white clays from the volcanic island of Pantelleria which have been studied in depth during experiments to replicate Late Roman cooking ware fabrics from the island (Montana et al. 2007).
The surfaces of cooking pots are commonly treated during manufacture and/or before first use by the consumer with the aim of extending use-life and reducing unwanted flavours (Sillar 2000, 138). Such treatments are usually aimed at reducing permeability of the interior vessel wall, thereby controlling the degree of water absorption and improving heating effectiveness at the expense of some thermal shock resistance (Schiffer et al. 1994, Tite et al. 2001). Various treatments were used before the advent of glazed cooking pots, such as surface finishes (e.g. burnishing or polishing), soaking regimes and the use of organic coatings (Arnold 1985, 139ff., Rice 1986, 163ff., Longacre et al. 2000). The latter leave few traces in the archaeological record, but advances in organic residue analysis (Evershed 2008) have enhanced the feasibility of detecting such processes.

Aside from issues of production the control of thermal shock is also dependent on cooking techniques. Procedures that incorporate lower rates of temperature change or distribute heat more evenly, such as supporting a pot at a distance from the heat source or heating the whole pot, are likely to reduce the degree of thermal shock within a vessel thereby extending its use-life. Fireproof pottery in general is made to resist thermal shock but it can be divided into flameproof ware and ovenware (Cardew 1969, 75). Flameproof ware has to withstand the severe thermal gradients that accompany direct contact with fire. Ovenware is exposed to less extreme conditions. It is isolated from the fire and the vessel as a whole is subjected to heat. Account therefore needs to be taken of the different ways in which cooking pots might have been used. For example, Woods (1986) noted that despite the apparent advantages of using rounded vessel shapes (Tite and Kilikoglou 2002) most cooking pots in Britain, from the prehistoric to medieval periods, were made with flat bases. This implies that the effects of shape were either not appreciated, were minimised by the ways in which these vessels were used, or were considered to be negligible compared to other considerations. For example, Jung’s (2011) study of cooking pots in Late Bronze Age Cyprus distinguishes between round-bottomed Levantine and Cypriot vessels that may have been placed on charcoal and lifted vertically from their settings and flat-based Mycenaean-style vessels better suited to horizontal movement in relation to a fire, as on the flat surface of a hearth. Experimental studies have shown that soot patterns on cooking pots may give further clues as to whether vessels were placed on embers, over open flames, exposed to wind in open areas or used within enclosed spaces (Gur-Arieh et al. 2011).

Ultimately the production and distribution of cooking pots is a function of consumption practices. The diversity of materials, shapes and cooking methods introduce considerable variation in the use-life of cooking pots (Rice 1987, 297). Performance in terms of longevity and heating effectiveness were no doubt important considerations when acquiring new cooking pots or when comparing vessels from alternative sources, but their value to an individual will also have depended on the vessel’s biography and the availability of replacements. Consumers may have been able to exercise choice where different producers were operating within a community or when imported pottery was available from more remote centres. Given its utilitarian role there is likely to be a practical basis underlying decisions made by consumers of cooking pots, but socially determined factors should not be discounted even though they may be difficult to isolate (Kilikoglou et al. 1998). Consumers in the Kalinga village of Guina-ang, Philippines, gave various reasons for preferring cooking pots from either Dangtalan (the more common source) or Dalupa (Arsonson et al. 1994). Preferences for Dangtalan pots were justified in terms of strength and durability, whereas consumers who chose Dalupa pots mainly cited their light weight. Additional properties were also mentioned, though less frequently: appearance, a well polished surface, clay quality, firing, thickness, good heat conduction and cost. As noted above, strength and durability are
important mechanical properties that carry a significant materials contribution. Lightness of weight is also a physical property, in this case reflecting thinner walls, but it can incorporate distinctly personal concerns such as how an individual prefers to handle a pot when it is full or hot. The list of additional properties shows that evaluations are likely to take a range of attributes into account, some being of greater significance than others. Less tangible were the socially embedded exchange networks in which Dalupa potters bartered their wares in Guinea-ang (Stark 1994). Potters stayed in the village with a relative or friend and exchanged their products with friends and relatives of their hostess. This type of interaction can serve to propagate the adoption of cooking ware from a particular source, but it also illustrates the potential for consumer choice to be shaped by social relationships and agendas.

This brief discussion shows that a complex range of factors could affect the performance of cooking pots before taking account of any cultural distinctions or preferences held by consumers. The development of production centres with a reputation for making good cooking pots is often associated with access to specific materials, but issues of manufacturing techniques, the preparation and use of cooking pots, and the social contexts in which they were sourced are more elusive variables. Perhaps more than for most types of pottery a sequence of technological choices (chaîne opératoire) continues to be made throughout both the production and use of cooking pots.

**Cooking ware production centres in the Aegean region**

Having considered some of the principal issues that affect the production and consumption of cooking ware the discussion now examines materials issues in terms of two major centres of cooking pot production in the Aegean region, the island of Aegina, situated in the Saronic Gulf south of Athens, and the Cycladic island of Siphnos (Figure 1). These centres represent cooking ware traditions that exploited raw materials from very different geological terrains. Moreover, both terrains are remote but potentially accessible sources of cooking ware for communities in the Berbati Valley, subject to production and availability in any particular period.

Like the examples of Pantelleria and Vasanello discussed above, the geology of Aegina is dominated by volcanic rocks with sedimentary deposits cropping out across the northern part of the island. Two principal types of coarse ware pottery fabric were produced on the island during the prehistoric to Classical periods, both containing volcanic material and commonly identified by eye from the occasional presence of golden (biotite) mica (Gauss and Kiriatzi 2011, 22). Most utilitarian pottery was made from yellow calcareous clay, whereas red non-calcareous clay was used for cooking ware (Figure 2a, Gauss and Kiriatzi 2011, 250). During the Middle Bronze Age these wares were distributed to several sites on the eastern side of mainland Greece (Rutter 1993, Fig. 12, Gauss and Kiriatzi 2011, 243) in the regions of Euboea, Boeotia, Attica, Corinthia, the Argolid and Laconia. In the Classical period Aegina was again a noted source of cooking pots with considerable quantities consumed in Athens and further afield (Farnsworth 1964, Gauss and Kiriatzi 2011, 23). The fabrics of Aeginetan pottery and their potential raw materials have been extensively characterised (Gauss and Kiriatzi 2011), but the extent to which the volcanic component was advantageous in producing cooking ware is more difficult to assess. As discussed above, the quantity of inclusions is especially significant, but specific contributions from different mineralogical components within the fabric need to be further explored in terms of microstructure and mechanical performance.

Pottery production on the island of Siphnos was well developed by the 18th century (A.D.) and it is notable for the manufacture of casseroles (Jones 1986, 861), vessels
principally aimed at slow cooking in an oven. The island is located in the central Cyclades and, in contrast to Aegina, it is geologically metamorphic in character. Siphnian potters were itinerant, but a widespread migration in the early 20th century also led to permanent workshops being established in several parts of the Aegean region. Siphnian potters who settled on the northern Greek island of Thasos, for example, replicated the traditions of their home island and exploited small pockets of red and yellow clay amongst the local metamorphic rocks to produce fireproof wares (Papadopoulos 1999). There is also a distinct metamorphic component to cooking pots made by Siphnian potters who settled in the Amaroussi area of Athens, with platy inclusions of muscovite mica accompanying equigranular quartz and epidote (Figure 2b), not unlike the products of Pabillonis in Sardinia.

Siphnian casseroles were distributed widely throughout the Aegean and neighbouring regions. They were held in high esteem in Cyprus and when imports were banned potters at Kornos imitated the Siphnian casseroles. These imitations had thicker walls and were regarded by locals as inferior and more susceptible to thermal shock (Ionas 2000, 70). Similar problems were encountered at the pottery production centre of Knti, Crete, which specialised in making water jars. One potter briefly produced casseroles but abandoned his efforts due to the local preference for imported Siphnian vessels (Blitzer 1984). These examples show that although Siphnian potters were able to set up workshops in several areas of the Aegean region, attempts to replicate their products were not readily accepted by consumers. Evidence of alternative sources to Aeginetan cooking pots appears in the analysis of pottery from Thorikos on the east coast of Attica. This cooking ware of the 6th-4th centuries BC has predominantly volcanic fabrics, but the source was thought not to be Aegina based on the occurrence of metamorphic inclusions in the clay (De Paepe 1979).

The ability to expand production and exchange over long distances via sea-going transportation from the islands was probably a major factor in the widespread distribution of Aeginetan and Siphnian cooking pots. This was further enhanced by the extensive coastline of mainland Greece, permitting numerous points of access to communities located at some considerable distance from these sources. Transport overland was no doubt more challenging, but it should not be dismissed. Cooking pots produced at Pabillonis were distributed across the western and central area of Sardinia by carts carrying up to 100-120 four-piece sets, whilst women engaged in more localised exchange networks on foot, commonly carrying sets of pots over a 12-15km radius (Annis and Geertman 1987). The distribution of cooking ware need not therefore be restricted to narrow areas of coastal contact.

The traditions represented by Aeginetan and Siphnian potters show that in different periods volcanic and metamorphic materials have both been associated with the production of widely distributed, and presumably highly regarded, cooking ware. Given the proximity of these geological terrains the issue arises as to whether cooking pots made from similar raw materials were imported into mainland regions of Greece where sedimentary formations dominate the local geology.

Cooking pots in the Berbati Valley, Greece

The Berbati Valley is situated on the border of the Corinthia and Argolid in the northeast Peloponnese (Figure 1), approximately 15km to the north of the Argolic Gulf and 20-25km west of the Saronic Gulf. Actual distances of travel would have been longer depending on the routes taken, especially over the more mountainous terrain from the Saronic Gulf. The Berbati Regional Survey (Wells 1996) recovered ceramic evidence from this upland border zone that demonstrates at times intermittent occupation from the Neolithic to the
Medieval/Modern periods. Identification of kiln and related production evidence in the valley dating to the Late Bronze Age, Classical, Late Antique and Modern periods led to a programme of petrographic and chemical analyses being undertaken (Whitbread et al. 2007, Whitbread 2011). A total of 243 samples were taken from pottery of all periods with selection being aimed at gaining a chronological overview of materials used for different ceramic functions, principally building, cooking, drinking, storage and transport. This was achieved by sampling, so far as possible, similar ceramic forms, such as tiles, cooking pots, cups, bowls, jars, pithoi and amphorae from different periods. These were divided into seven principal fabric groups representing broad compositional differences: Calcereous sand, Felsic (quartz/feldspar), Grog, Mudstone, Sandstone and Clay Pellets. The majority of fabric groups are consistent with the local sedimentary geology of limestone, mudstone, shale, sandstone, chert, flysch, marls and sandy marls. A small Volcanic group consists of material that was probably imported though none of these samples come from pottery identified as cooking ware. The fabric groups were divided in 29 classes based on compositional variation within the groups and technological distinctions, such as grain size and sorting.

From the wide variety of utilitarian pottery that was sampled from all periods only thirteen pieces were catalogued as cooking pots in typological terms. These particular samples belong to groups and classes that are mainly felsic in character and dominated by quartz, accompanied in some cases by micritic to fine crystalline limestone: Felsic (quartz limestone), Felsic (packed quartz), Felsic (fine sand), Felsic (chert limestone garnet), Mudstone (quartz sand and breccia) and Clay pellet (red silt clay pellets) (Figure 3). In some periods pottery not identified as cooking ware also belong to these fabric classes. Unfortunately the number of samples catalogued as cooking ware is very small and cooking ware with volcanic or metamorphic fabrics could remain undetected amongst pottery of different periods in the valley. For example, the main area of Middle Bronze Age occupation, the Mastos, was excluded from the original survey, but a subsequent study has demonstrated the presence of Aeginetan cooking ware in this location (Lindblom 2011). This evidence shows that exchange networks during the Middle Bronze Age were capable of bringing Aeginetan pottery to the valley. The occurrence of felsic fabrics in cooking ware of the Archaic, Classical, Late Roman and Late Antique periods is however beyond dispute and demonstrates that viable cooking pots did not need to be made of volcanic or metamorphic materials.

Two fabric classes in particular stand out petrographically from all of the samples analysed on account of the high quantities and sorting of their quartz inclusions. These were only found in three samples, all cooking ware, belonging to Mudstone (quartz sand and breccia) and Felsic (packed quartz) fabrics of the Archaic and Classical periods respectively. In compositional terms these quartz-rich cooking pot fabrics echo the situation in Britain as argued by Woods (1986) in that they lack the distinctive inclusions of metamorphic or volcanic origin that would be comparable to Aeginetan and Siphniot cooking ware. The distinguishing feature in all of these fabrics, however, is the relatively high density of inclusions, which is consistent with the microcrack damage zone model. It appears, therefore, that potters who produced these cooking ware fabrics were aware of the advantages of using substantial quantities of inclusions. There may be performance differences between these quartz-rich fabrics and Aeginetan and Siphniot cooking ware but it is also possible that, so far as the consumers were concerned, satisfactory cooking pots could be made using sedimentary materials, comparable to the Andean example of Araypalpa discussed above.
Further research is necessary to verify and consolidate this initial examination. This applies in particular to the Felsic (packed quartz) and Mudstone (quartz sand and breccia) fabrics found in Archaic and Classical cooking pots. From their distinctive appearance within the total dataset these fabrics perhaps offer the best opportunity to isolate 'cultural recipes' for cooking ware amongst the quartz-rich fabrics represented in the analysis. A different situation appears to have emerged in the Roman and Late Antique periods. Approximately half of the samples in each case, 11/22 Roman and 18/38 Late Antique, have Felsic (chert limestone garnet) fabrics, which were used for a functionally diverse range of utilitarian pottery including food preparation (cooking pots, bowls, basins, dishes), storage (pithoi, jugs, jars) and transportation (amphorae). Raw material closely matching these fabrics has been found in the valley (Whitbread et al. 2007, Whitbread 2011), though there is little evidence of its exploitation in earlier periods. As noted above, earlier cooking ware fabrics may be distinguished by their high proportion of inclusions, but the wide range of Roman and Late Antique pottery forms produced in what might be termed a 'cooking ware' fabric masks the distinctive character of cooking pots compared with other utilitarian pottery. It is possible that under these circumstances the notion of functionally specific raw materials choices for cooking pots may have been less relevant to both potters and consumers.

This discussion has sought to review some of the broader issues concerning the relationships between raw materials and cooking pot performance. In some cases these relationships were quite distinct to both potters and consumers, but in fact numerous factors contribute to cooking ware performance, including the ways in vessels may have been constructed, fired, seasoned and used. The one property that stands out in particular is the quantity of inclusions. Fusibility of the clay has perhaps received less attention in materials studies of traditional and ancient cooking pots (cf. Aronson et al. 1994) but it could help to clarify some of the distinctions made between materials of different sources. The few samples of cooking ware studied from the Berbati Valley demonstrate that distinctive quartz-rich fabrics can be found in parts of mainland Greece, even though the potential may have existed to acquire cooking ware made from alternative materials. It is hoped that future studies will expand on these results to identify production centres within the region that may have specialised in making cooking pots with quartz-rich fabrics.

Acknowledgements
The petrographic analysis was undertaken in collaboration with Dr Berit Wells. I thank the Greek Ministry of Culture, the 4th Ephorate of Prehistoric and Classical Antiquities at Nauplion, and the Institute of Geology and Mining Exploration for granting the permissions for this study. I also thank the Gunvor and Josef Anér Foundation, Stockholm, for its support. Analyses were undertaken at the Fitch Laboratory, British School at Athens. The referees are also thanked for their valuable comments.

Bibliography

Annis, M. B. and Jacobs, L. (1989/90) Cooking Ware from Pabillonis (Sardina): Relationships between Raw Materials, Manufacturing Techniques and the Function of the


Captions

Figure 1 Map of southern Greece showing the location of places and regions mentioned in the text.

Figure 2 Cooking ware fabrics in thin section from (a) Aegina and (b) a Siphniot brazier, Amaroussi Athens, crossed polars, width of field is 2.75mm.

Figure 3 Cooking ware fabrics from the Berbati Valley in thin section, crossed polars, width of each field is 2.75mm: (a) Felsic (quartz limestone), sample 168, 11th to mid-13th century cooking pot, (b) Felsic (packed quartz), sample 247, Classical cooking pot, (c) Felsic (fine sand), sample 250, Classical cooking pot, (d) Felsic (chert limestone garnet), sample 187, Late Antique cooking pot, (e) Mudstone (quartz sand and breccia), sample 104, Archaic cooking pot, (f) Clay Pellet (red silty clay pellets), sample 167, 15th century cooking pot.