



Alexander Reis (Hrsg.)

Das Rhein-Main-Gebiet in der Spätantike – Beiträge zur Archäologie und Geschichte

Akten der Tagung
in Obernburg am Main
vom 12.–13. April 2018



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Das Rhein-Main-Gebiet in der Spätantike

Beiträge zur Archäologie und Geschichte

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Alexander Reis

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Vorwort

Das Rhein-Main-Gebiet nahm in der Antike als Kommunikationskorridor zwischen dem Imperium Romanum und der Germania (Magna) eine Schlüsselstellung ein. Als verkehrstopographische und klimatische Gunstregion mit fruchtbaren Böden bot und bietet es zugleich beste Voraussetzungen für Besiedlung und wirtschaftliche Prosperität. Besonders in Zeiten politischer Umbrüche geriet das Rhein-Main-Gebiet verstärkt in den Fokus staatlicher Interventionen Roms, so insbesondere während der Germanenkriege der frühen Kaiserzeit und in der Sicherheits- und Außenpolitik der Spätantike. Die Bedeutung der Region kommt in der reichhaltigen archäologischen Überlieferung sowie in den »res gestae« des Ammianus Marcellinus zum Ausdruck. Über die Ereignisgeschichte der Alamannenkriege des 4. Jahrhunderts hinaus bietet letztere auch Informationen etwa zu germanischen Oberhäuptern und Stämmen, die teilweise im Rhein-Main-Gebiet und angrenzenden Regionen verortet werden.

Die Umbrüche und Transformationsprozesse mit erhöhter Migration zwischen dem 3. und 5. Jahrhundert haben in der Region besondere Dynamiken entfaltet. Die Forschungen der letzten rund 30 Jahre führen zur Skizze einer vielfältigen und vielschichtigen Grenzgesellschaft, die sich nach den herkömmlichen Kategorien Provinzbevölkerung, Restromanen und germanische Einwanderer nur unzureichend beschreiben lässt. Das Ausmaß der Kontrolle Roms und seines Einflusses auf die rechtsrheinischen Gebiete in der Spätantike bleibt umstritten. Nicht zuletzt aufgrund der zahlreichen noch nicht ausgewerteten Ausgrabungen ist die Wissenschaft weit davon entfernt, alle Entwicklungen und Zusammenhänge zu durchdringen. Es obwalten noch Kontroversen, die in den verschiedenen Beiträgen aufgegriffen werden – ein Zeichen dafür, dass noch viel Grundlagenforschung zu leisten ist.

Mittlerweile mehren sich die Indizien dafür, dass mit dem Verlassen römischer Siedlungen teilweise erst im letzten Drittel des 3. Jahrhunderts zu rechnen ist. Ging der (endgültige) Rückzug der römischen Verwaltung aus dem rechtsrheinischen Limesgebiet damit einher? Mehrere Beiträge dieses Bandes beleuchten die Weiternutzung oder das Weiterbestehen römischer Siedlungen beziehungsweise die Neubesiedlung unter germanischen Vorzeichen und diskutieren ihre Einordnung als geduldete Inbesitznahme oder gezielte Vorfeldsicherung der Rheingrenze. Die Anknüpfung an bereits vorhandene Bevölkerungselemente scheint dabei möglich, die Einbindung in den spätrömischen Wirtschaftsraum zeichnet sich ab (Beiträge Alexander Reis; Margot Klee; Thomas Becker; Vince Van Thienen/Markus Helfert). Wie verhalten sich dazu römische Befestigungsmaßnahmen, die (Neu-)Strukturierung der römischen Grenzsicherung und schließlich die Entstehung befestigter germanischer Höhsiedlungen (Beiträge Ronald Bockius; Katharina Ramstetter)? Welche Rolle das Rhein-Main-Gebiet überhaupt in der römischen Außenpolitik spielte, analysiert Nikolas Hächler. Dem aktuellen Forschungsstand zum Charakter der städtischen Zentren am nördlichen linksseitigen Oberrhein und den sie betreffenden Fragen von Transformation und Kontinuität in der Spätantike widmen sich an den Beispielen von Mainz und Worms die Beiträge von Alexander Heising und Mathilde Grünewald.

Ein in der ganzen Region herausragendes Einzelstück stellen die Fragmente einer Glasschale des letzten Drittels des 4. Jahrhunderts mit gravierten Szenen aus dem Alten und Neuen Testament aus Obernburg am Main dar, die wohl als Handels- oder Beutegut an den Unterrhein gelangte. Die wissenschaftliche Auseinandersetzung mit ihr bot den Anlass einer Tagung zur Spätantike im Rhein-Main-Gebiet in Obernburg im April 2018, deren Vorträge in dieser Publikation vorgelegt werden. Die Obernburger Glasschale steht bei-

spielhaft für das archäologische Überraschungspotential, das die spätantiken bis völkerwanderungszeitlichen Fundstätten der Region bergen können. Gleichwohl bleibt sie in der Region ein Solitär, wie die technische, künstlerisch-ikonographische sowie religionshistorische Einordnung und Neubewertung des Fundes zeigen (Beiträge Stefanie Nagel; Manuela Studer-Karlen; Sebastian Ristow). Der Beitrag von Constanze Höpken erlaubt eine Einordnung der Obernburger Schale in das Spektrum spätantiker Glasgefäße und ihrer Verwendungen auch weit über die Region hinaus.

Die Bedeutung des Rhein-Main-Gebietes in der Spätantike gründet hauptsächlich auf seiner strategischen Geographie. Rohstoffe und Ressourcen scheinen dabei, von den fruchtbaren Böden der Wetterau abgesehen, eine untergeordnete Bedeutung gespielt zu haben. Eine Ausnahme stellen die Steinbrüche des Felsberges im Odenwald dar, die für kaiserliche Monumentalbauten in Trier ausgebeutet wurden. Der Beitrag von Jochen Babist und Alexander Vögler beleuchtet die damit verbundene Infrastruktur.

Die Stadt Obernburg, das Medienhaus Main-Echo, der Heimat- und Verkehrsverein Obernburg, der Förderkreis Mainlimes-Museum und die Kolpingfamilie Obernburg haben zum Zustandekommen und zur Durchführung der Tagung in Obernburg hilfreich beigetragen. Ihnen sowie den Referentinnen und Referenten sei herzlich gedankt.

Dr. Alexander Reis

Prof. Dr. Markus Scholz

Institut für Archäologische Wissenschaften, Abt. II: Archäologie und Geschichte der römischen Provinzen,
Goethe-Universität Frankfurt am Main

Analysis of Germanic handmade pottery from the Rhine-Main region during the late Roman period: initial results from Groß-Gerau

Vince Van Thienen / Markus Helfert

In archaeological studies, the late Roman period often remains an elusive period. As many regions within the Western Roman Empire underwent a demographic decline, the number of known sites is few and often not well understood. While the major transformations of Late Antiquity are widely studied, the dynamics and conditions of local communities during the Roman-to-Medieval transition are poorly understood in many areas, including the Rhine-Main region. The study of locally produced pottery offers a way of focussing on the daily activities of local communities. In contrast to earlier Roman phases, the pottery produced in the rural provincial landscape during the late Roman period is mainly composed of handmade ceramics. Ceramics dating after ca 260 are often attributed to Germanic settlers who migrated into the Roman territories or (re)settled in the frontier region along the Rhine. Earlier provenance studies¹ have confirmed this phenomenon to some extent, yet a systematic study of the organisation and networks of Germanic pottery, or an interpretative framework beyond a basic migration perspective, is often lacking. In general, handmade pottery has for a long time remained neglected in favour of better documented (imported) Roman tableware or transport vessels, as these finds allow for a better reconstruction of economic networks. Domestic production, how-

ever, is better suited for studying the organisation and social changes of local communities. This study of handmade pottery in the Rhine-Main region attempts to contribute to a more integrated and differentiated interpretation of Germanic communities along the Middle Rhine frontier during the late Roman period.

Some recent studies and scientific analyses of handmade pottery dating to the late Roman period – i.e. late 3rd to early 5th century – from neighbouring regions² document local production practices, and reconstruct networks of trade and migration by establishing the origin of the clay, or investigating technological markers. Yet, despite a number of excavated sites³ with evidence for occupation in the 4th and 5th century, most studies on handmade ceramics from the Rhine-Main region⁴ focus on the 1st to 3rd century. The studies⁵ that do venture into the late Roman period concentrate on wheel-turned pottery and imported Roman wares. One exception is Schneider's study that includes geochemical and mineralogical analyses of Neckar-Suebian and Alamannic pottery⁶ from Ladenburg.

The current study combines geochemical and petrographic techniques on the material to establish the provenance of the clay, as well as attempting to reconstruct cultural traditions of Germanic commu-

We would like to thank Prof. Dr. Markus Scholz for providing the opportunity for this research, as well as Dr. des. Thomas Becker, Ralf Klausmann, Bernd Mertens, Werner Jährling and Henrik Leif Schäfer for their essential help and assistance in this study. Funding has been provided by the Alexander von Humboldt Foundation.

1 Cf. for instance De Paepe/Van Impe 1991.

2 Cf. for instance Nösler 2013; Nösler/Stilborg 2010 for the Elbe-Weser coastal area; Taayke 2013 for the northern Netherlands; Flügel et al. 2000 for the site of Auerberg in Südbayern; De Paepe/Van Impe 1991 for Belgium and the southern Netherlands.

3 Steidl 2000; Maurer 2011.

4 Cf. for instance Abegg et al. 2011; Lenz-Bernard 1990; Walter 2000.

5 Cf. for instance Biegert/Schneider 2011 on ceramics from Nida-Hedderheim at Frankfurt am Main; Frank 2011 for material from the Main-Tauber region.

6 Schneider 2002.

nities through technological markers in the composition of their domestic pottery. According to Peacock's modes of production,⁷ the handmade pottery studied here can be defined as manufactured in a household production, or household industry, based on the technological level of handmade pottery during the Roman period, and the accessibility to wheel-turned wares. Walter⁸ noted that the Rhine-Weser Germanic pottery in the region between the Main and Taunus was most often designed for common daily practices related to eating and drinking. This implies that this type of pottery was most likely made in a domestic setting by a few (semi-)specialised potters producing for a small community.

Domestic pottery productions express the traditions of local communities. The actions and choices made by local potters are reflected in every aspect of the ceramic vessels, such as their colour, shape, decoration and quality. These actions and choices can be seen as a recipe of steps that have to be followed in order to make traditional pots. This is also referred to as the ›chaîne opératoire‹⁹ or *modus operandi*. Therefore, the study of ceramic fabrics reflects technological and environmental aspects such as technical know-how, instruments, facilities and access to raw materials, and also provides information on the social and cultural environment in which the pottery was created.

Here, we present the first results of the compositional analyses of the late Roman handmade pottery in Germanic or Alamannic tradition from Groß-Gerau, recovered during excavations between 1989 and 1992 under the direction of the Landesamt für Denkmalpflege Hessen, Außenstelle Darmstadt. A few samples of handmade pottery from the late 1st to 2nd century have been selected as comparative examples to those of the 3rd and 4th century. The ceramic compositions were analysed by petrographic optical microscopy and X-ray fluorescence spectrometry.

The Alamannic settlement at Groß-Gerau of the late 3rd to 4th century

The Roman vicus of Groß-Gerau originated from the former Roman fort and settlement in the last third of the 1st century. At the beginning of the 2nd century, the castellum was abandoned by the Roman military. During the phase of the military occupation of the site – ca 75–120 –, three Gallo-Roman pottery workshops¹⁰ produced a large variety of ceramic types and wares. In the following centuries, the vicus of Groß-Gerau was part of the economic and military network in the hinterland of the limes.¹¹ At the end of the 3rd century, the settlement is suspected to have been abandoned, following the so-called Limesfall between 260 and 280, after which most Roman settlements on the right bank of the Rhine were abandoned. The final building phases in the Roman settlement at Groß-Gerau are dated to the middle of the 3rd century according to dendrochronological data.¹² The late Roman occupation is traditionally dated to the 4th century and is attributed to the arrival of Alamannic communities that had settled just outside the core area of the former Roman vicus (fig. 1). A number of features belong to this phase, including several sunken huts, wells and a large wastepit (BF-1438, figs. 1.2; 2) – which is possibly a knacker's yard. The finds from these structures are considered to represent traditional Elbe-Germanic traits, such as handmade pottery, brooches, beads, needles and bone combs. Yet Roman influences were not totally absent as indicated by the imports found at the site. These mainly consisted of Brown and Grey Terra Nigra produced in Mogontiacum (Mainz) during the 4th century, small amounts of Argonne Terra Sigillata and Eifel ceramics from Urmitz and Mayen.¹³ Furthermore, a study of the animal bones from the large wastepit¹⁴ demonstrated that cattle breeding in particular was conducted according to Roman tradition, as evi-

7 Peacock 1982.

8 Walter 2000.

9 Lemonnier 1983; Leroi-Gourhan 1964; Martínón-Torres 2002; Sellet 1993.

10 Helfert 2010.

11 Wenzel 2012, 94–100.

12 Ibid. 105.

13 Ibid. 106–108.

14 Kerth et al. 2006, 400–404.



Fig. 1. Groß-Gerau, Auf Esch. Excavated areas (yellow) west of the Roman vicus. 1 Alamannic settlement; 2 Large wastepit; 3 Roman cemetery (1st–3rd century); 4 Western part of the Roman vicus.

denced by a preference for the larger Roman breeds. In addition, the late Roman coin finds¹⁵ demonstrate that the area on the right bank of the Rhine, opposite Mainz, was a part of the regular coin circulation of the Roman Empire until the middle of the 4th century. The extent of the Roman-Germanic interaction at Groß-Gerau remains unclear, although it is not unlikely that either a Roman military unit was located here or that the Alamannic settlers received Roman coins for their services as mercenaries or tradesmen.

Handmade pottery from Groß-Gerau

At the site of Auf Esch in the former vicus of Groß-Gerau, the large wastepit (BF-1438, fig. 2) was found dug into the Roman road leading to Mainz. The wastepit contained a large concentration of handmade ceramics. The content of this pit was initially studied by Wenzel,¹⁶ who noted Roman imports and local productions, alongside the sus-



Fig. 2. Transect of the large wastepit (BF-1438) from Groß-Gerau, Auf Esch that was dug into the Roman road leading to Mainz. The V-shaped ditch of the Roman road is still visible underneath the pit.

¹⁵ Stribny 1989.

¹⁶ Wenzel 2009.

Ceramic	Number of sherds	%
Handmade pottery	1007	69,98%
Fine wares		
Terra Sigillata	94	6,53%
Terra Nigra	31	2,15%
Brown Nigra	174	12,09%
Grey Nigra	17	1,18%
Marbled ware	8	0,56%
Gold-mica ware	3	0,21%
Red-coated ware	2	0,14%
Indet	28	1,95%
Plain ware	5	0,35%
Coarse wares		
Urmitz ware	19	1,32%
Mayen ware	12	0,83%
Amphorae	2	0,14%
Indet	37	2,57%
	1439	100%

Tab. 1. Overview of ceramic finds in the large waste pit (BF-1438)

pected Alamannic handmade pottery (tab. 1). In addition to ceramics, this feature also contained a large amount of animal bones,¹⁷ as well as a number of metal, glass and stone finds.

In this study, we focus on the handmade pottery, combining the compositional information to gain new insights into the suspected Alamannic handmade pottery. A wide variety of pottery types have been selected, including cooking pots, bowls, cups, beakers, jugs, storage vessels, as well as possible crucibles (fig. 3). Owing to the large degree of fragmentation, it was not possible to identify the vessel type for every sherd. In general, most of the handmade pottery is quite simple and very functional in design, characterized by flat bottoms, oval and S-profiled walls, some biconic shapes, and flat or elevated bases of foot vessels. Decorations are found on a minority of vessels, including finger or round impressions, incised lines, grooves and nicks in geometrical, waved or striped patterns, and appliqué knobs.

In order to compare the finds from the large pit, BF-1438, additional handmade pottery from Groß-

Gerau was selected from sunken hut features, wells, a stone cellar and a farmstead (tab. 2) dating from the late 1st to late 3rd century. This allows us to determine if there is a chronological consistency or change in the compositional elements, i.e. in the provenance of the clay or the recipe by which the pottery was made.

Petrographic analysis

The fabrics of the handmade pottery are described and grouped by means of ceramic petrography, following the method of Quinn,¹⁸ in which thin sections are studied under a polarizing microscope at various magnifications. In general, the fabrics are quite heterogeneous with varying silt-to-sand ratios, fired in reduced or mixed reduced-oxidized atmospheric conditions, often with coarse inclusions that are visible to the naked eye. The mixed fabrics can be divided into layered fabrics with a core lighter or darker than the outer edges and fabrics with oxidation zones from the surface towards the core. At least three petrographic groups (fig. 4) can be distinguished within the sampled handmade pottery from Groß-Gerau, based on the dominant mineralogical constituents from the first assessment of fifty thin sections.

The main group, labelled as the sedimentary/metamorphic group (S/M), consists of twenty-eight thin sections and is characterized by fabrics deriving from a sedimentary clay containing various amounts of sedimentary and/or metamorphic rock detritus, mainly from sedimentary parent rocks. The mineralogical profile is dominated by quartz minerals and contains a range of fine to coarse rock inclusions (clastic sandstone, siltstone, chert, low to high grade metamorphosed sedimentary rock), plagioclase feldspars, iron oxides and clay pellets (fig. 5). Both unimodal and bimodal fabrics have been observed, indicating that, in a number of sherds, the coarse fraction was added as a sand temper. A large amount of plastic and semi-plastic inclusions can be observed, some of which might be considered as an intentional temper, although this is only a minor feature, as well as some plant matter that appears to

¹⁷ Kerth et al. 2006.

¹⁸ Quinn 2013.

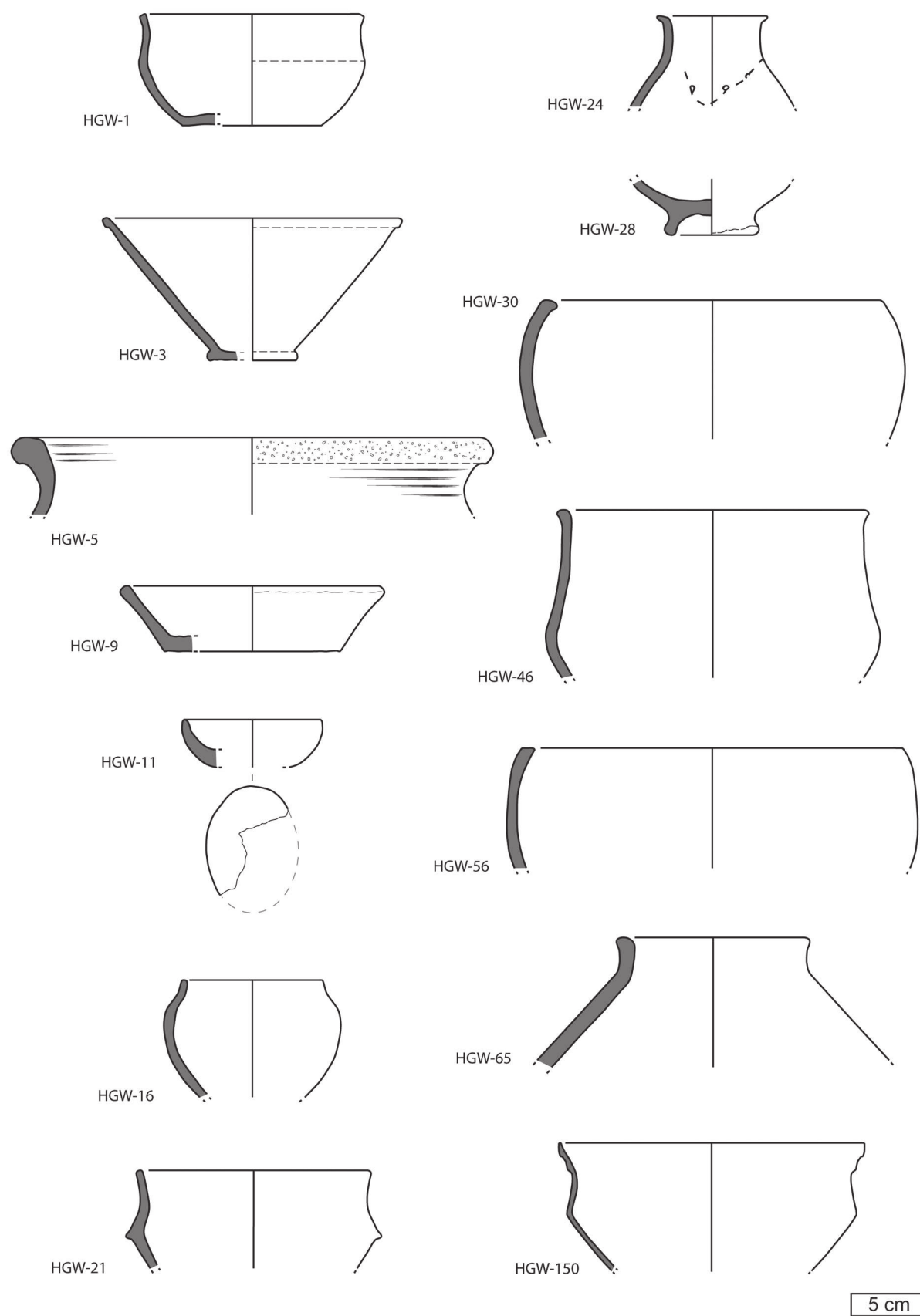


Fig. 3. Selection of different handmade pottery vessel shapes from the large wastepit, analysed by thin section petrography.

site	context	description	date	datable finds
Auf Esch	BF 658	sunken hut	late 1 st century (ca 75–95)	Terra Sigillata (stamp COTO), Flavian Terra Nigra, local ceramics (ca 75–120), Wetterau marbled ware
Auf Esch	BF 652	two-post house, possible sunken hut	late 1 st – early 2 nd century (ca 75–120)	South Gaulish Terra Sigillata, Mainz production (Flavian–Trajanic), local ceramics (ca 75–120)
Auf Esch	BF 683	well	late 1 st – early 2 nd century (ca 75–120)	Wetterau marbled ware, local ceramics (ca 75–120)
Auf Esch	BF 813 (89/1456)	stone cellar	late 3 rd century (ca 260/270–300)	Terra Sigillata (Drag. 33), Urmitz ware (post quem 233), Brown Nigra (ca 270–280), Dieburg ware, local ceramics (ca 75–120)
Auf Esch	BF 855	well	late 3 rd century (ca 260/270–300)	South Gaulish Terra Sigillata (stamp MEDDULUS), Urmitz ware (post quem 233), Brown Nigra (late 3 rd century), marbled ware, flamed ware, jug (white engobe, 3 rd century), local ceramics (ca 75–120)
Auf Esch	BF 1438 (89/1899, 1904, 2016)	filling (waste dump) of a large dug-out feature; possible artisanal pit	late 3 rd – early/mid 4 th century (ca 280–350)	coins: Constantius' sons (post quem 335/337), Constantius II (post quem 340); Urmitz ware (post quem 233), Brown Nigra (ca 4 th century)
Auf Esch	BF 877 (89/1440)	sunken hut	late 3 rd – early/mid 4 th century (ca 275–350)	Argonne Terra Sigillata (Chenet 304), Mayen ware (Alzey 28e), Brown Nigra (ca 4 th century)
Auf Esch	BF 2973 (DA. EV.2015:152)	sunken hut	late 3 rd century (ca 260/270–350)	Mainz Brown Nigra (plate, ca 270–280)
Auf Esch	BF 2984 (DA. EV.2015:152)	sunken hut	late 3 rd century (ca 260/270–350)	marbled ware (›céramique à l'éponge‹), central Gaulish Terra Sigillata (ca start 2 nd century), ›brown nigra‹ (ca 270–300)
Auf Weidig	BF 982	cellar	mid 2 nd century (ca 120–180)	Terra Sigillata (post quem 150), Cologne ware (ca 70–120)
Dornheim, Im Biet	BF 2040	house, possibly part of villa rustica	mid 3 rd century (ca 230–260)	Rheinzabern Terra Sigillata, Trier Terra Sigillata, Urmitz ware (post quem 233), metallic ware, Brown nigra (late 3 rd or early 4 th century), red-coated soldier's dish
Genfer Str.	Grab 47	burial	mid to late 3 rd century (ca 230–260)	Rheinzabern Terra Sigillata (Niederbieber 3 stamp COSTITUTI ca 160–260, Niederbieber 3 stamp PRIMANUS FE ca 160–260, secondarily fired ›Spruchbecher‹ with white engobe spelling BIBII SO[LVATO]R, possibly late 3 rd century), Trier Terra Sigillata (Drag. 32 stamp PATRVITV[S] ca 160–260), Caracalla coin (post quem 202/210)

Tab. 2. Overview of sampled contexts from Groß-Gerau for petrographical and geochemical analysis, including short description and chronology.

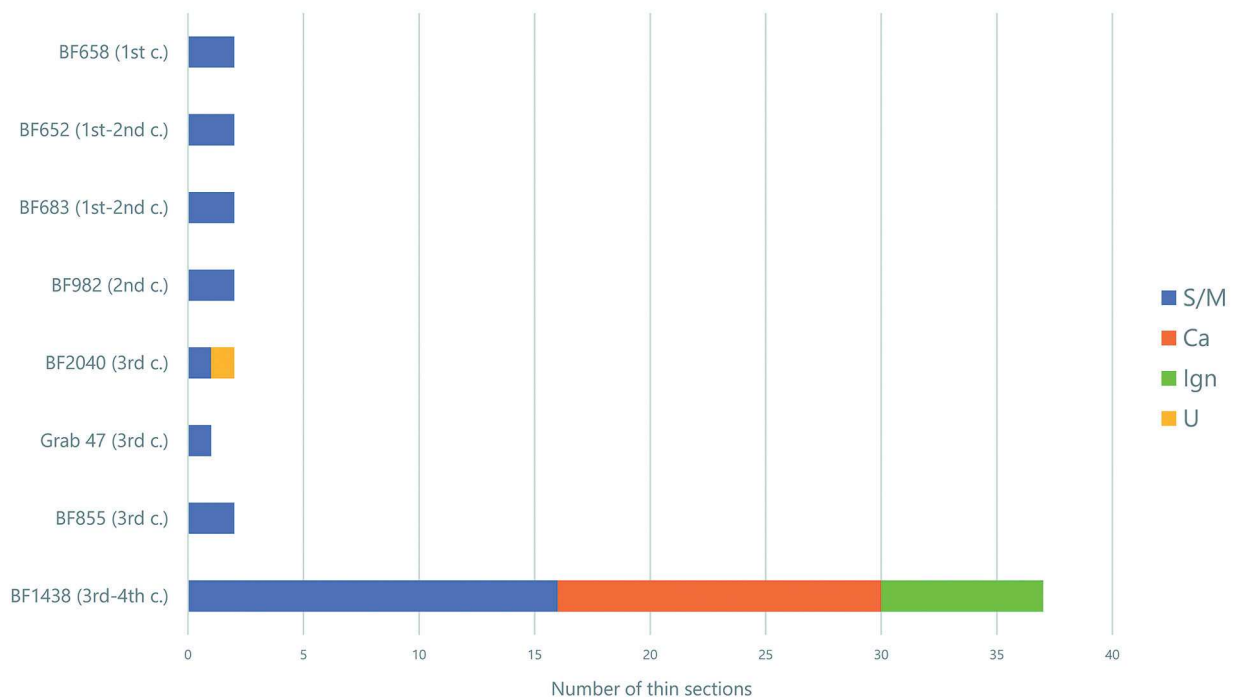


Fig. 4. Distribution of petrographic groups, based on the dominant mineralogical constituent for each sampled context. Sorted chronologically from 1st to 4th century ($n = 50$).

have been naturally embedded in the clay. This fabric group appears to have been made with sedimentary clays, indicating a potential provenance with alluvial clays from the fluvial landscape of the abandoned Altnekar. The samples in this group exhibit a large variation in grain size, heterogeneity and mineralogical profile, demanding further detailed study to determine possible meaningful subgroups, and pinpoint a more precise provenance area. The samples from this main group derive from all sampled contexts (fig. 4), spanning a continuous chronological range from the late 1st century to the middle of the 4th century (table 2). Nearly all sampled pottery types are represented within this group: cooking pots, bowls, cups, jugs, foot vessels and storage vessels. Only the suspected crucibles are lacking in this fabric group.

The second group is labelled as the calcite group (Ca), and consists of fourteen thin sections that are mainly characterized by large angular calcite minerals and occasional carbonate rock fragments. They also contain some metamorphic and sedimentary

rock inclusions, albeit to a lesser extent, iron oxides and iron-rich clay pellets (fig. 6). A large variation within this fabric group can be observed in thin sections, dominated by fresh coarse calcite minerals with or without a higher amount of rounded metamorphic and sedimentary rock fragments, or iron oxides and iron-rich clay pellets. Most fabrics appear bimodal, indicating that calcite minerals or rocks were crushed and added as a temper. This interpretation is supported by their angular shape and large grain sizes. At the Alamannic settlements of Ladenburg, ca 60 km south of Groß-Gerau on the Neckar river bank, marble-tempered pottery has been observed,¹⁹ indicating a potential link with this fabric group. The eastern or western hills containing limestone, dolomite or marble can be considered as potential provenance areas, but this has to be confirmed by further analyses. Interestingly, the samples from this calcite group only derive from the large waste pit BF-1438 (fig. 4), dated between the late 3rd and the middle of the 4th century (tab. 2). The thin sections of this group are also not restricted to

19 Schneider 2002.

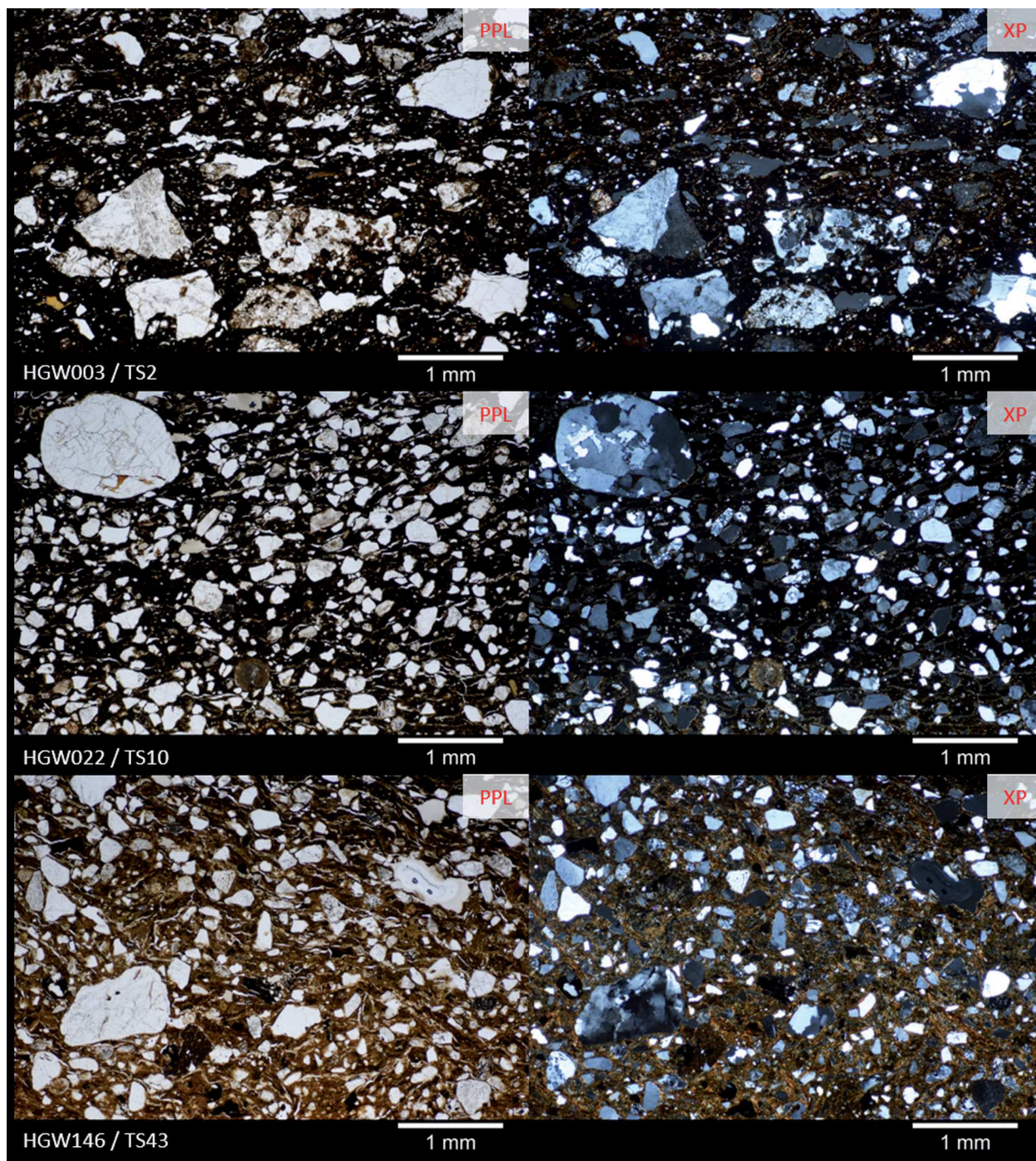


Fig. 5. Examples of thin sections from petrographic group 1 (S/M).

one type of pottery. From those that could be identified, samples belong to cooking pots, bowls, jugs and suspected crucibles.

The third group is labelled as the igneous group (Ign) and consists of seven thin sections that differ from both other groups by the presence of igneous rock fragments, such as granite or diorite, and large biotite and/or muscovite mica minerals (fig. 7). Typi-

cally, many of these samples contain a larger amount of feldspars. Occasionally, hornblende and pyroxene are observed as well. In addition, the fabrics also contain quartz minerals and sedimentary rocks – mainly sandstone and chert – indicating a considerable overlap with the mineralogical profile of the base clay in group one. Given that most of the fabrics from group three appear bimodal, it is likely

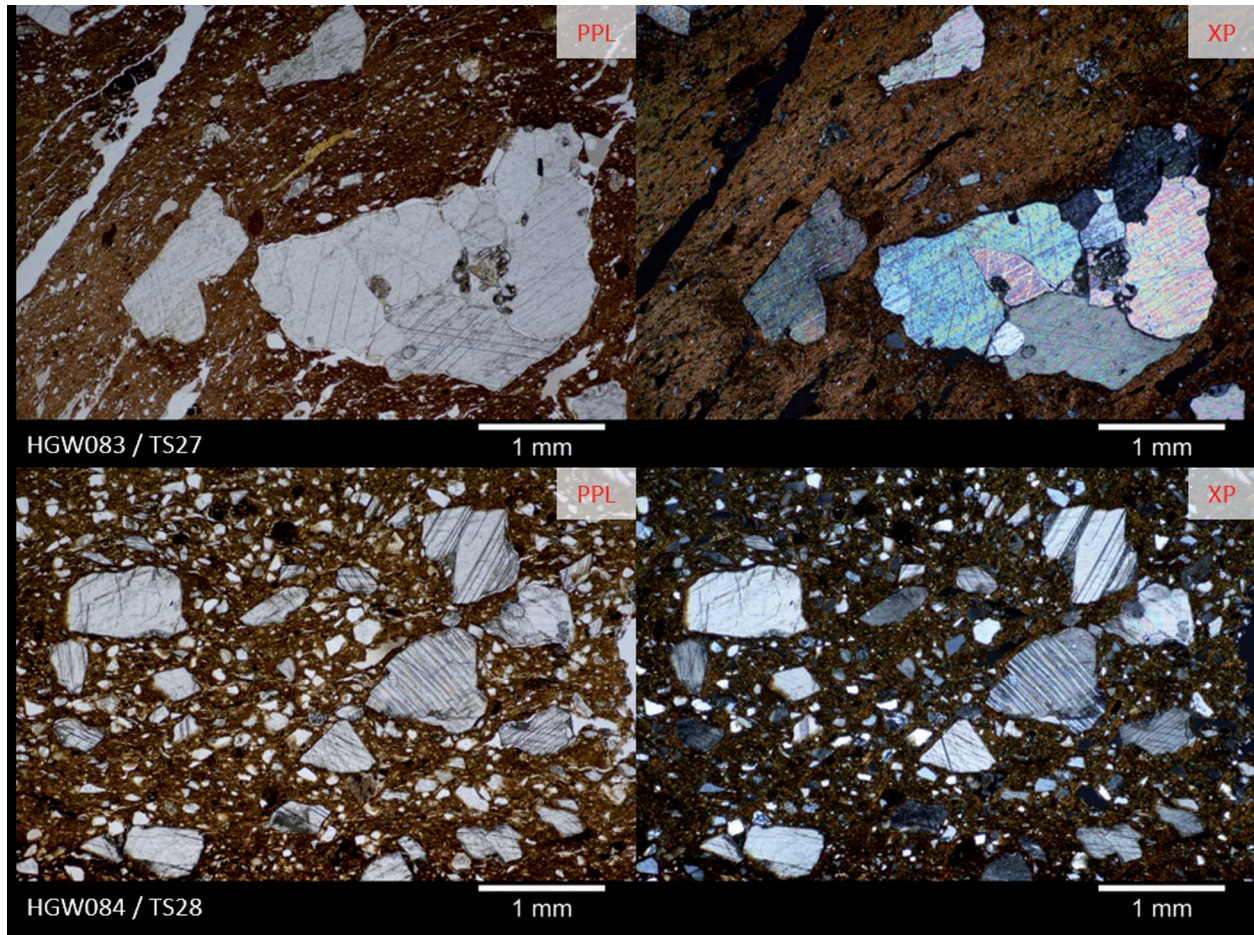


Fig. 6. Examples of thin sections from petrographic group 2 (Ca).

that its base clay was extracted in a similar geological setting to that of group one, i.e. in the Altnekar region. The magmatic rock fragments could originate from the Odenwald or Black Forest mountain ranges, which both have a large geological diversity, with both metamorphic and igneous rock formations. Similar to group two, the samples of this group only derive from the pit BF-1438 (fig. 4; tab. 2). The thin sections of group three belong to cooking pots, bowls and storage vessels.

One deviating thin section (HGW-144, Dornheim, Im Biet) demonstrates a grog-tempered fabric, consisting of a fine inclusion-poor sedimentary clay with many grog fragments and clay pellets. This fabric is considered to be an outlier (U) from the other three groups, although the mineralogical profile can be related to that of the finer fabrics in the sedimentary/metamorphic group.

A much more detailed petrographic study is necessary before proposing conclusive provenance statements for these fabric groups, although it is

very likely that the clays stem from local outcrops along the Altnekar river banks. Various thin sections also exhibit mineralogical elements from two or three groups, suggesting the exploitation of an extensive landscape with a large geological variation. These first results might indicate the availability of different clay outcrops around the settlement, or a regional exchange network between Germanic communities in the Rhine valley. The relationship between production area and consumption site might be more complex than is traditionally assumed in the Germanic settlement or migration models.

Geochemical analysis (XRF)

Prior to the thin section investigation, X-ray fluorescence analyses were carried out on 195 samples from various features of the Alamannic settlement of Groß-Gerau and its surroundings. The portable

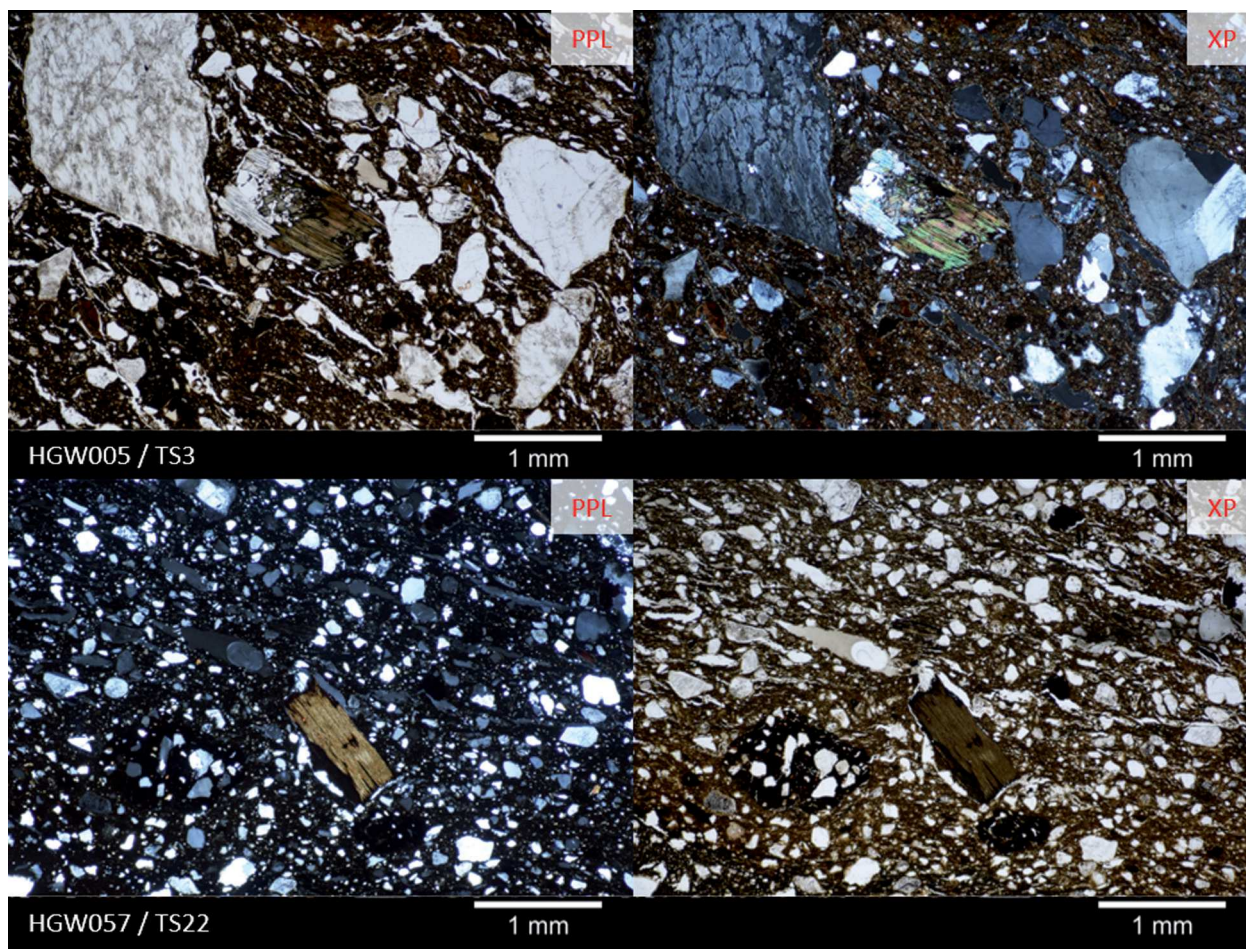


Fig. 7. Examples of thin sections from petrographic group 3 (Ign).

energy dispersive X-ray fluorescence analysis (pXRF) was used, with which larger sample series can be measured with good precision in a relatively short time. The Vanta M spectrometer from Olympus, which has been available at the IAW Ceramics Research Unit since 2019, was used for the sample series. This was empirically fine calibrated before the actual measurements by using 140 reference samples, so that the results are compatible with those from other studies.

From this larger series of measurements, the thin section samples were selected based on their macroscopic and geochemical characteristics. During the pXRF measurements, the ceramic samples were analysed at three different locations where a fresh fracture had previously been generated. The three measured values per sample were averaged in order

to minimize the effect of very heterogeneously distributed minerals in the ceramic. This procedure has proved particularly useful for highly tempered ceramic wares.²⁰ The first results presented in this paper will be limited to the geochemical results of the fifty thin sectioned samples.

The three petrographic groups were examined and compared with regard to their geochemical composition. Firstly, the overall data set had to be checked for outliers showing a geochemical composition strongly deviating from the groups. After a principal component analysis, a total of five of the fifty samples considered here in particular were identified as outliers (HGW-3, 25, 83, 144 and 158). Under the premise that the majority of the analysed sherds were probably produced locally by Germanic peoples in the context of a subsistence economy, the

²⁰ Helfert et al. 2011.

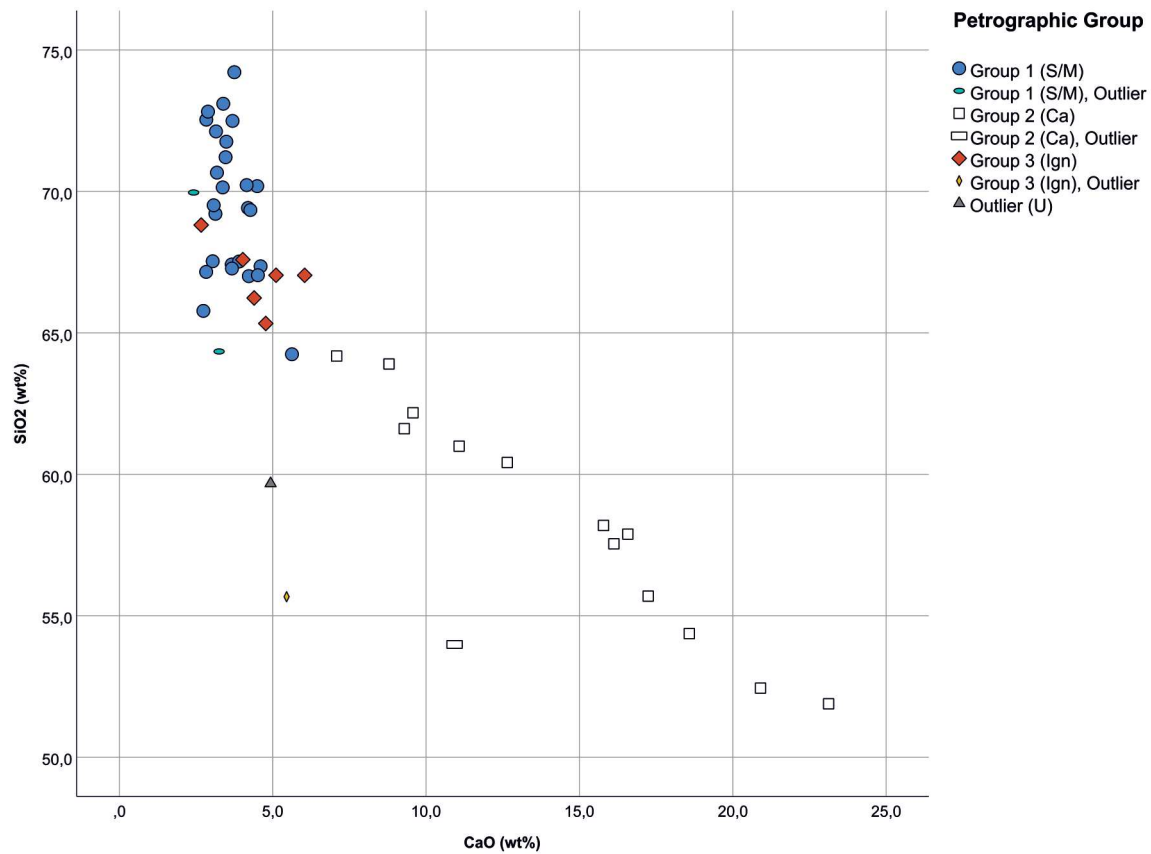


Fig. 8. Scatterplot SiO_2 versus CaO of handmade pottery from Groß-Gerau, marked by recognised petrographic groups.

five samples mentioned can be considered to represent imports to Groß-Gerau. As expected from the petrographic results, group one, with the sedimentary clay, and group two, with the calcite minerals, differ most clearly (fig. 8). Group one has a moderate and consistent calcium oxide content of 2.7 to 5.6 wt%. The silicon oxide contents range from 64.2 to 74.3 wt.% and show a slight negative correlation with the calcium oxide contents. For group two, calcium oxide contents of 7.0 to 23.1 wt.% are proven, which represents a comparatively large range. A strong negative correlation exists here with the silica contents of the same group. On the one hand, a natural clay with a strongly varying calcium content may be the reason for this; on the other hand, quantities of raw clay may have been mixed intentionally with calcium in varying proportions. Group three with its granitic and micaceous content hardly differs geochemically from group one. In four sam-

ples the potassium and rubidium contents are elevated, which can be attributed to the presence of biotite minerals (fig. 9). The calcium oxide content is similar to that of group one. Strikingly, the silica contents are only in the range of between 55.6 and 68.8 wt.% as compared to group one. With regards to trace elements, there is no noticeable difference between the three groups, except for the aforementioned fluctuation of rubidium.

In order to check the provenance of the handmade pottery from the Alamannic settlement of Groß-Gerau, the samples were compared with reference samples of Roman period wheel-thrown pottery, which had certainly been produced in the three pottery workshops of the vicus.²¹ The comparison clearly demonstrates that the handmade pottery matches the geochemical composition of the wheel-thrown pottery. There is a particularly good correspondence with pottery workshop I and the few

21 Helfert 2010, 141–164.

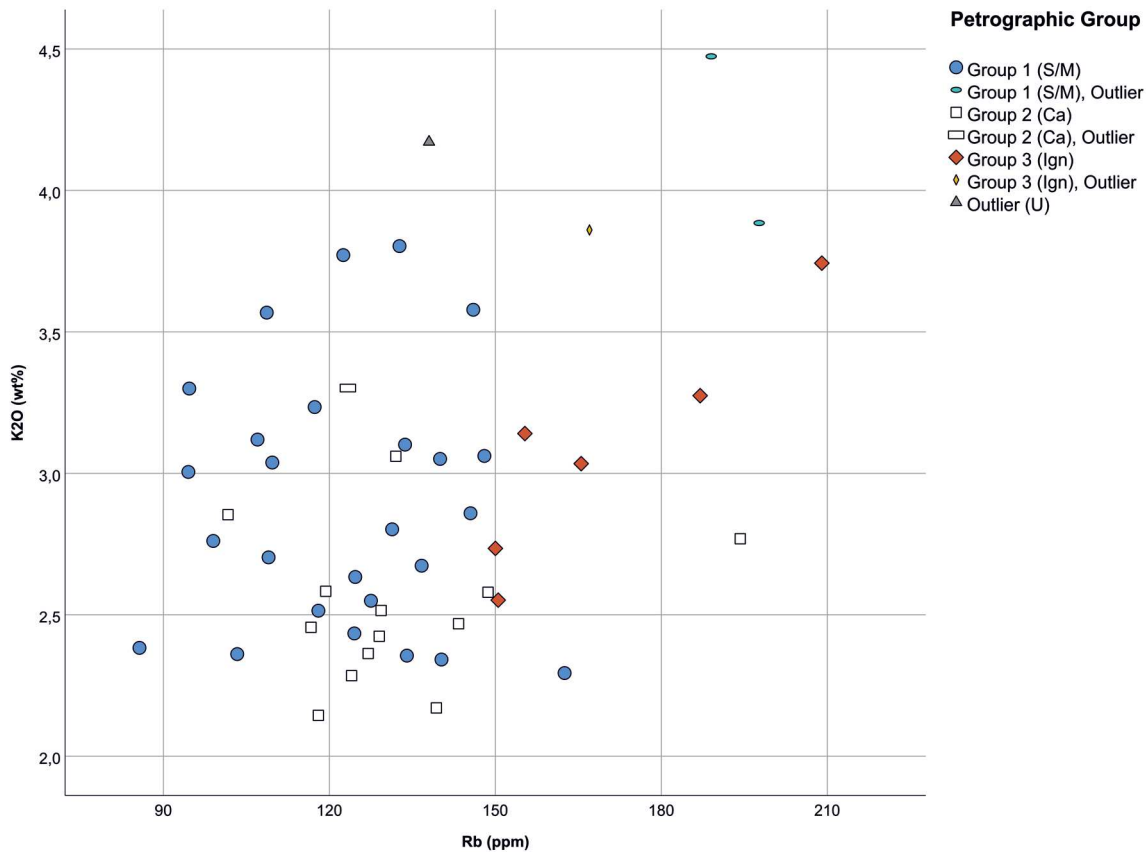


Fig. 9. Scatterplot of K_2O versus Rb of handmade pottery from Groß-Gerau, marked by recognised petrographic groups.

clays and loams recovered from the pottery finds. This is demonstrated, for example, by the concentrations of magnesium oxide and zinc, which show that a large part of the samples from pottery I and clay sample H060 lie within the scatter range of the handmade pottery of the 1st to 4th century (fig. 10). The contents of silicon oxide and calcium oxide are almost identical between the wheel-thrown ceramic and the handmade fabrics (fig. 11). The trace elements are also largely the same, although there are strong differences for the elements phosphorus and sulphur. The phosphorus oxide contents of the handmade ware are twice to two and a half times higher than those of the wheel-thrown ceramics (fig. 12). This is due to the greater porosity of handmade ceramics, which allows the sherds to absorb more phosphorus, sulphur and barium in particular. Normally, wheel-thrown ceramics have sulphur concentrations below 500 ppm.²² As can be seen in figure 13, with the exception of three of the fifty thin-

section samples, all of them are above this limit, and in some cases well above it.

From a geochemical point of view, the measured concentrations indicate that the raw clays had been extracted in the vicinity of Groß-Gerau in the Alamannic period as well as in the Flavian/Trajanic period. This indicates that since the foundation of the Roman vicus and after its abandonment by the military, handmade pottery was produced as well as wheel-thrown. This is supported by the dating of the handmade pottery from Groß-Gerau (e.g. fig. 14). The clay masses belonging to group one were used from the end of the 1st century until the first half of the 4th. The earliest pottery of group two was attested in the lowest backfill of the road ditch of the former vicus, indicating that calcium-rich clay masses had been used for pottery production since the end of the 3rd century. Similarly, sherds from group three containing igneous rock fragments and mica minerals also appear at the end of the 3rd century, but can

²² Schneider 2002.

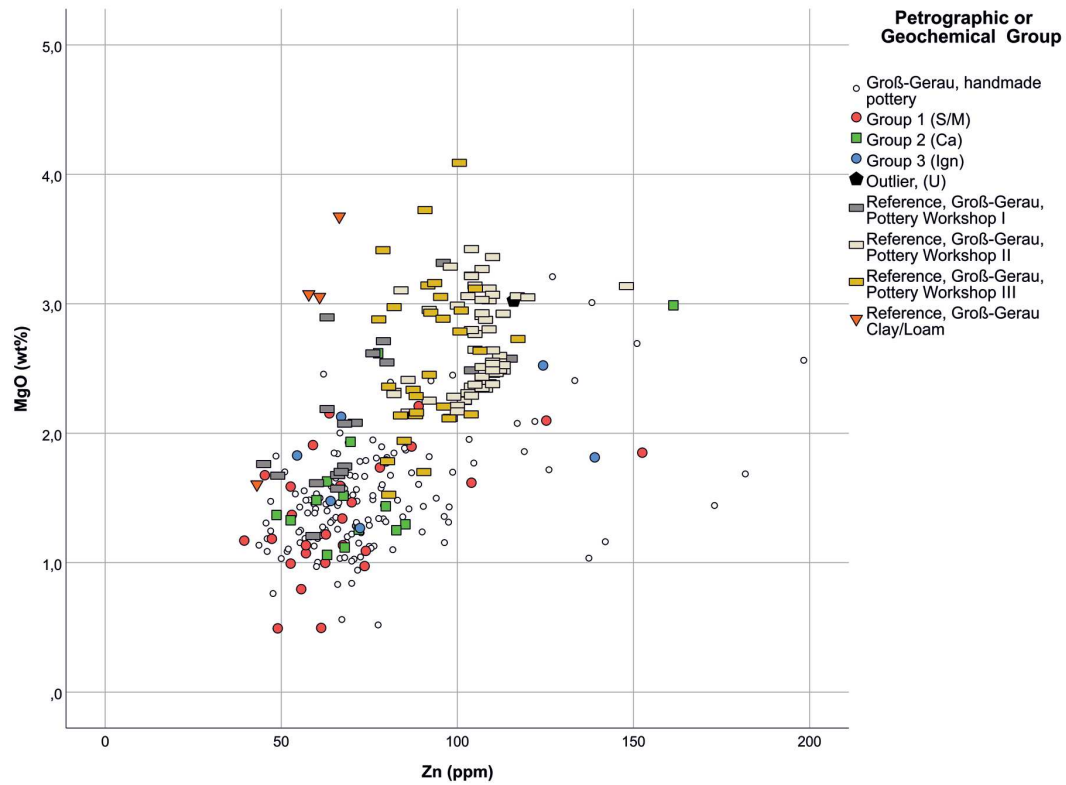


Fig. 10. Scatterplot MgO versus Zn of handmade and wheel-thrown pottery from Groß-Gerau, marked by recognised petrographic and geochemical groups.

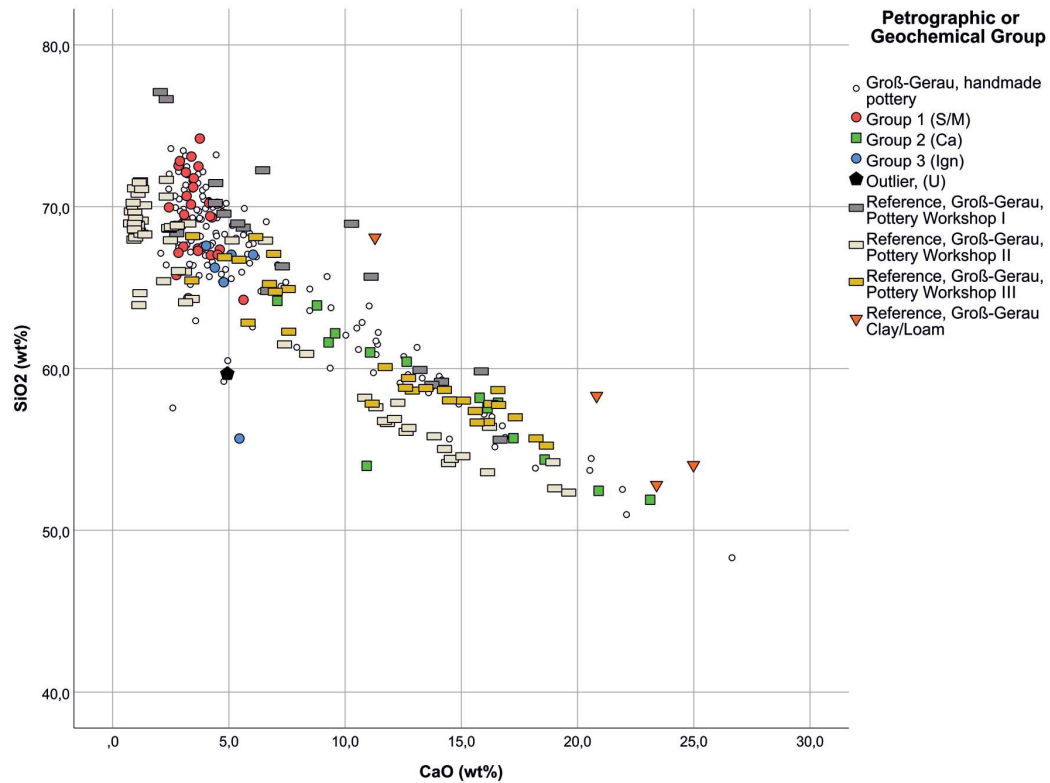


Fig. 11. Scatterplot SiO₂ versus CaO of handmade and wheel-thrown pottery from Groß-Gerau, marked by recognised petrographic and geochemical groups.

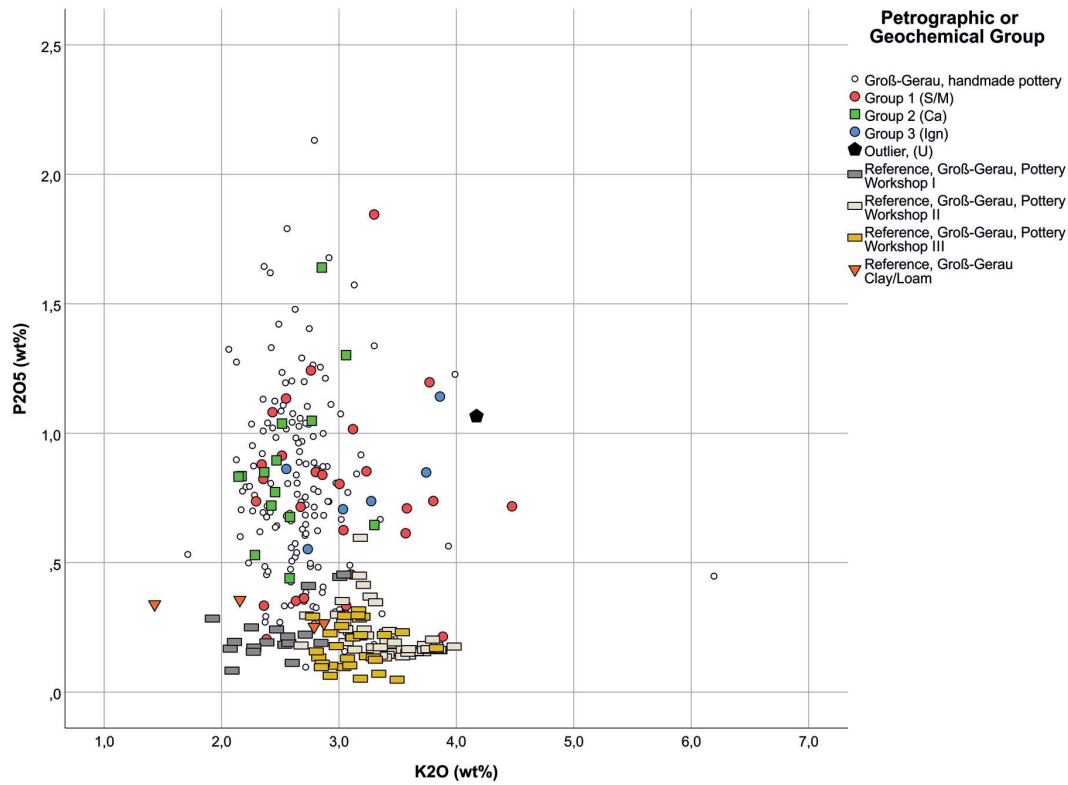


Fig. 12. Scatterplot P_2O_5 versus K_2O of handmade and wheel-thrown pottery from Groß-Gerau, marked by recognised petrographic and geochemical groups.

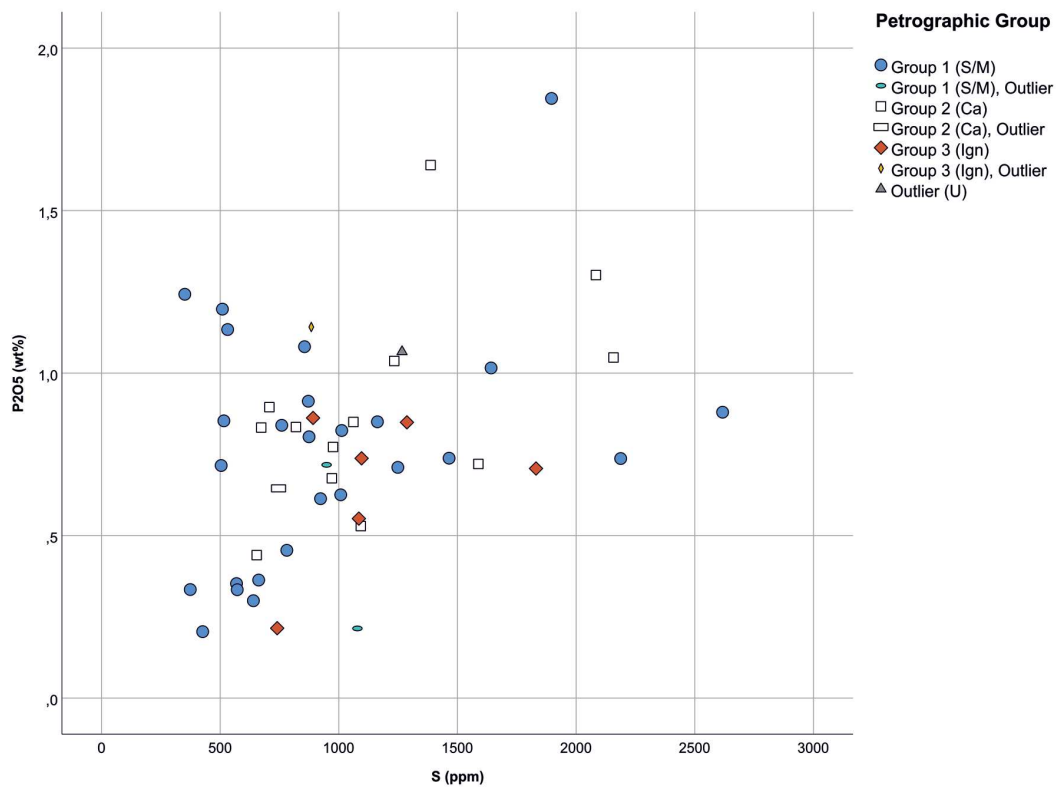


Fig. 13. Scatterplot P_2O_5 versus S of handmade pottery from Groß-Gerau, marked by recognised petrographic groups.

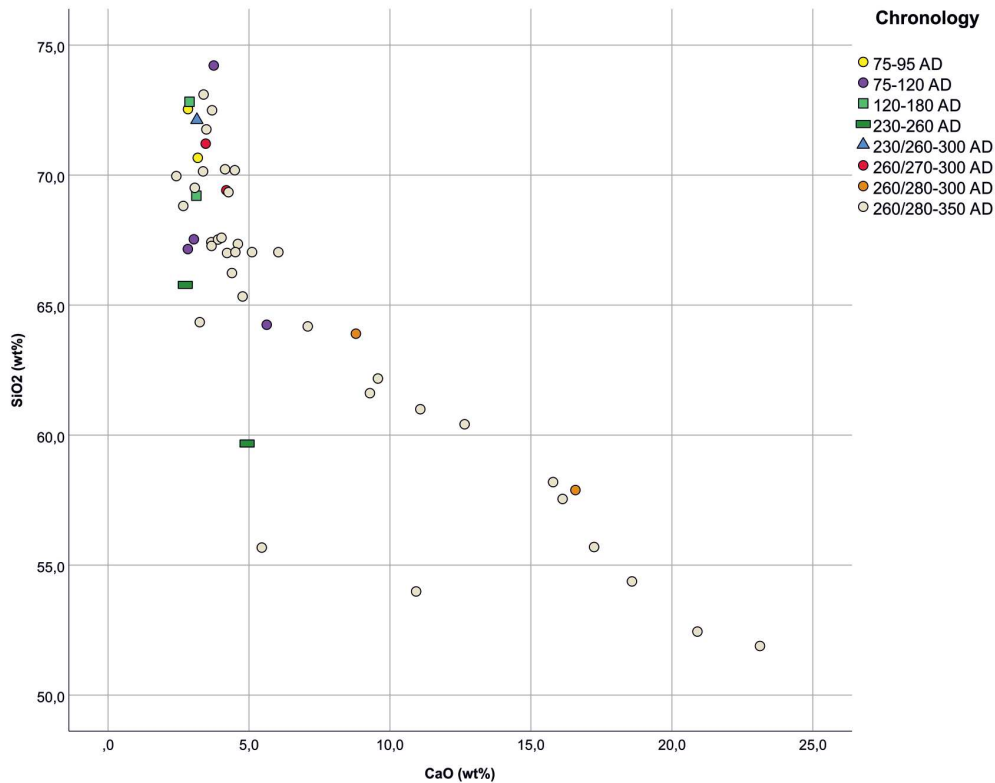


Fig. 14. Scatterplot SiO_2 versus CaO , marked by the chronology of the sherds.

mainly be found among the assemblages dating to the first half of the 4th century.

Alamannic pottery traditions

The mineralogical characteristics observed in the thin sections from Groß-Gerau demonstrate many similarities with the results described by Schneider²³ for the Germanic pottery from Ladenburg. Specifically, parallels can be drawn between the Groß-Gerau groups one (S/M) and three (Ign) with the main Neckar-Suebian and Alamannic fabric groups. Schneider describes them as consisting of low silt fabrics with large rock fragments, mainly (sub)rounded grains indicating transport through water, containing mainly quartz, muscovite or biotite granite, (grano)diorite and finely grained quartz

porphyry. Additionally, the samples are often characterized by large mica minerals.²⁴ Schneider also observed fabrics containing a temper of crushed marble.²⁵ Although the calcite-tempered pottery from Groß-Gerau includes more individual coarse, angular calcite minerals, and fewer marble rock fragments, it is possible that both groups belong to a similar fabric tradition. In general, Schneider observed that the Germanic pottery from Ladenburg was tempered with sand, grog and/or marble. The grog-tempered sherds were mainly attributed to Neckar-Suebian pottery and the marble-tempered sherds were mainly assigned to the Alamannic pottery. Despite the distinction in tempering traditions, the similarities in the mineralogical profile of the base clay in both groups indicate that the same clay sources had been used. The geochemical results from Ladenburg demonstrate that various clay outcrops from the western edges of the Odenwald were

²³ Ibid.

²⁴ Ibid. 634.

²⁵ Ibid. 635.

most likely used.²⁶ The overlap in the mineralogical profile between the Germanic pottery of Ladenburg and Groß-Gerau strengthens the hypothesis of a potential provenance area in the Odenwald region for all three petrographic groups of the Alamannic pottery from Groß-Gerau.

Finally, a brief consideration of the observed outliers is necessary, as they might indicate the presence of pottery imported to the Alamannic settlement of Groß-Gerau or divergent production traditions. In total, five samples proved to be outliers: sample HGW-144, as the only grog-tempered fabric, and samples HGW-3,-25,-83,-158 demonstrating a different composition in the results of the pXRF analysis. The grog-tempered sherd could resemble a fabric such as the Neckar-Suebian pottery studied by Schneider.²⁷ However, this does not necessarily have to be the case as grog-tempering is a common technique for various Northwest European regions dating back to prehistoric traditions. The sample is an outlier in the petrographic, as well as geochemical, analysis, indicating that this sample could well have been an import to the site. It is not yet possible to make a definitive statement about the origin of the other four outliers recognized in the geochemical analysis, due to the fact that knowledge about the geochemical signatures of handmade wares of the 1st to 5th century is still very limited, and more reference groups from the Rhine-Main-Neckar area are needed. These samples may represent pottery brought by the first generation of settlers, or ceramics that reached Groß-Gerau through the exchange of goods. In any case, the vessels not originating from Groß-Gerau show that there was at least a small exchange of handmade goods between settlements.

Conclusion

The Alamannic pottery from the large waste pit at Groß-Gerau contains a large diversity of handmade specimens that were made from local clays which correspond to those selected for pottery production during the Flavian/Trajanic period. The main chronological distinction between Germanic pottery of the

late Roman period and pottery of earlier phases can be made with reference to calcite-tempered pottery, which is absent among the samples dating before the late 3rd century. The similarity with the marble-tempering tradition in the Alamannic pottery of Ladenburg²⁸ points towards a larger tradition within Germanic pottery production along the Middle Rhine frontier. Several fabric types have been observed in the large assemblage of the waste pit which can be considered to reflect recipes from different potters, suggesting that various pottery traditions are present at the same time in the Germanic settlement of Groß-Gerau. If calcite-tempering is interpreted as a Germanic tradition, then the fabrics from the sedimentary/metamorphic and igneous groups could be seen as a continuity of earlier local Roman pottery traditions. An alternative explanation might be that the new settlers were capable of locating previously exploited clay outcrops in the search for suitable raw materials for their pottery production and adapting their ceramic recipes to suit the available sources in the new landscape. The coarse and heterogeneous nature of handmade pottery results in a broad definition of fabric groups and production traditions, indicating that the latter theory might prove to be more likely. Finally, a number of outliers were observed that could be interpreted as imported pottery from trade or exchange, or brought along with people moving to the settlement.

Summary

Excavations at Groß-Gerau uncovered an Alamannic settlement, located at the edges of the former Roman vicus, dated to the late 3rd and 4th century. This study presents the first compositional results of the handmade pottery from these Germanic features. Three mineralogical groups could be distinguished: group one is characterized by sedimentary and metamorphic rock inclusions, group two by large calcite minerals, and group three by igneous rock fragments. Geochemical results indicate a provenance in the Altneckar region for all groups. A comparison with earlier pottery demonstrates the

²⁶ Ibid. 635.

²⁷ Ibid. 634.

²⁸ Schneider 2002.

use of the same clays during the Alamannic and Flavian/Trajan period. Five outliers represent possible imports to Groß-Gerau.

Zusammenfassung

Bei Ausgrabungen in Groß-Gerau wurde eine alamannische Siedlung am Rande des ehemaligen römischen Vicus freigelegt, die in das späte 3. und 4. Jahrhundert datiert. In dieser Studie werden die ersten Ergebnisse zur Zusammensetzung der handgemachten Keramik aus den germanischen Befunden vorgestellt. Es konnten drei mineralogische Gruppen unterschieden werden: Gruppe eins ist durch sedimentäre und metamorphe Gesteinseinschlüsse gekennzeichnet, Gruppe zwei durch große Kalzitminerale und Gruppe drei durch magmatische Gesteinsfragmente. Die geochemischen Ergebnisse weisen für alle Gruppen auf eine Herkunft aus dem Altnackargebiet hin. Ein Vergleich mit älterer germanischer Keramik zeigt, dass in der alamannischen und flavisch-trajanischen Zeit dieselben Tone verwendet wurden. Fünf Ausreißer stellen mögliche Importe nach Groß-Gerau dar.

Picture credits

Fig. 1 Map based on GoogleEarth. – Fig. 2 Ralf Klausmann, Landesamt Denkmalpf. Hessen, hessenArchäologie, Außenstelle Darmstadt, No. 4829. – The rest: authors.

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Dr. Vince Van Thienen

Department of Archaeology
Faculty of Arts and Philosophy
Ghent University
Sint-Pietersnieuwstraat 33
9000 Ghent
Belgium
Vince.VanThienen@ugent.be

Dr. Markus Helfert

Archäologie und Geschichte der römischen
Provinzen
Goethe-Universität
Institut für Archäologische Wissenschaften,
Abteilung II
Norbert-Wollheim-Platz 1
60323 Frankfurt am Main
m.helfert@em.uni-frankfurt.de

HGW	Con- text	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	K ₂ O	P ₂ O ₅	S	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Pb
001	1438	71,76	0,60	13,92	5,59	0,06	1,07	3,49	2,43	1,08	856	195	68	22	12	57	18	125	193	24	199	22	17
003	1438	64,34	1,03	15,70	8,01	0,12	2,35	3,25	4,47	0,72	949	192	109	36	23	106	32	189	200	28	160	14	13
005	1438	65,33	0,69	15,87	6,80	0,13	1,81	4,77	3,74	0,85	1287	154	84	38	21	139	20	209	220	31	179	27	24
007	1438	61,00	0,68	16,22	6,47	0,11	1,44	11,08	2,17	0,83	819	211	100	37	17	80	33	139	223	31	193	21	23
009	1438	67,03	0,59	13,91	7,08	0,22	1,83	6,04	2,73	0,55	1085	176	58	26	12	55	23	150	192	25	182	21	19
011	1438	60,42	0,72	14,84	6,38	0,12	1,52	12,65	2,47	0,90	707	184	93	30	14	68	17	143	268	28	161	22	18
016	1438	57,54	0,79	13,60	6,62	0,15	1,63	16,12	2,52	1,04	1234	191	91	25	17	63	19	129	230	30	181	25	18
018	1438	67,04	0,64	14,64	6,59	0,12	2,13	5,11	3,03	0,71	1831	173	66	44	20	67	20	166	207	32	207	28	20
021	1438	61,61	0,76	13,68	7,53	0,15	2,62	9,29	3,06	1,30	2084	193	65	53	23	78	21	132	197	31	188	24	24
022	1438	70,19	0,60	13,92	5,83	0,11	1,22	4,50	2,80	0,85	1163	185	71	36	16	63	15	131	208	24	192	24	16
024	1438	55,69	0,78	14,32	6,71	0,18	1,93	17,24	2,42	0,72	1588	211	93	36	18	70	19	129	266	33	184	26	19
025	1438	69,96	0,85	15,67	5,31	0,08	1,62	2,42	3,88	0,21	1078	142	88	62	28	104	12	198	155	39	359	30	26
028	1438	67,42	0,79	13,88	7,50	0,05	2,15	3,66	3,80	0,74	1465	162	73	131	18	64	10	133	186	27	224	31	21
029	1438	67,00	0,72	16,67	6,77	0,13	1,13	4,22	3,05	0,30	640	172	93	31	13	68	21	140	194	34	226	29	23
030	1438	54,37	0,70	14,88	7,18	0,19	1,12	18,58	2,14	0,83	673	216	117	45	17	68	22	118	227	32	196	20	19
034	1438	62,18	0,64	15,91	6,49	0,10	1,30	9,57	2,77	1,05	2158	164	86	38	48	85	24	194	220	29	184	25	21
046	1438	67,59	0,63	15,57	6,61	0,10	1,48	4,03	3,27	0,74	1096	165	84	76	19	64	20	187	225	32	196	28	23
053	1438	67,35	0,75	15,21	6,65	0,11	2,10	4,61	2,34	0,88	2617	268	108	35	88	125	17	140	237	25	202	23	20
054	1438	67,52	0,75	16,31	6,51	0,12	1,85	3,90	2,29	0,74	2188	257	90	41	30	153	19	163	259	31	228	25	22
055	1438	69,34	0,58	14,96	5,95	0,13	1,59	4,27	2,36	0,82	1012	200	90	25	13	67	17	134	217	23	193	21	17
056	1438	73,10	0,54	13,65	5,49	0,05	0,80	3,39	2,63	0,35	569	148	80	18	8	56	14	125	148	22	179	22	17
057	1438	68,81	0,72	16,23	6,81	0,14	1,27	2,67	3,14	0,22	740	150	87	50	15	72	18	155	169	34	269	30	23
058	1438	52,44	0,70	14,47	7,26	0,15	1,25	20,91	2,28	0,53	1093	165	104	57	17	72	27	124	240	33	195	24	18
059	1438	64,18	0,63	17,56	6,15	0,12	1,25	7,08	2,58	0,44	654	146	97	52	15	83	26	149	168	35	211	28	21
065	1438	67,04	0,65	17,16	6,18	0,08	0,97	4,52	3,06	0,33	572	161	102	42	12	74	23	148	279	33	214	28	23
082	1438	51,89	0,59	12,82	5,62	0,14	1,33	23,12	2,85	1,64	1387	137	65	29	12	53	16	102	207	25	204	24	12
083	1438	53,99	1,14	16,07	10,72	0,23	2,99	10,93	3,30	0,65	746	159	146	81	25	161	15	123	181	22	141	21	10
084	1438	58,19	0,72	14,31	6,51	0,17	1,06	15,79	2,58	0,68	971	187	84	66	14	63	21	119	234	25	173	22	17
110	1438	72,49	0,54	13,57	5,71	0,07	0,49	3,69	2,51	0,91	872	180	66	61	10	49	16	118	171	19	169	19	15

Tab. 3. Geochemical results of the fifty thin sectioned samples gathered by portable energy dispersive X-ray fluorescence analysis (pXRF). HGW-numbers = sample identifiers. Further context information available in table 2. Main components expressed as percentages (%): SiO₂, TiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, CaO, K₂O, P₂O₅. Trace elements expressed in parts per million (ppm): S, Y, Cr, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Pb.

HGW	Con- text	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	K ₂ O	P ₂ O ₅	S	V	Cr	Ni	Cu	Zn	As	Rb	Sr	Y	Zr	Nb	Pb
111	1438	66,23	0,72	16,25	6,93	0,27	1,78	4,40	2,55	0,86	892	228	134	35	16	80	22	151	231	35	198	25	21
112	Grab47	72,12	0,55	14,36	4,80	0,04	1,17	3,15	3,00	0,80	875	153	61	16	15	40	10	95	159	19	165	19	15
114	652	67,53	0,61	14,98	7,93	0,08	1,74	3,04	3,23	0,85	516	189	86	41	27	78	22	117	148	24	176	18	36
115	652	74,21	0,55	12,46	4,74	0,03	1,68	3,75	2,38	0,20	426	108	72	32	12	45	6	86	104	24	229	12	20
117	658	70,66	0,58	14,42	5,52	0,08	1,37	3,18	3,57	0,61	923	180	69	22	22	53	18	109	152	21	231	22	17
118	658	72,54	0,56	14,97	5,14	0,07	1,18	2,84	2,36	0,33	374	179	93	23	12	47	17	103	154	22	215	20	15
123	982	72,82	0,61	14,49	4,93	0,20	0,99	2,89	2,70	0,36	662	168	80	14	18	53	19	109	139	23	229	21	17
127	982	69,21	0,71	14,90	6,43	0,14	1,34	3,13	3,12	1,02	1642	238	70	27	9	67	12	107	127	22	198	20	17
132	683	64,24	0,95	15,60	6,02	0,21	2,21	5,63	3,30	1,85	1896	196	76	45	27	89	19	95	149	29	234	16	26
137	683	67,16	0,68	19,06	5,66	0,11	0,50	2,83	2,76	1,24	351	161	65	24	19	61	24	99	168	22	237	22	19
139	855	69,41	0,59	14,63	6,40	0,09	1,00	4,19	2,55	1,13	532	169	73	43	12	63	17	128	275	24	196	22	18
140	855	71,21	0,56	13,05	6,25	0,22	1,59	3,46	3,04	0,63	1008	198	64	40	17	53	15	110	162	22	197	21	14
144	2040	59,68	0,99	16,35	9,31	0,47	3,02	4,93	4,17	1,07	1267	205	106	64	35	116	20	138	177	36	177	23	33
146	2040	65,78	0,71	17,04	6,75	0,13	1,90	2,74	3,77	1,20	510	177	101	44	23	87	15	123	167	27	155	18	21
147	1438	63,90	0,67	15,66	6,07	0,21	1,48	8,79	2,36	0,85	1061	220	88	31	16	60	24	127	262	24	206	25	19
148	1438	57,89	0,69	14,05	6,01	0,19	1,37	16,58	2,46	0,77	976	198	82	34	17	49	20	117	282	22	197	26	17
150	1438	70,14	0,68	15,02	5,53	0,10	1,47	3,37	2,86	0,84	760	206	78	59	18	70	15	146	203	25	219	24	19
151	1438	70,22	0,57	14,57	5,81	0,15	1,13	4,15	2,67	0,72	504	201	66	71	14	57	16	137	157	27	212	20	18
156	1438	69,51	0,63	14,20	7,63	0,31	1,09	3,08	3,10	0,45	781	194	77	28	13	74	29	134	140	26	215	26	21
158	1438	55,67	1,12	17,88	12,24	0,10	2,52	5,45	3,86	1,14	884	201	37	12	20	124	24	167	182	25	108	16	13
159	1438	67,28	0,76	14,33	7,62	0,15	1,91	3,67	3,58	0,71	1249	216	77	26	15	59	21	146	233	25	194	23	19

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