
NEOLITHIC POTTERY FROM PIANOSA ISLAND (TYRRHENIAN SEA); PRELIMINARY PROVENANCE DATA

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Introduction

Pianosa is a very small island (about 10 km^2) situated in the middle of the northern part of the Tyrrhenian Sea (Fig. 1). Recent excavations (Bonato *et al.* 2000; Tozzi, Weiss 2000; 2007) have brought to light a Neolithic settlement, that can be ascribed to the so-called "Middle-Tyrrhenian Impressed Ware" and "Linear Pottery" cultural *facies* of the Early Neolithic; dates are listed in Table 1.

Some peculiar characteristics of the assemblage of cultural remains must be pointed out, like the very broad provenance area of the raw materials (*e.g.* obsidian, flint and quartz, granite and greenstone), and the remarkable quantity of ornamental objects. These aspects testify to intense contacts throughout the Tyrrhenian Sea, and suggest that Pianosa may

have been an important harbour along the exchange or trade routes. But were these routes limited to the procurement of raw materials, or were there other links with neighbouring populations? And what was the real role of Pianosa within this network? Was it a permanent settlement or just a safe haven during storms?

Laboratory #	Method	Dated material	Uncalibrated BP	Calibrated BC (95.4%)
LTL 1468A	AMS	Charcoal	6222 ± 60	5320/5020
LTL 1153A	AMS	Soil organic matter	6200 ± 70	5320/4980
Beta 181546	AMS	Charcoal	6090 ± 40	5210/4890
LTL 1778A	AMS	Charcoal	5877 ± 55	4900/4590
GrA 13474	AMS	Bone	5680 ± 40	4620/4440

Table 1. ^{14}C datings of the Pianosa – Cala Giovanna site

The provenance of pottery is probably the most useful information that can be used to answer these questions. Vases and other ceramic objects are cultural indicators that best testify to the contacts with other populations, whatever their purpose. It is also most likely that pottery was produced at permanent or seasonal sites, and not during occasional stops, which are more likely to produce an assemblage of imported vessels.

It can also be pointed out that relatively few sites of the Middle Tyrrhenian Impressed Ware and Linear Pottery are known (and studied) at present along the coast of continental Italy, of the islands and in the neighbouring areas. Therefore, pottery provenance studies may point to possible human presence within areas that are considered now as almost uninhabited.

Methods

As a rule of the thumb derived from direct experience of several Early Neolithic contexts in Italy, petrographic study of the temper grains in thin section can resolve the provenance of the shards almost unequivocally in most cases. This is generally true for relatively coarse-grained pastes, which are the most common within these contexts; conversely, chemical analyses are useful in more recent contexts, where fine-grained pottery (*figulina*) is common.

The pottery assemblage of Pianosa is made up mostly of very coarse pastes, with temper grains that are frequently larger than 2 mm; differences in mineral composition are evident even macroscopically. The poor preservation of the fragments, whose finer surface is worn off, exposing the temper grains, which just out from the surfaces gives the shards a peculiar coarse aspect.

First, the whole assemblage was examined macroscopically and/or with a 10x magnifying lens, and some basic mineral composition groups were identified; test thin sections were prepared from 20 samples (Boschian 2000b). As to the texture, it has be pointed out that almost all the groups are rather rich in temper, and that the sorting is always extremely poor; moreover, strong textural inhomogeneities can be observed within the shards. Therefore, a grain-size classification was not formalised, even if it can be observed that some better sorted mineral groups may be divided into some grain-size classes.

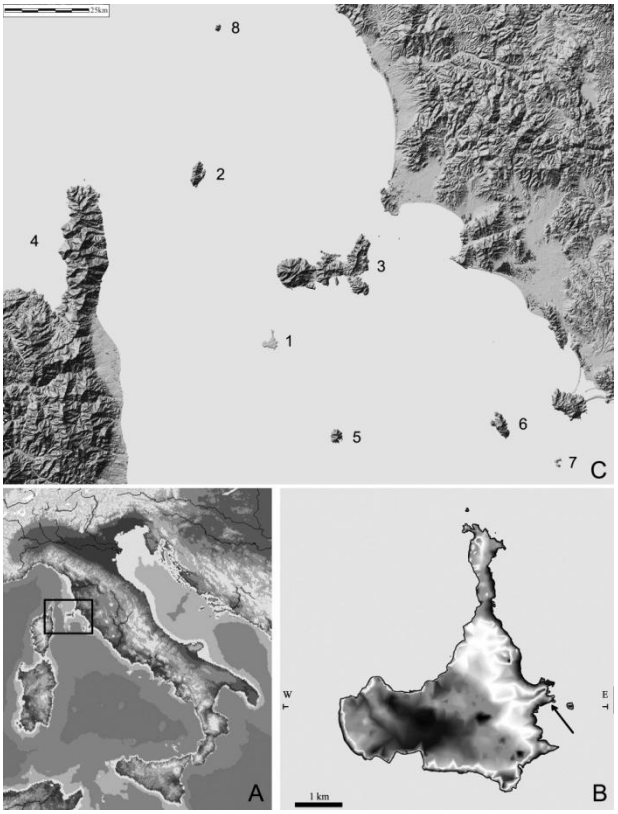

Figure 1. A: general location map. B: Pianosa Island; arrow: Cala Giovanna. C: Northern Tyrrhenian Sea; 1: Pianosa; 2: Capraia; 3: Elba; 4: Corsica; 5: Montecristo; 6: Giglio; 7: Giannutri; 8: Gorgona.

Secondly, samples for thin section preparation were selected from each mineral group. The number of samples per group depended mostly on the homogeneity of the composition, and also partly on the abundance of shards within the group itself. As an average, 10-12 thin sections per group were cut, except in the case of groups made up of very few shards.

At the end of the sampling process, 73 thin sections 45 mm x 26 mm were cut, perpendicularly to the vessel walls. These were examined under a Leica standard polarising microscope, and the mineral identifications were carried out following Kerr (1959), Deer *et al.* (1992), MacKenzie and Guilford (1985), MacKenzie *et al.* (1990) and Yardley *et al.* (1992); the text of Stoops (2003) was adopted in the description of the pedofeatures.

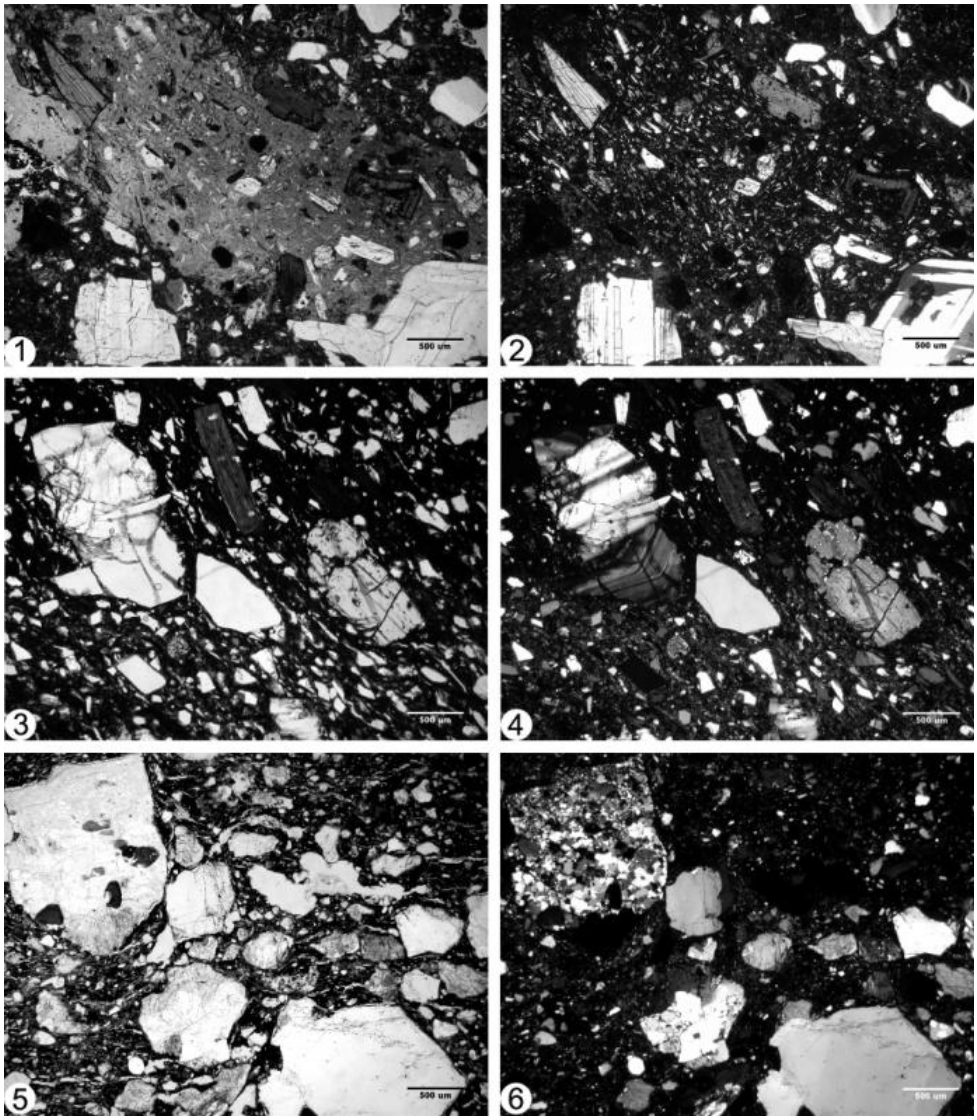

Figure 2a. 1) Dacitic pastes. Fragment of plagioclase-porphyric lava, biotite amphibole and clinopyroxene; 2.5x, PPL. 2) As in 1, XPL. 3) Sanidine and biotite pastes. Plagioclase, abundante biotite, clinopyroxene and sanidine; 2.5x, PPL. 4) As in 3, XPL. 5) Granitic pastes. Upper left: tormalinipherous microquartz; some perthite crystals, abundant unsorted quartz; 2.5x, PPL. 6) As in 5, XPL.

The mineral composition of the ceramic pastes was compared to soil and sediment samples collected during extensive geoarcheological studies (including sedimentology and soil micromorphology) carried out throughout the island (Boschian 2007; Boschian *et al.* 2007), and to some sparse samples collected within the neighbouring Elba island. These were also used to produce experimental briquettes that were laboratory fired and observed in thin section.

Comparisons were also carried out with thin sections of pottery samples coming from sites of the same cultural *facies* situated on the Italian side of the Tyrrhenian Sea, *i.e.* Grotta di Settecannelle (Viterbo) for the "Middle-Tyrrhenian Impressed Ware" (Ucelli Gnesutta, Bertagnini 1993), and Casa Querciolaia (Livorno) and Grotta Patrizi (Roma) for the "Linear Pottery" *facies* (Boschian 2000a; 2001).

Data about the mineral composition of other sites and areas were retrieved from the literature: Costa *et al.* (2002), Paolini-Saez (2002), and Nonza-Micaelli (2005) for the Corsica assemblages, and Martini *et al.* (1996) for Tuscany.

Results

Nine main paste groups were suggested by the thin section study (Figs 2a, 2b). It is noteworthy that the mineral associations are usually homogeneous, and reflect the composition of not more than one or two basic rock types, while mixed or detrital associations are rather rare; this observation may assist in the unequivocal identification of the provenance area of the temper raw material.

The compositional groups were named according to the name of the parent rock(s) or the dominant mineral association, and are presented in Table 2, with a short list of the mineral occurrences.

Discussion

The rocks outcropping on the island are recent (Miocene to Pliocene and Pleistocene) non metamorphosed marine sedimentary rocks, such as silty clays and calcarenites (Colantoni, Borsetti 1973; Graciotti *et al.* 2003; Boschian *et al.* 2007); the silicate component of these rocks is only compatible with the granitic group of pastes, but its grain-size is always much finer than the temper grains in these shards.

Some eroded remains of Pleistocene Alfisols that lie along the coast contain sand-size quartz grains, but also these are finer than the temper. Nevertheless, it must be observed that their texture varies strongly from outcrop to outcrop, so it cannot be ruled out that raw material compatible with the

pastes existed on the island during the Neolithic, but was removed later by erosion. Therefore, it may be concluded that it is unlikely that the Pianosa pottery assemblage was produced *in situ*, even if this possibility cannot be completely excluded.

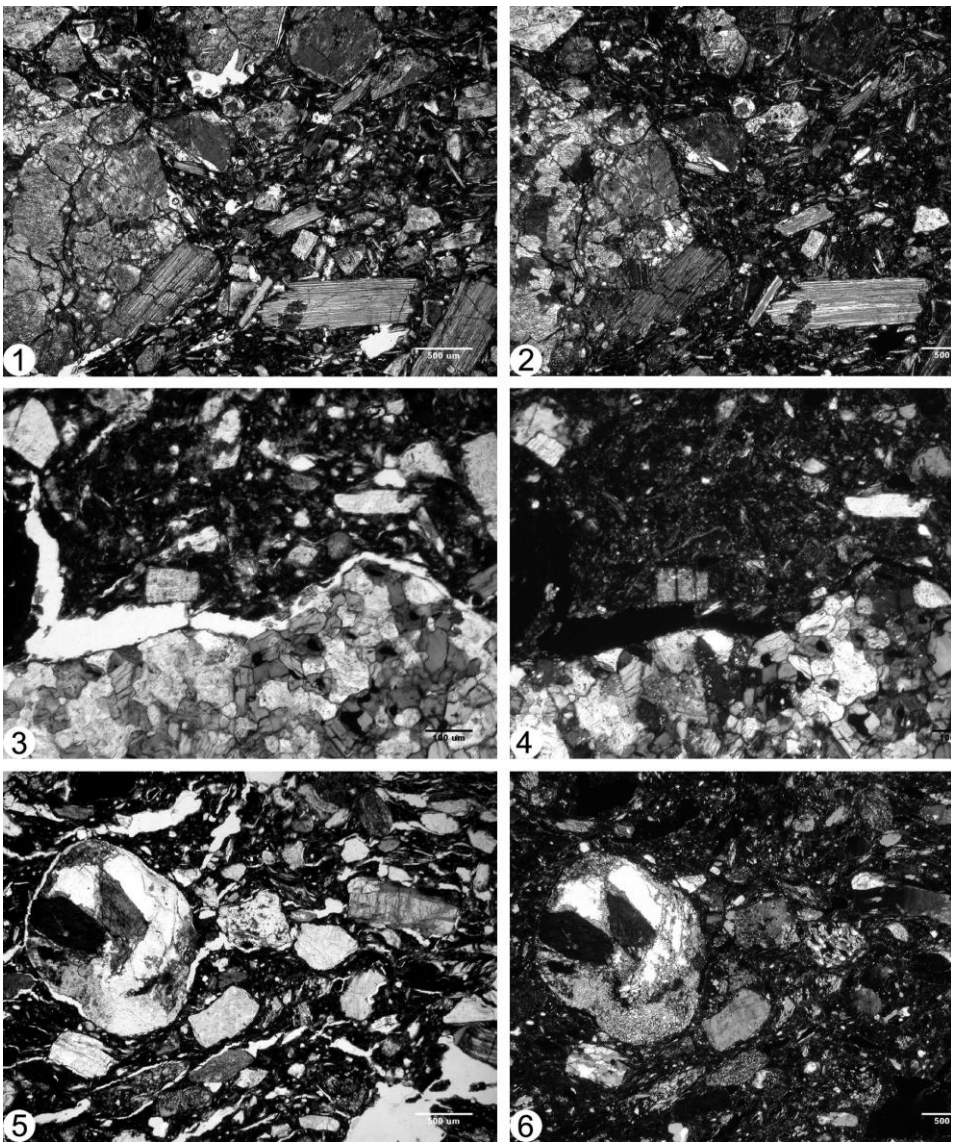

Figure 2b. 1) Gabbroid sensu stricto pastes. To the left, large granule of altered gabbro with diallagio, epidote and very altered plagioclase; lower left: diallagio crystal; upper centre: altered plagioclase grains; 2.5x, PPL. 2) As in 1, XPL. 3) Gabbroid sensu lato pastes. Bottom: large granule of triple-junction granoblastic rock; altered plagioclase; 2.5x, PPL. 4) As in 3, XPL. 5) Blue-schist pastes. Upper right: grain with glaucophane and possibly omphacite; to the left, rounded grain with stressed quartz, brown amphibole and epidote; centre:

Consequently, assuming that the pastes are non-local, their composition was compared to the mineral associations of the possible parent rocks that occur within the area that corresponds to the distribution of the cultural *facies*, *i.e.* the Northern and Central Tyrrhenian (Fig. 3).

Two of the identified groups can be ascribed to a well defined and relatively small provenance area: the "blue-schists" and the "sanidine-biotite" associations. Rocks compatible with the former outcrop only in north-eastern Corsica and in western Liguria, but it must be pointed out that both areas belong to the Alpine ophiolites with very similar compositions that do not allow a distinction between the areas. The results of comparisons with archaeological assemblages from Corsica available in the literature (Paolini-Saez 2002; Nonza-Micaelli 2005) are rather scanty because the analysed samples are few on both sides. The "sanidine-biotite" group can be easily compared to the high-K volcanic rocks of Southern Tuscany-Northern Latium. The hypothesis that vessels were imported from Northern Latium is corroborated also by specific compositional analogies with some samples from Grotta Patrizi (Boschian 2001) and Grotta di Sette-cannelle (Ucelli Gnesutta, Bertagnini 1993) that are located in this area.

It is somewhat more complicated to infer the provenance of the "dacitic" group because calc-alkaline volcanic rocks can be found in several places in the Tyrrhenian area. The three main outcrops are Capraia, another small island some 50 km north-west of Pianosa; an area of about 450 km^2 in north-western Corsica, near Galeria; and a long belt crossing Sardinia along the N-S direction, parallel to the western coast.

Capraia is the closest to Pianosa, but no settlements or evident traces of human activity have been found on this island until now, and therefore this is unlikely to be the procurement site. Corsica is somewhat more likely, even if no definitive evidence is available. Direct comparison of the mineral associations is not possible at present because no

Components / Groups	Qtz	K-Fs	P	Pl	Bt	Msc	Amph	Cpx	Trm	Ep	Plutonic rock	Volcanic rock	Meta-morphic rock	Notes
Granitic	D	D	D	C	Fr-C				Fw-Fr		C-D			Granite
Gabbroid *sensu stricto.*	VFw	VFw		D	VFw	Oc	VFw	D		Fw	Fw-C	VFw		Diopside (*diallagio*); gabbro; pillow lava; porphyritic rocks
Gabbroid *sensu lato.*	VFw	VFw		D	VFw	Oc	VFw	VFw				VFw	Oc	Diopside (*diallagio*); porphirytic rocks; triple-junction granoblastic rocks
Granitic-Gabbroid	C-D	Fw-C	VFw	C	VFw	VFw		C-D		VFw	F	VFw	VFw	Diopside (*diallagio*); calcite (VFw); granite; pillow lavas, micaschist; bioclasts (VFw); grog (?)
Dacitic				D	Fr-C	VFw	VFw-Fw	Fw-C				D-VD		Calc-alkaline dacitic rocks; sparse pumice
Sanidine-biotite	Oc	D-VD			D	VFw	VFw	C				VFw	VFw	Sanidine; microcrystalline volcanic rocks; metamorphic rocks
Blue-schists	C	VFw		VFw	VFw	C	C	VFw		Fw			VD	Glaucophane; pistacite; blue schist and green schist; garnet (Oc)
Micaschists	Fw-C	Fw		Fw-C		Fw-C	VFw	VFw		Oc		Fw	D	Diopside (*diallagio*); calcite (Oc); micaschists, phyllyte, serpentinite, triple-junction granoblastic rocks; porphyric rocks
Serpentinite and meta-sedimentary rocks	Fr	C		C	Fw	C	Fw	Oc			Oc		VD	Granite; serpentinite, tremolite-schist; epidote-rich rocks; micaschist, meta-sedimentary rocks

Table 2. Basic mineral composition of the Pianosa pastes

Table legend : Qtz: Quartz; Pl: Plagioclase; Kfs: K-felspar; Cpx: Clinopyroxene; Amph: Amphibole; Bt: Biotite; Msc: Muscovite; P: Perthite; Trm: Tourmaline; Ep: Epidote
Oc: Occasional; VFw: Very Few; Fw: Few; Fr: Frequent; C: Common; D: Dominant; VD: Very Dominant

experimental firings have yet been carried out on these raw materials, and also because at A Petra (Weiss 1997), the only Neolithic site of the area whose pottery was analysed, the ceramic pastes do not include dacitic components (Paolini-Saez 2002; Nonza-Micaelli 2005). However, the occurrence of Corsican greenstone at Pianosa points to links between these islands, suggesting that pottery may also have been exchanged.

Nevertheless, similar hypotheses can be inferred also for the Sardinian outcrops, because obsidian from Monte Arci was also found at Pianosa. In this case, it would much more difficult to ascertain the provenance of the raw material, because the Sardinian area with calc-alkaline dacites is rather wide. Moreover, mineral data about the Sardinian Neolithic pottery are still very scanty (Bertorino *et al.* 2000).

The "Granitic", "Gabbroid s*ensu stricto*", "Gabbroid *sensu lato*" and "Granitic-Gabbroid" can be ascribed to parent rocks that outcrop in several locations of the Central and Northern Tyrrhenian (Table 2). Gabbros occur in Corsica, at Elba, in eastern Liguria and western Tuscany; granites can be found in north-eastern Sardinia, in almost all Corsica, at Elba, and some other islands along the coast of Tuscany. This situation does not favour the archaeometric work, because the parent rocks are widespread and somewhat homogeneous, and because the distinctive minerals are rare and do not occur frequently within the ceramic samples. At present, the question about the provenance of these pastes cannot be answered in more detail.

The problem is the same for the groups "Micaschists" and "Serpentinite", that may come

from the same area, where the parent rocks are closely associated within the ophiolitic series.

Concluding remarks

Apparently, these data suggest well established links between the Italian mainland and Corsica (and possibly Sardinia); within this network, the islands of the Northern Tyrrhenian Sea may have been used as midway settlements. As for Pianosa, pottery was probably not produced *in situ*, and the settlement may not have been permanent, as suggested also by geoarchaeology and other cultural data (Boschian 2007; Tozzi 2007).

Further research is needed on the ceramic assemblages of Pianosa and of the other sites of the same age and culture within the Tyrrhenian area, including those in more far-off areas. The number of analysed samples per group must be increased, in order to achieve statistically significant results; this will improve the estimate of the compositional variability of the pastes within the sampled areas, giving better indications of their provenance.

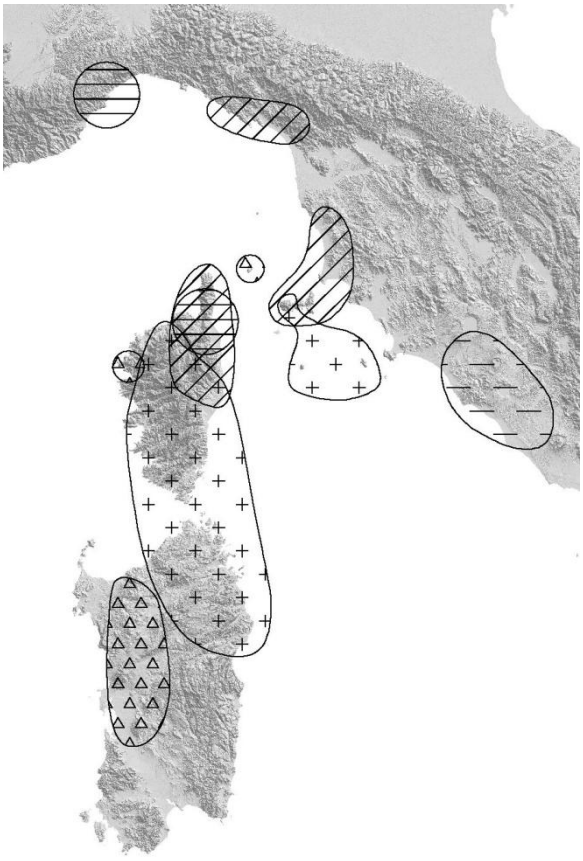

Figure 3. Tentative map of the pottery provenance areas. Crosses: granite; triangles: dacite; oblique hatch: gabbros; horizontal hatch: blue schists; dashes: high-K rocks.

Frequently, the minero-petrographical study of the archaeological samples alone cannot determine unequivocally the provenance of the pastes. In these cases, the comparison with experimental pottery has proved to be an invaluable tool, provided that the raw materials are sampled systematically in a wide area around the sites. This technique takes also into account the natural mixing of the mineral associations and the thermometamorphic modifications occurred during firing.

In the future, soil micromorphological studies on potential clay sources, which are under examination at present, may bring to light distinctive features occurring also within the ceramic pastes.

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