Marble-Tempered Ware in 3rd Millennium BC Anatolia

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Abstract: Marble-tempered ware is a macroscopically and microscopically distinctive ceramic ware particular to the Early Bronze Age Aegean. This study examines marble-tempered ware recovered from the site of Çukuriçi Höyük in western Anatolia and offers a preliminary interpretation of its use and distribution during the third millennium BC, which is the heyday of marble-tempered ware at the site. Chronologically, this coincides with the spread of Anatolising influences across the Aegean and, vice versa, intensifying contact between the Cyclades and coastal western Anatolia. Through petrographic analysis of 27 samples of the material, this study aims to uncover compositional characteristics that can be used to embed the ware within the local and regional geological landscape. Diverse explanatory models for the emergence of marble-tempered ware will be reviewed and considered against archaeometric and archaeological data. This study will examine whether the evidence is strong enough to support a model of interdependence between the Aegean and Anatolian cultural spheres with regards to the adoption of specific potting traditions and recipes, and, ultimately, the extent to which these materials can serve as cultural marker.

Keywords: Çukuriçi Höyük, western Anatolia, Early Bronze Age, Cycladic influence, marble, clay manipulation, potting traditions

Introduction and Research Framework

In the third millennium BC, the coastal area of western Anatolia was subjected to novel cultural influences arising from intensifying contact with the nearby Aegean. Contributions centred on this time horizon continue to focus mainly upon socio-economic issues, in particular prestige goods exchange. Yet interaction between the Aegean and western Anatolia also involved the distribution and trade of ceramic vessels. By examining the ceramic evidence it may be possible to not only identify imported products, but at the same time closely investigate the integration of 'foreign' attributes into the prevailing cultural milieu. To this end it is not only the stylistic peculiarities of ceramics, but also compositional and technological patterns that should be considered meaningful. The detailed analysis of a diagnostic ceramic ware, in particular so-called marble-tempered ware from Çukuriçi Höyük in western Anatolia, may serve as a starting point for a more comprehensive discussion of technological networks throughout the Aegean and Anatolia during the period.

The term, 'marble-tempered ware' was introduced by Sarah Vaughan in 1994 when reporting her professional activities in a short note to the American Journal of Archaeology.[2] The complete title of her report, 'Marble-tempered ware: an example of cross-craft exchange in the Early Bronze Age Aegean?' points to her intention to reconstruct networks and ceramic traditions across the broader cultural landscape. Her interest in the topic arose as she conducted petrographic studies of several ceramic assemblages at sites in the Cyclades that featured the intentional addition of marble fragments to clay pastes. Shortly afterward, in 1995, Vaughan, in collaboration with Norman Herz, gave an oral presentation entitled, 'Marble from Amorgos and sources of Cycladic Early Bronze Age marble temper' at the 4th ASMOSIA conference in Bordeaux.[3] Another talk, which focused on the geological origin of marbles as possible tempering additives in ceramics of

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[2] Vaughan 1994.

[3] Vaughan – Herz 1995.

the Cyclades, followed in 1997 at the 213th National Meeting of the American Chemical Society Symposium in San Francisco. This talk, in collaboration with, again, Norman Herz and Scott Pike, discussed, 'The application of stable isotope analysis to a ceramic provenance study of Early Cycladic Marble Ware'.[4] Soon afterward, at the Geological Society of America Meeting in 1999, the same team of researchers presented a paper entitled, 'Ceramic provenance and the Aegean marble stable isotope database: a study of Early Bronze Age 'Marble Ware' from the Aegean Islands of Amorgos, Keros and Naxos'.[5] However, more detailed research into this interesting topic seems not to have been carried out, and apart from several case studies no comprehensive publication highlighting cultural transfers within the Cyclades based on marble-tempered wares has been prepared.

Tempering Practices as Cultural Traits?

Almost twenty years later, I return to this research topic by tracing marble tempering in the ceramic traditions of central western Anatolia, thereby generating new impetus for the subject. Marble tempering is a common practice in the Early Bronze Age Aegean[6] and to date has been considered a Cycladic technology.[7] By focusing on the ceramic material at Çukuriçi Höyük, I intend to test the interpretive value of marble-tempered ware, and whether it can be considered a socio-cultural and chronological marker in Aegean-Anatolian prehistory.

Can both regions be culturally linked through common traditions in marble tempering, and can evolving explanatory models offer a strong case for cultural connectivity? In examining the material from Çukuriçi Höyük, the following research questions are particularly relevant:

- Is marble-tempered pottery at Çukuriçi Höyük represented by imported wares,[8] similar to marble bowls and figures[9] that found their way from the Cyclades to Anatolia during the Early Bronze Age?
- Is marble tempering at Çukuriçi Höyük a local invention, emerging independently in the region, and triggered by the geological placement of the site and the availability of natural resources near the settlement mound?
- Or, did this tempering practice emerge at Çukuriçi Höyük as a reaction to cultural interplay with the Cycladic cultural sphere, leading to an adoption of clay paste preparation methods originally native to the Cyclades and beyond? Stylistic imitation of Cycladic ceramic material is well-attested in several areas of Anatolia, most convincingly by the reproduction of Cycladic-style frying pans.[10] Is it possible that clay manipulation methods were also shared as a result of technological transfer?

Besides aiming to clarify the provenance of marble-tempered ware at Çukuriçi Höyük, this study will also examine preferences in the fabrication of peculiar vessel shapes. The emergence of marble-tempered ware at the site will also be investigated in a synchronic perspective, through a comparison with other well-excavated sites in the greater Aegean. Since the designation of

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4 Vaughan et al. 1997.
5 Vaughan et al. 1999.
6 Nodarou 2012, 85.
7 Davaras – Betancourt 2012, 96.
8 Imported Cycladic vessels emerge during the advanced Early Bronze Age 1 in Anatolia and continue into the Early Bronze Age 2 (Şahoğlu 2011a, 137).
9 Marble artefacts arriving from the Cyclades to the coastal region of western Anatolia have been discussed, for example, by Takaoğlu 2004, who suspected that their presence antedated the Anatolian Early Bronze Age 2 (Takaoğlu 2004, 67). Sotirakopoulou 2008, 537 refers to, 'the presence of Cycladic or Cycladicising types of marble and clay vessels in the islands of the East and North Aegean and in western Asia Minor'.
10 Şahoğlu 2008, 487. Şahoğlu 2011a, 136–137 names the sites of Liman Tepe, Bakla Tepe, and Karahisar.

cultural periods over the course of the third millennium BC deviates between regions, a concordance is necessary: The Late Chalcolithic and the Early Bronze Age 1 (EBA 1) and 2 (EBA 2) periods in Anatolia are analogous to the Early Minoan IB period (EM IB) on Crete, the Early Helladic I period (EH I) on mainland Greece, and the Early Cycladic I (EC I) and beginning of Early Cycladic II (EC II) periods in the Cyclades.

Terminological Issues and the Definition of "Marble Temper"

In reviewing the published literature, one rarely comes across the term, 'marble temper',[11] and more often one encounters fabric or petrographic descriptions referring to calcite-tempered[12] wares or crushed calcite fabrics.[13] A selection of terms extracted from relevant research articles is presented in Table 1.

Term	Site	Shapes	Chronology	Reference
"Calcite"	Dhaskalio (Keros), Cyclades	Baking pans, braziers, jars, jugs, bowls, pithoi, basins, cooking pots	Early Cycladic II	Hilditch 2013, 473–474
"Calcite"	Kavos (Keros), Cyclades	Bowls, jars	Early Bronze Age 2	Hilditch 2007, 242; 260
"Calcite-tempered"	Kephala Petras, northern Crete	Bottles, pyxides, bowls	Final Neolithic IV to Early Minoan IB	Nodarou 2012, 84–85
"Frequent crushed calcite fabric"	Ayia Photia, north-eastern Crete	Bowls, chalices, pyxides, bottles	Early Bronze Age	Day et al. 2012, 119–121
"Marble ware"	Markiani (Amorgos), Cyclades	Storage vessels, pithoi, bowls, jars, pyxides, plates	Early Bronze Age	Vaughan 2006, 99–100

Tab. 1 Terminology applied in the description of possible 'marble-tempered' wares

What is the difference between marble- and calcite-tempered ware? There are three possibilities for the distinction: is there a difference in (1) the size of the inclusions and thus the presence or absence of fully-preserved marble fragments, or in the (2) geological association of the temper, in this case the calcite temper that does not necessarily have to derive from marble,[14] or (3) is the terminology that is chosen dependent upon the geographical location of the study sites, alternating for example between the Cyclades and Crete, both of which were producers of these wares? Without a doubt, the term 'calcite-tempered' is far more established in archaeological and ceramological research than is the term 'marble-tempered'.

In this article, the term, 'marble-tempered' will be used when any of the following three parameters apply: (1) a geological association of the aplastics with marble, (2) a predominance of calcite grains and/or marble fragments in the clay paste, and (3) proof of the intentional addition of the temper to the clay paste.

[11] A short review of the terms used to describe marble-tempered wares is already provided in Vaughan 1994.

[12] For example, Pentedeka et al. 2010; Nodarou 2012; Hilditch 2013.

[13] Day et al. 2012, 119–121.

[14] Besides its association with marble, calcite can also originate from limestone. Hilditch 2007, 242, for instance, notes the possibility that calcite-tempered wares at Keros might be associated with either limestone or marble deposits.

For example, even when a clay paste is densely packed with only calcite grains, several fragments of marble might be found to be embedded, and thus the term, 'marble-temper' may apply. In this case, the loose minerals are evidently former marble components that were separated into individual mineral grains, for instance through intentional crushing. Whenever a geological relationship to marble can be discerned, I will employ the term, 'marble-tempered ware' or use a related vocabulary.

Contextualising and Characterising Marble-Tempered Ware at Çukuriçi Höyük

Çukuriçi Höyük is a settlement mound located within the coastal area of central western Anatolia. It had direct access to the sea during all phases of occupation, and was at the same time surrounded by a fertile plain to its south, east, and northeast. Stratigraphic sequences cover the Anatolian Neolithic to the Early Bronze Age 1 periods.[15] The focus of this study is the Late Chalcolithic (4250–ca. 3000 BC) and the Early Bronze Age 1 (2900–2750 BC) occupational horizons, corresponding to phases CuHö VII, VI, and IV at the site.

In all phases of occupation at the site, ceramics exhibit great diversity in composition.[16] The results of petrographic analyses attest to symptomatic changes in the selection of clay raw materials, and specific patterns with regard to chronology at the site emerge. Within the Late Chalcolithic and Early Bronze Age 1 levels at the settlement,[17] a number of specific ware groups can be discerned.

In cross-section, ware groups (WG) 15, 27, 40, and 51 are characterised macroscopically by a dense enrichment of angular whitish to transparent aplastics. The amount of aplastics and their size and distribution within the ceramic bodies varies. A common attribute is the presence of a dark greyish firing core framed by thin reddish margins (Fig. 1). Vessel surfaces exhibit marks of sporadic burnt-off organic matter, which contribute to its unevenness. Another property worth mentioning is the extraordinary hardness of specimens of, in particular, ware group 15, which is characterised by thick walls. The quantities in which the wares have been recovered at the site are by no means enormous: they constitute only 3% of the Late Chalcolithic and EBA 1 ceramic assemblages that have been studied.

Petrographic analyses soon confirmed that the aplastics of the ware groups are identified as fragments of marble and, predominately, calcite grains. On the basis of the textural features of the marbles and the spectrum of recognised grain sizes, three petrofabrics[18] can be differentiated:

(1) Petrofabric EPH-MARBLE_01 (Fig. 2.1), which contains marble fragments, can be regarded as the most commonly-represented petrofabric, comprising ten of the analysed samples. Looking at the selected marble fragments, their relative equigranular texture and the obvious lack of impurities is remarkable (Fig. 2.2). The size of the marble fragments is between 1.16 and 2.62mm. The individual calcite grains can reach a size of 0.48 to 1.18mm. Calcite grains distributed within the clay paste comply with the characteristics of the marble fragments noted above. Thus it is legitimate to assume that the calcite grains, being bits of broken marble, were most

[15] For the earlier occupation phases, covering the Neolithic and Chalcolithic periods, see Horejs 2012; Horejs 2014; Horejs – Schwall 2015 and, most recently, Horejs et al. 2015.

[16] Peloschek 2017 gives an overview of the most significant petrofabrics spanning from the Neolithic to the EBA 1 periods at Cukurici Höyük.

[17] The transition from the Chalcolithic to the Early Bronze Age 1 at Cukurici Höyük has been set around 3000 BC (Horejs – Schwall 2015, 457). For the Early Bronze Age 1 remains at Cukurici Höyük, compare Horejs et al. 2011. The Early Bronze Age 1 sequence at the site dates to 2900–2750 BC, based on radiocarbon dating (Horejs et al. 2011, 31).

[18] Preliminary notes on marble-tempered wares at Cukurici Höyük can be found in Österreichisches Archäologisches Institut 2013, 45 (then-labelled EPH-CW-001); Peloschek 2016a; Peloschek 2017.

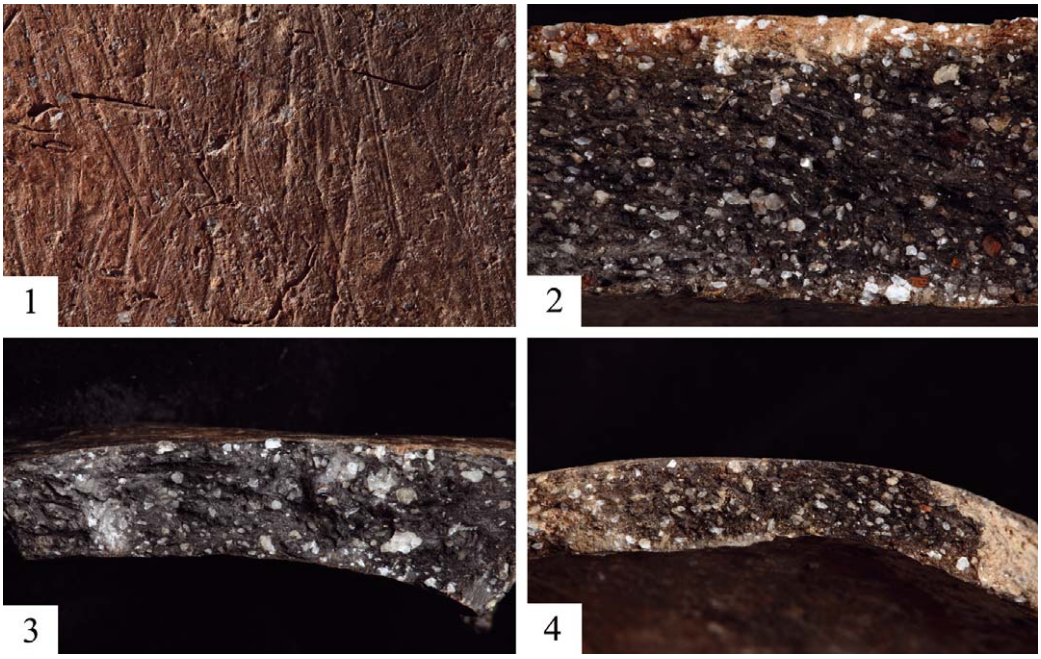

Fig. 1 Macroscopic characteristics of marble-tempered wares. 1. Surface of ceramics falling within WG 15 showing pores of burnt-off organics; 2. WG 15 excellently illustrates a greyish-black firing core framed by reddish margins; 3. WG 27; 4. WG 4 (ERC Prehistoric Anatolia, photos: N. Gail/ÖAI)

likely generated by intentional crushing. Considering the rock type and preparation involved, the recipe for this clay involved marble tempering.

The base clay, fired to a grey colour, contains only a few and very fine inclusions, consisting of muscovite micas, quartz, chert, alkali feldspars, few carbonates, and accessory augite and epidote. Clay pastes matching this composition are concurrently used in the production of finewares.

(2) Petrofabric EPH-MARBLE_02 (Fig. 2.3) is closely analogous with the paste described above. What distinguishes this ware, visible in thin-section, is the character of the marble that is added. The calcite grains that constitute the marble exhibit a more rounded shape and the grain size of the individual minerals varies considerably. Larger (up to 0.75mm) and smaller (ca. 0.06mm) calcite or dolomite grains are randomly assembled (Fig. 2.4). This is evidently a different type of marble from that of Petrofabric EPH-MARBLE_01.

Due to the character of the marble added, calcite grains in the clay matrix have an entirely different pattern of distribution. This observation again confirms that the calcite grains of the individual marble-tempered wares originate from respective rock species. The clay matrix principally matches the properties defined for EPH-MARBLE_01, yet possible volcanic rock inclusions are also attested.

EPH-MARBLE_02 is represented in the ceramic assemblage at Çukuriçi Höyük in considerably lesser quantities than EPH-MARBLE_01. Only three samples have been studied in thin-section. Providing exact numbers for both EPH-MARBLE_01 and _02 is not possible as these pastes are macroscopically indistinguishable and are differentiated solely through petrographic analysis.

(3) The range of marble-tempered wares at Çukuriçi Höyük is completed with Petrofabric EPH-MARBLE_03. It contains calcite grains that exclusively correlate with those detected in EPH-MARBLE_01 (Fig. 2.5). Thus the ware may be understood as a finer variant of EPH-MARBLE_01, containing only the finer portions of crushed marble, i.e. marble powder.

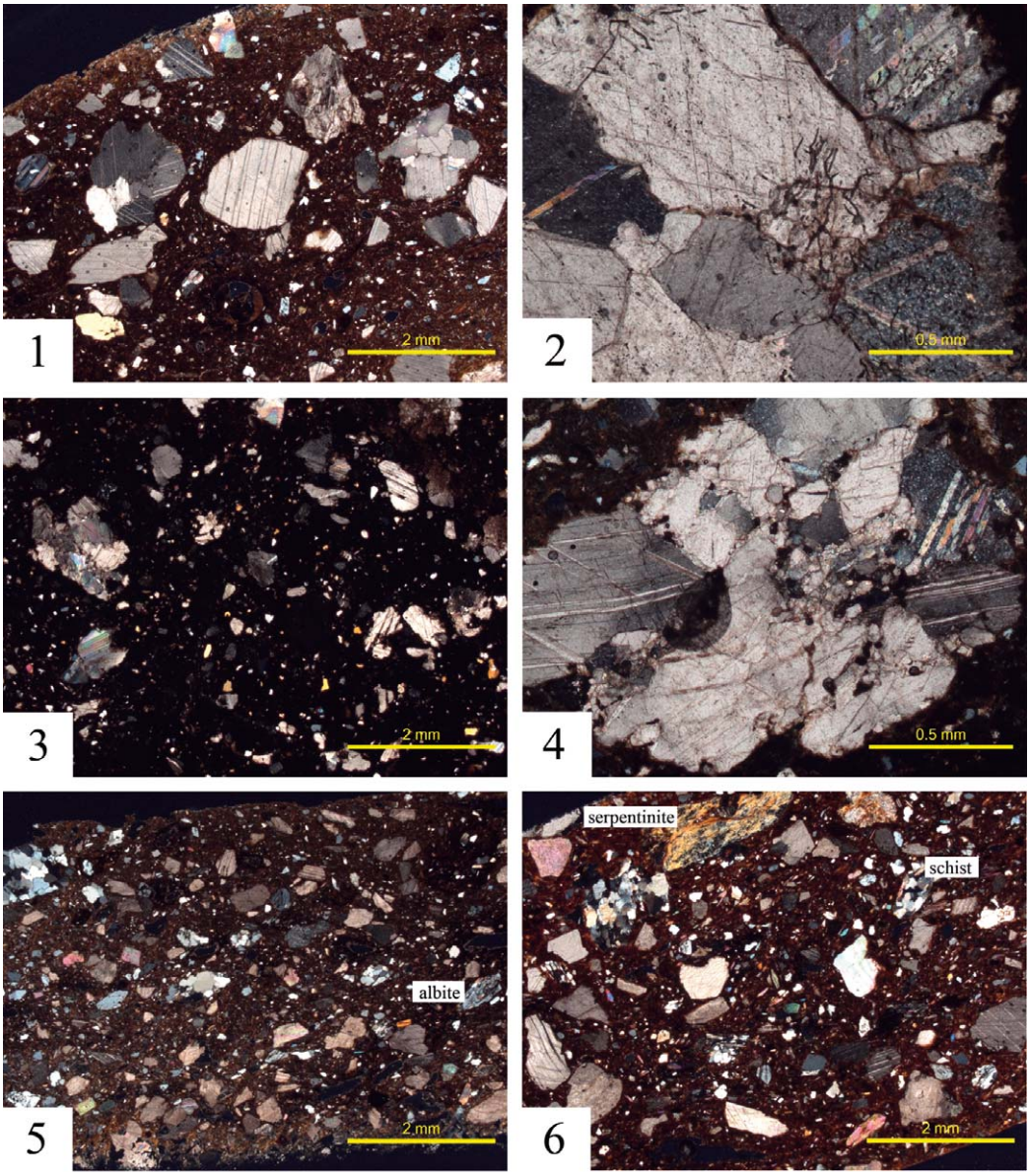

Fig. 2 Photomicrographs of ceramic thin-sections. 1. Petrofabric EPH-MARBLE_01; 2. Detail of a marble fragment in EPH-MARBLE_01; 3. Petrofabric EPH-MARBLE_02; 4. Detail of a marble fragment in EPH-MARBLE_02; 5. Petrofabric EPH-MARBLE_03; 6. Serpentinite and schist fragments in EPH-MARBLE_03. All images taken in XPL (L. Peloschek, ÖAI/ÖAW)

Of interest is the presence of sporadic quartz-mica schists in the coarser elements of this petrofabric, as well as mica schists (muscovite), sporadic serpentinite, and albite (Fig. 2.6). These rocks and minerals are natural constituents of the base clay that was used prior to manipulation.

Marble Deposits and Geological Setting of the Region

Çukuriçi Höyük and the adjacent later city of Ephesos are situated in a region where the Cycladic Complex and the Menderes Massif merge. Generally speaking, the area is defined by metamorphic

Fig. 3 Modern marble quarries at Belevi (Archiv ÖAI, A-W-OAI-DIA-021365)

rock, mainly mica schists and quartz-mica schists.[19] The prevalence of this rock material is reflected in the ceramic assemblage at Çukuriçi Höyük with highly micaceous clay pastes[20] constituting about 85% of all catalogued ceramics.

The marble resources at Ephesos have been extensively studied by Walter Prochaska at the Montanuniversität Leoben. Petrographic and isotopic signatures of all relevant marble quarries in the greater environs have been compiled in previous years. Most importantly, the presence of grey and white marbles, and two clearly distinguishable types of marble, needs to be mentioned. Prochaska and Grillo explain this variability with reference to the geological setting of the region between two tectonic units.[21]

The two types of marble identified by Prochaska are compatible with those detected in the ceramic assemblage at Çukuriçi Höyük. Marble Ephesos II, as denominated by Prochaska, can be equated with the marble recognised in Petrofabrics EPH-MARBLE_01 and _03. Most characteristic is the homoeoblastic texture of the marble described by Prochaska and Grillo,[22] which resembles the two marble-tempered ceramic variants (above). As major sites of deposition, the sources at Belevi (Fig. 3) and Kuşini[23] have already been noted.

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19 Most comprehensively, Çakmakoğlu 2007. The associations of marble and the other metamorphic rocks around modern Selçuk have been described by Yavuz et al. 2011, 217–219.

20 Peloschek 2016b, 254–256.

21 Prochaska – Grillo 2010, 68.

22 Prochaska – Grillo 2010, 69.

23 Compare also Kerschner – Prochaska 2011, 134.

Marble Ephesos I, by contrast, matches the rock fragments displayed in Petrofabric EPH-MARBLE_02. This type of marble is native mainly to the region north of Belevi[24] and, aside from its characteristic texture, is defined by the sporadic occurrence of dolomite crystals within the marble[25] – recognised also in Petrofabric EPH-MARBLE_02. Large-scale exploitation of both types of marble is attested from the Archaic period onwards, when they were used as building materials for Ephesian monuments.

It is more than plausible that the marble-tempered petrofabrics at Çukuriçi Höyük originate in local or regional sources. At least sixteen different marble quarries petrographically corresponding to Marble Ephesos I and II have been identified by Yavuz and collaborators,[26] with the closest marble outcrop to Çukuriçi Höyük located at Mount Panayırdağ. Another argument that would support a local or regional provenance of the marble-tempered wares is the suite of accessory mineral and rock inclusions noted in the clay pastes. Albites, serpentinites, and mica schists are indicative of the local geology.[27] Considering those together with the marble fragments, which correspond to native sources, one can exclude the possibility that this ware had been imported from the Cyclades, and confirm instead its local or regional production.

Percentage Representation of Petrofabrics: Local, Regional, or Cycladic Ceramic Traditions?

In absolute terms, ceramics tempered with crushed marble (EPH-MARBLE_01 and _02) are represented in the Late Chalcolithic period by 66 fragments, and in the Early Bronze Age 1 by 65 fragments. In each of these periods, nine samples of ceramics tempered with marble powder (EPH-MARBLE_03) were recovered. As noted above, with regard to the overall ceramic assemblage at Çukuriçi Höyük, marble-tempered or marble powder-enriched ceramics make up a small proportion of the assemblage – only 3% – within relevant Late Chalcolithic and Early Bronze Age 1 strata.

As noted in the introduction of this paper, marble tempering is a ceramic tradition that is usually associated with the islands of the Cyclades. Recent studies have also verified the production of marble – or, rather, calcite-tempered vessels – on Crete, particularly in its northeastern part.[28] There is a clear preference for these clay pastes in the production of Cycladic or Cycladicising vessel shapes in the Early Minoan I and II periods on Crete.[29] The geological conditions on Crete provided appropriate calcite rock materials for tempering, facilitating local production. However, the ratio of marble- or calcite-tempered wares in ceramic assemblages was much lower than in the Cyclades at that time; for example, at Amorgos, up to 99% of the pottery[30] consists of these wares.

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[24] Prochaska – Grillo 2010, 70; Kerschner – Prochaska 2011, 132–138.

[25] Kerschner – Prochaska 2011, 137.

[26] Yavuz et al. 2011, 220 within a region of up to 25km north and northeast of ancient Ephesos. Various types of marbles outcropping are described in detail here.

[27] Previously, Sauer – Ladstätter 2008, 184–185 with regard to late antique amphoras and cooking wares from the Vediusgymnasium in Ephesos. Their petrofabrics K to K4, represented by cooking wares containing the spectrum of rock/mineral inclusions identified in the base clay of marble-tempered wares, are attributed to local Ephesian clays.

[28] Day et al. 1998, 133 (Ayia Photia cemetery); Day et al. 2012, 119–121; Haggis et al. 2007, 679–680 (Azoria); Nodarou 2012 (Kephala Petras).

[29] For instance, Day et al. 2012, 119; Nodarou 2012, 86 with case studies. More generally: Wilson et al. 2008, 262 or Renfrew 2010, 288.

[30] Vaughan 2006, 100.

Returning to western Anatolia, Çukuriçi Höyük is, to date, the only site with marble-tempered ware in this part of the prehistoric Aegean or western Anatolia.[31] This may reflect the limited state of the publication record of integrated natural-scientific studies of ceramics in Anatolia.

Shape Repertoire and Dimensions of Relevant Vessels

Inspection of the Çukuriçi Höyük assemblage (Tab. 1) makes it clear that shapes associated with domestic, cooking/baking, serving, and storage activities were produced using marble- or calcite-tempered fabrics. These shapes also appear in the ceramic repertoire of Crete, particularly in the second quarter of the third millennium BC, coincident with an increase in the use of this ware for producing cooking pots.[32]

At Çukuriçi Höyük, ceramics tempered with crushed marble (Petrofabrics EPH-MARBLE_01 and _02) are principally represented by storage vessels and bowls (Fig. 4). The walls of these vessels have a thickness of 1.2 to 1.5cm. Clay pastes enriched with marble powder (Petrofabric EPH-MARBLE_03), by contrast, were primarily used for the production of cooking vessels. The walls of these vessels are considerably thinner, at 0.5–0.7cm.

Fig. 4 Overview of vessel shapes represented in marble-tempered ware being associated with SE 216, SE 834 and SE 1361 at Çukuriçi Höyük (ERC Prehistoric Anatolia, photos: N. Gail/ÖAI)

[31] No evidence for the marble tempering of ceramics has been recovered on the island of Samos (Menelaou et al. 2016). Liman Tepe and Bakla Tepe in western Anatolia (Day et al. 2009) in the Anatolian EBA 2 periods were defined by a stronger interrelationship with the Aegean than during the EBA 1. Similarly, in the Middle and Late Bronze Age ceramic assemblage at Iasos, marble-tempered wares are not represented (Hilditch et al. 2012).

[32] Day et al. 1998, 138. Broodbank 2007, 126 notices that in some regions of the Bronze Age Aegean world, marble/calcite-tempered wares are preferred for cooking practices.

Thus the choice to produce storage vessels using clay pastes enriched with marble at Çukuriçi Höyük, and possibly elsewhere, may relate to the functional properties of the fabric – it is particularly solid. On Amorgos, S. Vaughan noted a preference for storage vessels and other thick-walled ceramic shapes in this ware.[33]

However, storage vessels at Çukuriçi Höyük are not exclusively manufactured using pastes with marble temper. In diachronic perspective, it is more often coarse and highly micaceous clay (EPH-METAMORPHIC_01,[34] the most commonly-represented petrofabric at Çukuriçi Höyük) that is used for this purpose. With regard to the cooking wares, it is worth asking whether, especially in regions outside the Cyclades, such as Crete and the Çukuriçi Höyük area, there was a preference for forming these shapes using clay pastes with marble constituents. This practice is commonly observed in antiquity, for example in the Roman era,[35] and is linked to vessel function.

Culture or Nature-Based Technological Practices?

Another aspect that needs to be addressed is the chronology of the emergence of marble-tempered ware at Çukuriçi Höyük, and whether a particular stimulus led to the discovery of marble as a tempering agent. In what context did marble-tempered ware develop, and how can it be understood with regard to local, regional, supra-regional, and foreign traditions?

The earliest ceramic fragments attributed to marble-tempered ware (Petrofabrics EPH-MARBLE_01 to _03) date to phase CuHö VII, corresponding to the Late Chalcolithic period, and the ware continues to increase in use during the Early Bronze Age 1. Another clay paste containing sporadic marble fragments and calcite is attested (Petrofabric EPH-MARBLE_04), though these are natural ingredients of the clay. One possible hypothesis is that the exploitation of this particular paste, and thus the approach to raw materials in environs featuring marbles, ultimately supported the use of marble as an aplastic additive in potting activities.[36] However, the use of this paste cannot be directly correlated with the emergence of marble-tempered wares, as Petrofabric EPH-MARBLE_04 is not attested in the archaeological record prior to the Early Bronze Age 1.

Which account, then, best explains marble-tempering at Çukuriçi Höyük, based upon the evidence? Does the practice follow Cycladic or other foreign traditions, or is it a development indigenous to this particular region of western Anatolia?

An appropriate geological environment with a source of marble is required. There is no argument that would support the importation of marble from elsewhere in order to perform marble tempering, and it is more likely that, in such cases, it is finished vessels that would have been exchanged. In all regions where marble tempering is attested in prehistory – the Cyclades, Crete, and the region surrounding Çukuriçi Höyük – these natural conditions are provided. At other sites in western Asia Minor dating to the third millennium BC such as Liman Tepe and Bakla Tepe, which have been comprehensively studied, no traces of marble tempering have been recognised. However, these sites lie in areas characterised by volcanic rather than metamorphic rock. At Iasos, a site with Early Bronze Age 2 remains and, according to the literature, strong influence of Cycladic traditions, marble-tempered ceramics are similarly absent.[37] This is particularly surprising

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33 Vaughan 2006, 100 mentions a wall thickness of 1.2 to 3cm for ceramic vessels on Amorgos (Cyclades) manufactured from marble-tempered clay pastes.

34 Österreichisches Archäologisches Institut 2013, 45 ("Petrographisches Hauptfabrikat").

35 As an example, Kramar et al. 2012 can be mentioned.

36 In general, clay pastes containing calcite in the Mediterranean also appear in periods antedating the Anatolian Late Chalcolithic and Early Bronze Age periods. Compare Whitbread – Mari 2014 for the use of calcite-tempered ceramics on Late to Final Neolithic (5300–3200 BC) Salamis. Davaras – Betancourt 2012, 98 mention the appearance of considerably large quantities of calcite-tempered fabrics in the Cyclades already during the Final Neolithic period.

37 Hilditch et al. 2012.

as the landscape around Iasos is well-known for its marble deposits. Natural conditions, then, are no guarantor for the emergence of this potting practice. However, at Çukuriçi Höyük, no remains of the Early Bronze Age 2 exist and, by contrast, at Iasos no earlier materials have been studied. Strictly speaking, both sites have only a limited comparability.

Marble tempering at Çukuriçi Höyük was begun in the Late Chalcolithic but intensified in the Early Bronze Age 1 when contact between western Asia Minor and the Cyclades increased.[38] Thus the ceramic ware can be regarded, to some extent, as a chronological marker. However, its emergence cannot be considered a direct reflection of strengthened Aegean-Anatolian networks. The limited range of vessel shapes represented in marble-tempered ware were used for specialised activities such as storing, dining, or cooking. Therefore I would argue that the material properties and functional characteristics of the ware played a decisive role. Unlike marble tempering practices on Crete, which imitated Cycladic prototypes, ceramics at Çukuriçi Höyük followed regional or Anatolian traditions. Judging from the repertoire of shapes, this ware was not exceptional but conformed to coincident stylistic conventions of local coarse wares. Based upon the available evidence, the production of marble-tempered ware within the environs of Çukuriçi Höyük might not be directly related to Cycladic inspiration, but rather was influenced by increasing contact between both cultural spheres. That Çukuriçi Höyük's potters were familiar with Cycladic pottery production techniques is aptly demonstrated by the fragment of a Cycladic-style frying pan, which from petrographic assessment was determined to be of local or regional production.[39]

Acknowledgements: This research was conducted over the course of the project P25825, 'Interaction of prehistoric pyrotechnological crafts and industries. Natural resources, technological choices and transfers at Çukuriçi Höyük (western Anatolia)', funded by the Austrian Science Fund (FWF) under the direction of B. Horejs (OREA, ÖAW). I am very grateful to the entire Çukuriçi Höyük project team for stimulating discussions, support, and help in many regards. Many thanks also to the Austrian Archaeological Institute for provision of the research and laboratory infrastructure.

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[38] Knappett – Nikolakopoulou 2014; Şahoğlu 2011b.

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