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Transport Amphorae from Velia

Introduction

Until now the production of transport amphorae in Velia is only confirmed by archaeometric analyses, while evidence for kilns or other indicators of local production are still missing.[1] The earliest amphorae produced in Velia appear only in the second quarter of the 5th c. B.C.E. and their production can be followed until the first quarter of the 2nd c. B.C.E.[2] In general their typology corresponds to the usual development of Western Greek amphorae though some specific morphological elements can be observed.[3] These characteristics are mostly shared with amphorae from the production of Poseidonia so that it is virtually impossible to distinguish these productions by their morphology only, while there are clear differences to products of Calabria or the Ionic-Adriatic region.[4] Thus the unambiguous attribution of an amphora to a production centre is only possible by classifying the fabric.

This paper intends to give an overview of the characteristics of the Velinian amphorae production and their morphological development.[5] For the 5th c. B.C.E. it is based on materials from Austrian excavations in the Lower Town of Velia, namely the excavations of the mud-brick houses in the area of the later Insula II, while the development from the 4th to the early 2nd c. B.C.E. has been studied on the basis of finds from the excavations along the fortifications (wall B) in the Lower Town, conducted from 1997 – 1999.[6] Thus all amphorae presented here come from settlement excavations and therefore are very fragmented. We do not have any totally preserved amphora from the production of Velia,[7] so that the form

[1] For pottery kilns in Velia see now Gassner et al. 2014, 191-94.
[2] We have to mind, however, that the contexts of which the material has been studied end in the early 2nd c. B.C.E., as all later strata in the excavation area of the fortifications in the lower town have been already excavated by earlier investigations. The contexts mentioned in this text will be published in Gassner et al. (forthcoming).
[3] For the development of Western Greek Amphorae in general see Sourisseau 2011 and Van der Mersch 1994, for the later types also Panella 2010; for the history of research see also Gassner 2003 with the previous bibliography.
[4] See now also Gassner 2015.
[5] The topic has also recently been dealt with in Gassner et al. 2014.
[6] Gassner 2003 for the 5th c. B.C.E.; Gassner et al. (forthcoming) for the later periods.
[7] This is mainly due to the fact that the necropoleis of Velia have not been explored yet.

can only be reconstructed hypothetically by comparing the rims of amphorae of Velinian provenance to those of published amphorae with similar rims and toes, mainly coming from Paestum. During our studies of the amphorae material from the Lower Town it became evident that it thus would be very difficult to use the well-established typologies of Western Greek amphorae like those of J.-Ch. Sourisseau for the 6th and 5th c. B.C.E. or Ch. Van der Mersch for the 4th and 3rd c. B.C.E.[8] Therefore the classification of rim-types, proposed for the 5th c. B.C.E. contexts of Velia (Gassner rim types 1-7), was further developed arriving at a total of 14 rim types.[9]

For this presentation of the morphological development of Velinian amphorae we attempted to select mainly pieces which had been analyzed by R. Sauer. As the definition of Velinian amphorae fabrics was done in the early 1990s when we studied mainly materials of the 5th and 4th c. B.C.E. and as the study of later samples did not bring evidence for new fabrics, we here added some pieces that were not analyzed by Roman Sauer to accomplish the typological series.

The typological development of the Velinian amphorae

Amphorae of the form Sourisseau 2-3 in the first half of the 5th c. B.C.E. (Gassner rim types 3-4)

The most ancient amphorae of Velinian production occur at Velia only in the second quarter of the 5th c. B.C.E. and thus very late. Though we have to consider the fact that hitherto materials from the contexts of the late 6th and early 5th c. B.C.E. have not been studied systematically, a short screening of the relevant materials from the excavations of B. Neutsch on the south slope of the acropolis did not bring proofs for earlier examples of the local production, and also the amphorae repertory from the area of the oldest sanctuary on the acropolis, published by A. Fiammenghi, consisted mainly of imports from Calabria.[10]

[8] Sourisseau 2011; Van der Mersch 1994; Van der Mersch 2001. See also the new tentative by Cibecchini and Cappelli 2013 with the resumption of the often criticized terminus *graeco-italic*.

[9] Gassner 2003. The new typology, including various variants, will be fully presented in Gassner et al. (forthcoming).

[10] Fiammenghi 1994, fig. 114-15 with some later samples on fig. 115. The pieces have been seen by me in 1993 due to the courtesy of late A. Fiammenghi. For the materials from the excavations of B. Neutsch see the reports of Neutsch 1994; Otto 1994, but also Cicala 2002, 112-14.

The earliest example in the typological series of the Velinian production is a rim of Gassner rim type 3 (M6/116, cat. 1, pl.1) with a thickened and profiled rim and a straight neck.[11] Contextually it belongs, however, to the 3rd quarter of the 5th c. B.C.E. and thus has to be considered as residual. The earliest context that contained local transport amphorae is the first destruction layer of the mud brick houses in the Lower town (Gassner's phase IIa), dated to the second quarter of the 5th c. B.C.E.[12] The rim of M6/3 (cat. 2, pl.1) belongs to Gassner rim type 4, fabric VEL-A-3.[13] Characteristic is the almond shaped rim and the slightly bulged neck. To the same phase belongs also the hybrid form of a rim with a ridge that has shifted from the underside of the rim to the beginning of the neck (M6/16, cat. 3, pl.1).

Amphorae of the form Sourisseau 4/MGS II (Gassner rim type 7)

While the development of the first half of the 5th c. B.C.E. can be followed rather clearly, the changes in the second half of the century are more difficult to understand as we lack good stratigraphic contexts of this period.[14] But it may be assumed that the evolution at least of the rim types was slow and maybe slender variants of Gassner rim type 4 remained still typical (M6/55, cat. 4, pl.1).

On the other hand the excavations at the fortifications brought evidence for the development into a new type, corresponding to Van der Mersch's type MGS II from the middle of the 5th c. B.C.E. onwards. One of the earliest examples of this new rim type 7 is cat. 5 (pl.1) from the foundation fill of the early fortification wall G in the Lower town which clearly represents a transitional stage between Gassner rims 4 and 7. The context is dated shortly before or about the middle of the 5th c. B.C.E. Another good example for this phase M6/82 (cat. 6, pl.1) stems from a stratum immediately above the marine sands that destructed the mud brick houses in the Lower town about the middle of the 5th c. B.C.E. A date in the second half of the 5th c. B.C.E. seems probable. Here the ridge of the rim has shifted already below the thickened edge. In contexts of the late 5th c. B.C.E. (period 1.3. of the fortifications) rims of type 7 represent nearly 50% of all Western Greek amphorae.

[11] Corresponding to Sourisseau form 2, see Sourisseau 2011, fig. 6. Examples of the rim types 1-2 have only been found in non-Velinian fabrics.
[12] Gassner 2003, 170-71.
[13] The form corresponds to Sourisseau form 3 resp. the early variants of form 4, see Sourisseau 2011, fig. 6.
[14] This is mainly due to the fact that the best contexts for this period stem from the trenches at the crossroad in front of Insula II with strata resulting mostly from landslides and therefore containing many residual pieces; see Krinzinger 1994, 27-8 for the context; for a preliminary report on the Black glazed wares from this trench see Trapichler 2003. Selected fragments of amphorae have been published in Gassner 1994 (fig. 141, 1; 3-4; 6; 8-9; fig. 142, 12; 14-6).

The typical appearance of these amphorae can be seen better when looking to another sample (M6/5, cat. 7, pl.1) which shows the typical bulbous neck, well known from the famous amphora from the Porticello shipwreck from the beginning of the 4th c. B.C.E. or an amphora from the necropolis of Gaudo near Poseidonia of the middle of the 4th c. B.C.E.[15] Very short and thickened rims, as displayed by a sample from a context of the first half of the 4th c. B.C.E. from the trench at the crossroad in front of Insula II (M6/29, cat. 8, pl.1) belong to rather peculiar variants of MGS II amphorae, typical for the productions of Velia and Poseidonia. Amphorae of the MGS II type become rare at Velia in the last third of the 4th c. B.C.E. and disappear from the repertoire at the beginning of the 3rd c. B.C.E.

Amphorae of the form MGS III/IV (Gassner rim types 8-9)

In the course of the last third of the 4th c. B.C.E. the thickened rim of the MGS II amphorae changed to the type of the so-called "amphorae with echinus rim",[16] here classified as rim type 8 and – for a smaller, less articulated version – rim type 9. Rims of this type are found both with amphorae of the type MGS III (variant A) as well as with amphorae of the type MGS IV of Van der Mersch.[17] We do have few pieces that illustrate a transitional phase between rim types 7 and 8 (cat. 9, pl.1),[18] but in general we might guess that the alteration took place rather suddenly as demonstrated by cat. 10 (pl.2) from a context of the last third of the 4th c. B.C.E. Amphorae of Gassner rim type 8 are frequent during the late 4th and the first half of the 3rd c. B.C.E.[19] The variety of the type is demonstrated by samples from a disturbed context in the area of Insula II (M10/9; M10/18, cat. 11-12, pl.2) which have been analyzed by R. Sauer and thus can be attributed with certainty to the production of Velia.

Rim type 9 is represented by small triangular rims that resembles echinus rims by the fact that the upper side is nearly horizontal (cat. 13, pl.2), though approximately triangular samples seem more frequent (M10/19, cat. 14, pl.2). They are contemporary with the bigger

[15] Pontrandolfo and Rouveret 1992, 382: Gaudo tomba 2/1957, no. 27; for the amphora from the shipwreck of Porticello see Van der Mersch 1994, 66, fig. A.

[16] See Lamboglia 1952, 162-63; Lyding Will 1982, 341-44, type a; Barra Bagnasco 1992, 214-19, tavv. LXII-LXIII; LXXII-LXXIII (*di quarto di cerchio*). For the use of the term *Greco italiche antiche* see Manacorda 1986.

[17] Van der Mersch 1994, 69-76; for the use of the abbreviation MGS III/IV e. g. Olcese 2010, 32-50 and pls. 1,6-7; pls. 2,9-10.

[18] From a context dated to the last third of the 4th c. B.C.E. (period 2.3.Z.) in the excavations of the fortifications in the Lower town, 1997-1999.

[19] For a slightly earlier date of MGS III amphorae see Van der Mersch 1994, 69 (amphora from Cariati), who however dates MGS IV amphorae from the late 4th c. B.C.E. onwards, see Van der Mersch 1994, 74-5. The proposal of Bechtold 2007, 693 to date echinus rims already to the first half of the 4th c. B.C.E. is based on a neck fragment only and has to be reconsidered.

rims of Gassner rim type 8 and may belong to smaller vessels. They can be confronted with the rim of the amphora from Locri, reproduced by Van der Mersch.[20]

Amphorae of the form MGS IV and V of the 3rd c. B.C.E. (Gassner rim types 10-12)

During the 3rd c. B.C.E. the morphology of the rims became more heterogeneous and therefore it is more difficult to see a clear line in the development of the morphological characteristics. We also have to bear in mind that nearly none of the later examples presented here has been studied by petrographic analysis, as these amphorae were found when the local fabrics were already well-known, so that further analyses did not seem necessary any more.

At the beginning of the 3rd century rim type 8 and 9 are still the most frequent types, but in the course of the second quarter of the 3rd c. B.C.E. the rim becomes more triangular and rather elongated with the upper side of the rim gently sloping down (Gassner rim type 10, cat. 15, pl.2). Similar rims occur mainly with amphorae of the form MGS V, but transitional samples between rim types 8 and 10 can also be observed with amphorae normally classified as MGS IV like at Filicudi F.[21] Amphorae with rim type 10 have been found in various shipwrecks. The most ancient one is that of Marina di Montalto-Punta Morelle, dated to the first half of the 3rd c. B.C.E.,[22] but similar types are also found about the middle of the 3rd c. B.C.E. in the wreck of Montecristo A.[23] When the underside of the rim is clearly undercut we classified them as rim type 11 (cat. 16, pl.2). In the same period in the second quarter of the 3rd c. B.C.E., however, we also see the appearance of amphorae with a high, triangular rim corresponding more or less to an equilateral triangle (Gassner rim type 12, cat. 17, pl.2). These rims may be compared to those of the MGS VI amphorae, but are in general higher.

All these rim types find corresponding examples in productions attributed to the Bay of Naples and it remains to be discussed if this fact has to be interpreted in the sense of an *amphorae koiné* reaching from the Bay of Naples to North Western Lucania or if we rather should assume the beginning of this development in the Bay of Naples with a later imitation

[20] Van der Mersch 1994, 70, fig. B.
[21] See for MGS IV: Filicudi F, Van der Mersch 1994, 74 fig. B; Olcese 2012, 582, pl. 5.IV 1-2; for MGS V: Secca di Capistello and Rhogi (Panarea), Van der Mersch 1994, 77, fig. A and B; Olcese 2012, 583 pl. 5.V. 45; 585 pl. 5.VII. 1.
[22] Olcese 2012, 559 and 563 pl. 3.IV.
[23] Olcese 2012, 545 and 551, pl. 2.IV; Cibecchini 2005, 53.

of it by the North Western Lucanian production centres which came under Roman influence in this period.

Amphorae of the late 3rd and early 2nd c. B.C.E. (Gassner rim types 13-14)

The amphorae repertory of contexts of the late 3rd and early 2nd c. B.C.E. (period 2.6. and 3.B. of the fortifications) mainly consisted of rim types already known in the period before (rim types 10-12), but in few samples we also see the appearance of new types that indicate the further development of the rims of transport amphorae in this region. They might be seen as characteristic for a transitional stage in the evolution towards Dressel 1A amphorae.[24] Their number remained very limited so that all conclusions remain highly hypothetical.

Rim type 13 continues the development which started with rim type 12, the height of the rim being however slightly taller than the width of the basis (cat. 18, pl.2). The first samples appear already in period 2.6. in the late 3rd c. B.C.E. and continue to the 2nd c. B.C.E.

Clearly smaller triangular rims, corresponding to those of MGS VI amphorae or amphorae of the type *graeco-italiche recenti,* have been classified as rim type 14 (cat. 19, pl.2). At Velia only few examples were found in contexts of period 3.B. at the beginning of the 2nd c. B.C.E. It is this rim type that can be observed on amphorae from shipwrecks like Grand Congloué I, Portopalo di Capo Passero or Chretienne C.[25]

Conclusions

The results of this synopsis of the development of Velinian amphora are interesting in many aspects. Surprising is the late beginning of the production in the second quarter of the 5th c. B.C.E. Evidently the morphological language is shared with nearby Poseidonia as has been observed also for the glazed ware. This trend continues during the 4th c. B.C.E. so that we might suppose that the dramatic political changes assumed for Poseidonia/Paestum in this period did non affect cultural and/or economic contacts between both towns. Most striking,

[24] For Dressel 1A see in general Hesnard and Lemoine 1981; Tchernia 1986, 44; Peacock and Williams 1986, 86-8; Empereur and Hesnard 1987, 25-36; Hesnard et al. 1989; Panella 2010, 16; 45-52; Asensio i Vilaró 2010; and http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/ (14. 2. 2014) = University of Southampton (2005) *Roman Amphorae: a digital resource* [data-set]. York: Archaeology Data Service [distributor] (doi:10.5284/1000021).

[25] Grand Congloué: early 2nd c. B.C.E. according to Finkielsztejn 2001, 192, see also Olcese 2012, 640, pl. 7. XVIII.3 with previous bibliography; Portopalo di Passero: first quarter of the 2nd c. B.C.E., see Olcese 2012, 575 und 587, pl. 5.IX.2; Chretienne C: second quarter of the 2nd c. B.C.E., Olcese 2012, 607 and 630, pl. 7. VIII.

however, is the heterogeneous picture for the 3rd c. B.C.E. While in the centuries before the development of amphorae types was rather linear and could be followed easily, in the 3rd c. B.C.E. we can observe several, often contradictional trends that might be due to the fact that from the second quarter of the 3rd c. B.C.E. onwards Velia entered a new sphere of influence, namely that of the Bay of Naples and – in a wider sense – that of Rome. This is demonstrated by the fact that from the 3rd c. B.C.E. onwards imports of amphorae from that region became frequent at Velia – as did also imports of Campana A ware.[26] The co-existence of various types in closed contexts can also be found in some of the ship-wrecks like e. g. in the wreck of Marina di Montalto-Punta Morelle, dated to the first half of the 3rd c. B.C.E.[27] These variants therefore cannot be seen in the sense of a continuous typological development nor as an indication for various morphological languages of different production sites, but probably reflect relations that are much more complex and evidently also depend from very individual factors. The development of the production in the 2nd c. B.C.E. cannot be followed well in our material: in our latest contexts of the early 2nd c. B.C.E. vessels with elongated rims are rare and most probably have to be assumed as residual, while small triangular rims become most common. Velia thus probably followed the general trend known from other sites like the famous ship-wreck of Grand Congloué.

The fabrics of Transport Amphorae of Velia

Also the fabrics of Velinian transport amphorae are characterized by the lack of carbonate. They are arranged from fine grained fabrics to coarser ones.[28] Fabrics VEL-A-1 to VEL-A-4 have been observed in all periods, while the fabrics VEL-A-5 to VEL-A-6, which are characterized by a more crumbly matrix, occur only from the middle of the 4th c. B.C.E. onwards.

VEL-A-1 (pl.3)

Samples: M6/55; M10/10

[26] Gassner and Trapichler 2010.
[27] Olcese 2012, 563 pl. 3.IV.
[28] See Gassner and Trapichler 2011.

Vel-A-1 is a hard and rather fine red fabric (2.5R-5/8). The inclusions, mainly quartz, are small; to a minor degree we can observe red spots. It has been observed on Western Greek amphorae of the early 5th c. B.C.E. as well as on examples with Gassner rim type 7 (MGS II A) and in a context of the end of the 3rd/beginning of the 2nd c. B.C.E.

VEL-A-2 (pl.3)

Samples: M6/16; M6/29; M6/84; M6/30; M6/69

The matrix is hard and red (2.5YR-5/8) like VEL-A-1, but the frequent quartz particles as well as the white inclusions are much bigger than in VEL-A-1. Chronologically, VEL-A-2 occurs from the 5th c. B.C.E. onwards until the appearance of Graeco-Italic amphorae.

VEL-A-3 (pl.3)

Samples: M6/3; M6/21; M6/116

VEL-A-3 is very similar to VEL-A-2, but temper, in particular the white particles, are more frequent. It has been observed from the 5th c. B.C.E. until the beginning of the 2nd c. B.C.E.

VEL-A-4 (pl.3)

Samples: M6/5

This fabric shows the same colour as VEL-A-3, but the size of the inclusions ranges from very small to big, some of the red spots may be rather large. VEL-A-4 is a rather frequent fabric and was produced from the 5th to the 2nd c. B.C.E.

VEL-A-5 (pl.3)

Samples: M6/82; M10/1; M10/9; M10/18; M10/19

The fabric differs from the others by the colour of the matrix (yellow red 5YR-5/5). It is tempered mainly by colourless and grey quartz grains as well as white particles. Normally it was not fired as hard as the previous fabrics so that the structure of the break is crumbly. It has not been identified for amphorae of the 5th c. B.C.E. in the Velinian material, where it occurs only at the end of the 4th c. B.C.E. for Western Greek amphorae with Gassner rim 7 and in particular for amphorae with echinus rims. It was observed, however, at Naples with

an amphora of the type Sourisseau 2 imported from Velia.[29] It was still used for Graeco-Italic amphorae as well.

VEL-A-6 (pl.3)

Samples: M10/2; M10/16; M10/17; M6/83

VEL-A-6 is similar to VEL-A-5 in colour and in the strong tempering, mainly by quartz grains with a predominance of brown and grey particles. The size of these particles differs, however, much more and their distribution is irregular. Until now it has not been found with amphorae of the 5th c. B.C.E., but appears only from the middle of the 4th c. B.C.E. to the early 3rd c. B.C.E. for amphorae of Gassner rim 7 and for amphorae with echinus rim (Gassner rim types 8 and 9).

(V. Gassner)

Archeometric analyses of Velinian Amphorae

Among a total of about 180 analyzed amphorae from Velia of both the Western Greek as well as the Punic type many different petrographical fabrics have been distinguished. We identified 37 petrographical fabrics of imported amphorae as well as 3 petrographical fabrics (inclusive subfabrics) of local provenance by their petrographical characteristic.[30] This report concentrates on those petrographical types for which a Velinian production can be proved or is very likely.

Petrographic types of transport amphorae of possible Velinian production

(tab. 1 – 2; fig.1)

Petrographic type RVA001 (pl.4 – 5)

Samples: M6/3 (pl.4 – 5); M6/20, M6/116; M10/1; M10/9

[29] Gassner and Scoppetta 2014, cat. 7.

[30] See also Gassner and Sauer 1999; Gassner and Sauer 2002; Gassner et al. 2003 and www.facem.at s. v. Velia - amphorae.

The temper content of the analyzed amphora fragments ranges from 10 – 25%. The fine grained groundmass is non calcareous, optically active and shows a low mica content. The sorting of the temper particles is very poor, partially also bimodal grain distributions can be found. The grain size of the coarse fraction is around 0.3 mm (maximum grain size up to 1.4 mm).

The temper particles consist mainly of monocrystalline quartz grains, followed by feldspars and muscovite. The feldspars comprise mainly potassium feldspars, subordinate also sanidine and rare plagioclase (partially also of volcanic origin). Typical are the frequently occurring sericitised feldspars. Further constituents are polycrystalline quartz, sand/siltstone grains, heavy minerals (partly clinopyroxenes), chert, crystalline rock fragments (mainly quartzite), rare quartz-feldspar aggregates, volcanic rock fragments iron oxide concretions and very rare biotite/oxidised sheet silicates.

Samples M10/1 and M10/9 are characterised by the complete absence of mica, but higher contents of iron oxide concretions. The heavy mineral composition is characterised by a dominance of clinopyroxene. Subordinately also brookite/anatase, garnet, zircon, rutile and accessory tourmaline and hornblende/amphibole occur.

Interpretation

The petrographical composition of petrographic type RVA001 is very similar to common ware, petrographic types RVGK001 and RVGK001h. It was probably produced from material derived from local, Pleistocene terrace loams. The slight differences of samples M10/1 and M10/9 can be possibly interpreted by a higher contribution of altered paleosol.

Petrographic type RVA001a (pl.6 – 11)

Samples: M6/5 (pl.6 – 7); M6/21; M6/28; M6/29; M6/30; M10/2 (pl.8 – 9); M10/10; M10/11 (pl.10 – 11); M10/16; M10/17; M10/18; M10/19; M10/20; M10/21

The temper content ranges from 20 – 25%. The optically active to inactive (especially in the core areas), fine grained groundmass is non calcareous. The temper particles are very poorly sorted, partly also bimodal sorting can be observed. The grain size of the coarse fraction ranges from 0.3 to 0.5 mm (maximum grain size is up to 1.1 mm). The temper grains consist mainly of monocrystalline quartz, followed by feldspars, mainly potassium feldspars, partly sericitised, subordinate also sanidine and rare plagioclase can be observed. Further

constituents are polycrystalline quartz, chert, heavy minerals, crystalline rock particles (mainly quartzite, rare quartz-feldspar fragments), sand/siltstone grains and volcanic rock fragments (partly oxidised) occur. Only very rare muscovite and shale fragments can be found. Additionally frequent iron oxide concretions can be observed. Common are thin, often parallel, elongated crack like pores.

The heavy mineral composition is dominated by clinopyroxene besides abundant brookite/anatase. Subordinate zircon, rutile, hornblende/amphibole, accessory garnet and tourmaline occur.

Interpretation

Apparently most samples show a slightly higher firing temperature compared to RVA001 (optically inactive matrix). The petrographical composition of RVA001a is also similar and corresponds to the petrographic types RVGK001 and RVG001h of the Common ware. It was most likely produced from sandy, strongly altered Pleistocene loams derived from local paleosol horizons.

Petrographic type RVA001b (pl.12 – 15)

Samples: M6/8; M6/55 (pl.12 – 13); M6/16; M6/69; M6/82; M6/83; M6/84 (pl.14 – 15).

The average temper content of the analysed samples is about 15% (8 – 25%). The optically active to inactive groundmass is not calcareous and shows an increased content of mica. The temper particles show a very poor sorting. The average grain size of the coarse temper fraction is around 0.15 – 0.3 mm (maximum grain size is up to 1.5 mm). The temper particles mainly consist of monocrystalline quartz grains, followed by muscovite/oxidised sheet silicates and feldspars. Among feldspars potassium feldspar is dominating (partly sericitised), very subordinate also sanidine occurs. Plagioclase, partially of volcanic origin is rare. Further constituents are polycrystalline quartz, crystalline rock fragments (mainly quartzite, rare quartz-feldspar aggregates, chert, sand/siltstone fragments, volcanic rock fragments and heavy minerals (partly clinopyroxenes). Only occasional biotite could be found. Also typical is the occurrence of partially silty iron oxide concretions.

The heavy mineral composition of the only two analysed samples is characterised by dominances of clinopyroxene besides partly abundant zircon and brookite/anatase subordinate also garnet, rutile and hornblende/amphibole can be found.

Interpretation

Typical is the strongly increased mica content and the slightly finer grain size. The petrographical composition of RVA001b corresponds more or less to common ware petrographic type RVGK001d and was most likely produced from local terrace loams or alluvial loams of fine grained sediment deposits of the Alento river.

(R. Sauer)

petrographical type	sample number	very fine grained	coarse granular or micaceous	non calcareous	calcareous	optically active	optically inactive	partly isotropic, vitrified	isotropic, Fe-oxid rich clay	totally isotropic /vitrified/slag	reducing firing conditions	oxidising firing conditions	low firing temperature	high firing temperture	total temper content (%)	bimod coarse	grain size max. (mm)	bimod fine	sorting
		characteristics of the matrix													texture/ fabric				
RVA001	M6/003	x		x		x						x			25	0,30	1,40	0,03	6
RVA001	M6/020	x		x		x						x			20	0,30	0,80	0,03	6
RVA001	M6/116	x		x		x						x			10	0,20	0,76	0,04	5
RVA001?	M10/01	x		x		x						x			n.a	n.a	n.a	n.a	n.a
RVA001?	M10/09	x		x		x						x			n.a	n.a	n.a	n.a	n.a
RVA001a	M6/021	x		x			x					x		x	25	0,25	1,04	0,04	5
RVA001a	M10/02		x	x		x						x			n.a	n.a	n.a	n.a	n.a
RVA001a	M10/10	x		x		x						x			n.a	n.a	n.a	n.a	n.a
RVA001a	M10/16	x		x			x					x			n.a	n.a	n.a	n.a	n.a
RVA001a	M10/17	x		x		x	x				x	x			n.a	n.a	n.a	n.a	n.a
RVA001a	M6/005	x		x		x	x					x			20	0,40	1,00	0,03	6
RVA001a	M6/028	x		x		x	x					x			20	0,60	1,10	0,04	6
RVA001a	M6/029	x		x		x	x					x			25	0,40	0,80	0,04	5
RVA001a	M6/030	x		x		x						x			25	0,50	0,92	0,05	5
RVA001a	M10/18	x		x		x	x					x		x	n.a	n.a	n.a	n.a	n.a
RVA001a	M10/19	x		x		x						x			n.a	n.a	n.a	n.a	n.a
RVA001a	M10/20	x		x		x	x					x		x	n.a	n.a	n.a	n.a	n.a
RVA001a	M10/21	x		x		x	x					x		x	n.a	n.a	n.a	n.a	n.a
RVA001a	M10/11	x		x			x					x		x	n.a	n.a	n.a	n.a	n.a
RVA001b	M6/055		x	x		x	x					x			10	0,15	0,48	0,03	5
RVA001b	M6/016		x	x		x	x					x			15	0,10	1,20	0,07	5
RVA001b	M6/069		x	x		x	x					x			8	0,20	0,48	0,04	5
RVA001b	M6/082		x	x		x	x					x			25	0,30	1,40	0,03	5
RVA001b	M6/084		x	x		x	x					x			15	0,20	0,80	0,05	5
RVA001b	M6/083		x	x		x	x					x			15	0,20	0,80	0,04	5

petrographical type	sample number	monocrystalline quartz	polycrystalline quartz	chert	K-feldspar	K-feldspar sericitised	microcline	perthite	sanidine	plagioclase	volcanic plagioclase	muscovite	biotite/oxidised sheet silicates	carbonate grains	molds of former carbonates	foraminifera	carbonate bioclasts	siliceous bioclasts	siltstone/sandstone fragments	shale fragments	clay nodules (not resolved clay paste)	crystalline rock fragments	quartzite	volcanic rock fragments	volcanic tuff	volcanic glass brown	volcanic glass (colourless)	heavy minerals	iron oxide concretions+opaque matter
		petrographical composition of temper grains																											
RVA001	M6/003	b	e	g	d	f				f		c	g						g			g	g	g				g	g
RVA001	M6/020	a	f	g	c	f			g	g		c	f						g			g	g	g				g	f
RVA001	M6/116	b	g	g	d	f				h	g	d	f						f			g	g	h				f	f
RVA001?	M10/01	b	f	f	c	g				g	h								g	g		f		g	g			g	d
RVA001?	M10/09	b	f	h	d														h	g		f		g	f			g	a
RVA001a	M6/021	a	g	g	b	g			g	g		e	h						f			g	g	g				g	g
RVA001a	M10/02	b	d	h	c	g				g		d	f						h	g		f		h					d
RVA001a	M10/10	b	e	h	d	g				g		f	g							f		f			h			g	c
RVA001a	M10/16	b	d	g	c	g				g		d	g		h				h	g		f			h	h	h		d
RVA001a	M10/17	b	d	g	c	g				g		e	g						g	h		f						g	f
RVA001a	M6/005	b	f	g	d	g				g					g				g			g	g					g	c
RVA001a	M6/028	d	g	g	d	g			g	g									g	g		f	g	g				f	g
RVA001a	M6/029	b	f	g	d	g			g	g		h			h							h	g	h				f	d
RVA001a	M6/030	b	e	g	d	g	h		g	g		g							g			g	g	g				f	d
RVA001a	M10/18	b	d	h	d					g		g	h						g	g		f		h					e
RVA001a	M10/19	b	e		c	g				g		g	h	h					g	g		g						h	d
RVA001a	M10/20	b	d	g	c	g				g		g	h						g	h		f		h				g	e
RVA001a	M10/21	b	e	g	c	g			g	g		f	g				h		g	h		f				g		g	f
RVA001a	M10/11	b	d		c					g		f	g		g				g	h		g		h				h	g
RVA001b	M6/055	a	e	g	c	f				g		b	d										g					g	e
RVA001b	M6/016	a	d	g	b	g			g	g		b	d						f			g	g	h				g	g
RVA001b	M6/069	a	g	g	c	g			g	g		b	d		h				g				g	g				g	f
RVA001b	M6/082	b	e	g	c	g			g	g	g	c	d						g			f	f					g	f
RVA001b	M6/084	b	f	g	c	g			g	g		c	f						g			f	g	g				g	f
RVA001b	M6/083	b	g	g	c	g			g	f	g	c	g						g			g	g	g				g	g

Legend:
frequency: a: dominant, b: very frequent, c: frequent, d: subordinate, e: moderate, f: rare, g: very rare, h: traces
sorting: 1: very well, 2: well, 3:moderate, 4: bad, 5: very bad, 6: bimodal
tr. = traces
n.a. not analysed
for further explanations see text (methodology)

Tab.1. Velia. Transport Amphorae. Results of the thin section analyses.

		M6/003	M6/020	M6/116	M10/01	M10/09	M6/021	M10/02	M10/10	M10/16	M10/17	M6/005	M6/028	M6/029	M6/030	M10/18	M10/19	M10/20	M10/21	M10/11	M6/055	M6/016	M6/069	M6/082	M6/084	M6/083
zircon		16	3,5	16	12	9,9	9,3	5,9	n.a.	8,3	11	11	15	13	24	2	8,3	9,1	n.a.	13	n.a.	66	n.a.	n.a.	n.a.	9
rutile		5	2	2,4	2,4	2	5,1	1	n.a.	1	1,5	4,4	0,5	7,6	1,9	1,5	2,9	3,8	n.a.	1	n.a.	14	n.a.	n.a.	n.a.	4,8
brookite/anatase		4,1	16	15	18	26	11	24	n.a.	14	25	3,5	11	27	39	5	20	30	n.a.	44	n.a.	5,7	n.a.	n.a.	n.a.	12
titanite		5,4	2	2	9,2	0,5	0,9	0	n.a.	1,5	1	2,6	0	0	1	3,5	1,9	0,5	n.a.	0,5	n.a.	0,5	n.a.	n.a.	n.a.	2,4
monazite		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
tourmaline		0	0,5	3,1	2,9	2	0	2,5	n.a.	0	2,5	0	0	0	0,5	0	3,9	2,4	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
garnet		25	16	17	2,4	4	0,5	1	n.a.	0,5	1	4	0,5	1	2,4	1,5	1,5	1,4	n.a.	0	n.a.	2,4	n.a.	n.a.	n.a.	7,1
staurolite		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0,5
kyanite		0	0	0	0	0	0	0	n.a.	0	0	0	0,5	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
epidote/zoisite/clinozoisite		0,4	0	1,2	0,5	1	0	0	n.a.	0	0	0,4	0	0	0	0	0	0,5	n.a.	1	n.a.	0,5	n.a.	n.a.	n.a.	0
hornblende		0,8	2	2	3,9	2	1,4	2	n.a.	2,4	0	2,6	6,7	5,7	1,4	0	0,5	0,5	n.a.	0	n.a.	1,4	n.a.	n.a.	n.a.	2,4
chloritoide		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
andalusite		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
chromian spinel		0	0	0,8	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
sillimanite		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
clinopyroxene (augitic)		43	36	37	36	42	44	53	n.a.	57	48	71	51	32	23	76	47	40	n.a.	32	n.a.	9,5	n.a.	n.a.	n.a.	41
corundum		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
clinopyroxene (diopsidic)		0	23	3,1	13	10	27	11	n.a.	16	9,8	0	13	13	6,8	10	14	12	n.a.	8,8	n.a.	0	n.a.	n.a.	n.a.	20
hypersthene		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
?oxidised pyroxene		0	0	0	0	0	0	0	n.a.	0	0	0	0	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
melanite/spinel		0	0	0	0	0	0	0	n.a.	0	0,5	0	0,5	0	0	0	0	0	n.a.	0	n.a.	0	n.a.	n.a.	n.a.	0
total translucent grains counted		241	200	254	207	202	214	204		206	204	227	193	105	207	202	206	209		205		211				210
n.a.= sample not analysed																										

Tab.2. Velia. Transport Amphorae. Results of the heavy mineral analyses.

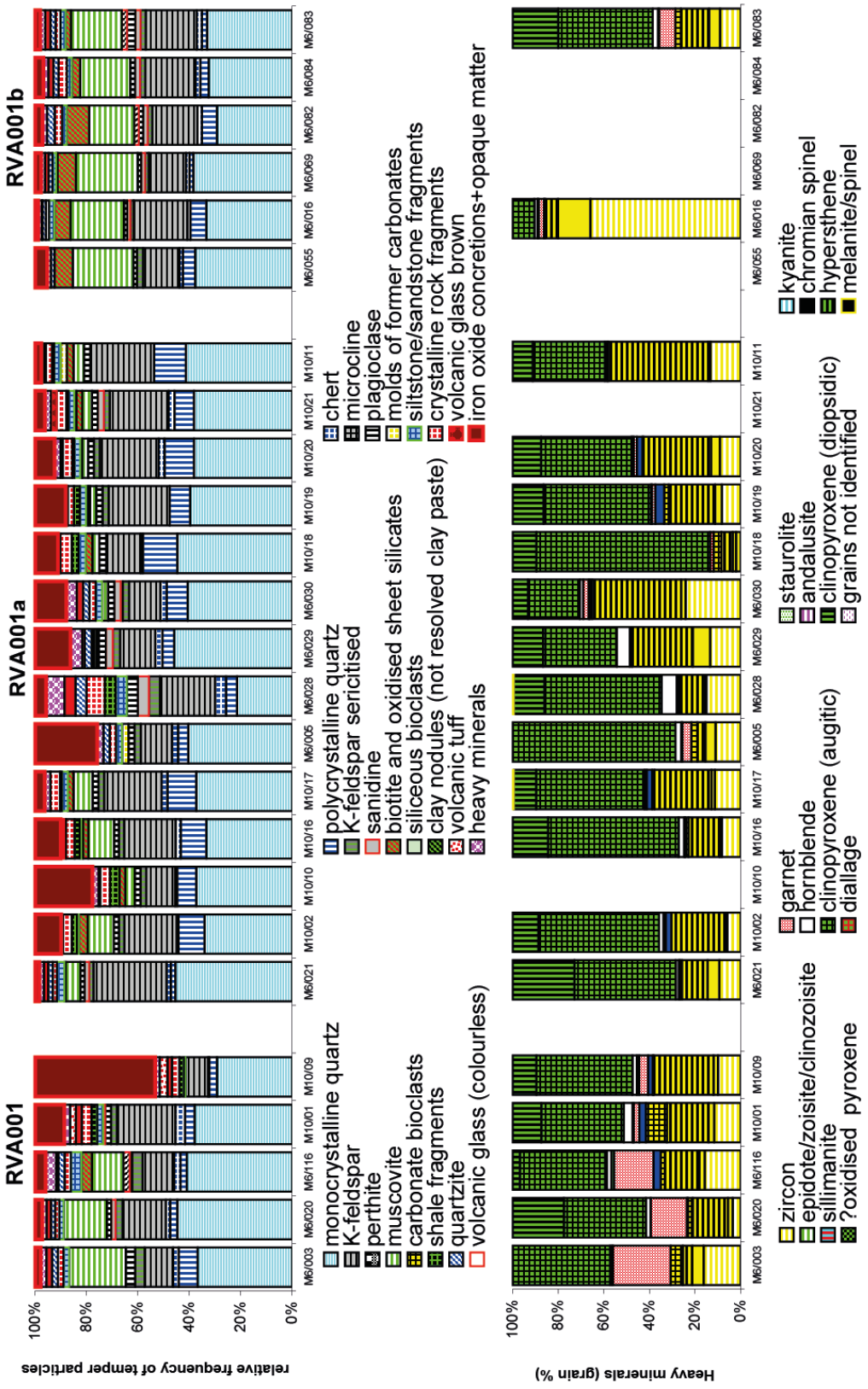

Fig.1. Velinian Amphorae. Petrographic types.

Catalogue

Cat. 1. (pl.1). Western Greek Amphora. Rim fragment, Gassner rim type 3. VEL-A-3. M6/116. Lower town, Crossroad, Inv. 27/90-45. Pottery phase B 2 (450–425 B.C.E.)

Cat. 2. (pl.1). Western Greek Amphora. Rim fragment, Gassner rim type 4. VEL-A-3. M6/3. Lower town, area of Insula II, Inv. 64/87-9. Pottery phase B 1 (475-450 B.C.E.)

Cat. 3. (pl.1). Western Greek Amphora. Rim fragment, Gassner rim type 4. VEL-A-4. M6/16. Lower town, area of Insula II, Inv. 51b/90-1. Pottery phase B 1 (475-450 B.C.E.)

Cat. 4. (pl.1). Western Greek Amphora. Rim fragment, Gassner rim type 4. VEL-A-1. M6/55. Lower town, area of Insula II, Inv. 87/89-46. Pottery phase B 3 (425-400 B.C.E.)

Cat. 5. (pl.1). Western Greek Amphora MGS II. Rim fragment, Gassner rim type 7. VEL-A-1. Lower Town, Fortification, wall B, Inv. 162/99-4. Period 1.1.B. (mid of 5th c. B.C.E.)

Cat. 6. (pl.1). Western Greek Amphora MGS II. Rim fragment, Gassner rim type 7. VEL-A-5. M6/82. Lower town, area of Insula II, Inv. 684/92-3. Pottery phase B3 (425-400 B.C.E.)

Cat. 7. (pl.1). Western Greek Amphora MGS II. Rim fragment, Gassner rim type 7. VEL-A-4. M6/5. Lower town, area of Insula II, Inv. 4003/93-13. Residual in later (possibly recent) context

Cat. 8. (pl.1). Western Greek Amphora MGS II. Rim fragment, Gassner rim type 7. VEL-A-2. M6/29. Lower town, area of Insula II, Inv. 38/89-22. Pottery phase C1 (400-360/50 B.C.E.)

Cat. 9. (pl.1). Western Greek Amphora MGS III (?). Rim fragment, Gassner rim type 7/8. VEL-A-5. Lower town, fortifications, Inv. 214/99-45. Period 2.3.Z (340/330-300 B.C.E.)

Cat. 10. (pl.2). Western Greek Amphora MGS III. Rim fragment, Gassner rim type 8. VEL-A-5. Lower Town, Fortification, wall B, Inv. 216/99-125. Period 2.3.B (340/330 B.C.E.)

Cat. 11. (pl.2). Western Greek Amphora MGS IV (a). Rim fragment, Gassner rim type 8. VEL-A-5. M10/9. Lower town, area of Insula II, Inv. 206/91-32. Residual in later context

Cat. 12. (pl.2). Western Greek Amphora MGS III/IV. Rim fragment, Gassner rim type 8. VEL-A-5. M10/18. Lower town, area of Insula II, Inv. 222/89-6. Residual in later context

Cat. 13. (pl.2). Western Greek Amphora MGS III. Rim fragment, Gassner rim type 9. VEL-A-2. Lower Town, Fortification, wall B, Inv. 214/99-48. Period 2.3.Z. (330-300 B.C.E.)

Cat. 14. (pl.2). Western Greek Amphora MGS IV/V. Rim fragment, Gassner rim type 9. VEL-A-5. M10/19. Lower town, area of Insula II, Inv. 208/89-31. Residual in later context

Cat. 15. (pl.2). Western Greek Amphora MGS V. Rim fragment, Gassner rim type 10. VEL-A-2. Lower town, fortifications, Inv. 209/99-371. Period 2.5.Z. (275-250 B.C.E.)

Cat. 16. (pl.2). Western Greek Amphora MGS IV (b). Rim fragment, Gassner rim type 11. VEL-A-5. Lower town, fortifications, Inv. 209/99-368b. Period 2.5.Z. (275-250 B.C.E.)

Cat. 17. (pl.2). Western Greek Amphora MGS V. Rim fragment, Gassner rim type 12. VEL-A-5. Lower Town, Fortification, wall B, Inv. 209/99-374. Period 2.5.Z. (275-250 B.C.E.)

Cat. 18. (pl.2). Western Greek Amphora MGS VI. Rim fragment, Gassner rim type 13. VEL-A-5. Lower Town, Fortification, wall B, Inv. 207/99-1191a. Period 2.6.Z. (250-225 B.C.E.)

Cat. 19. (pl.2). Western Greek Amphora MGS VI. Rim fragment, Gassner rim type 14. VEL-A-5. Lower Town, Fortification, wall B, Inv. 512/98-125. Period 3.B. (225-175/150 B.C.E.)

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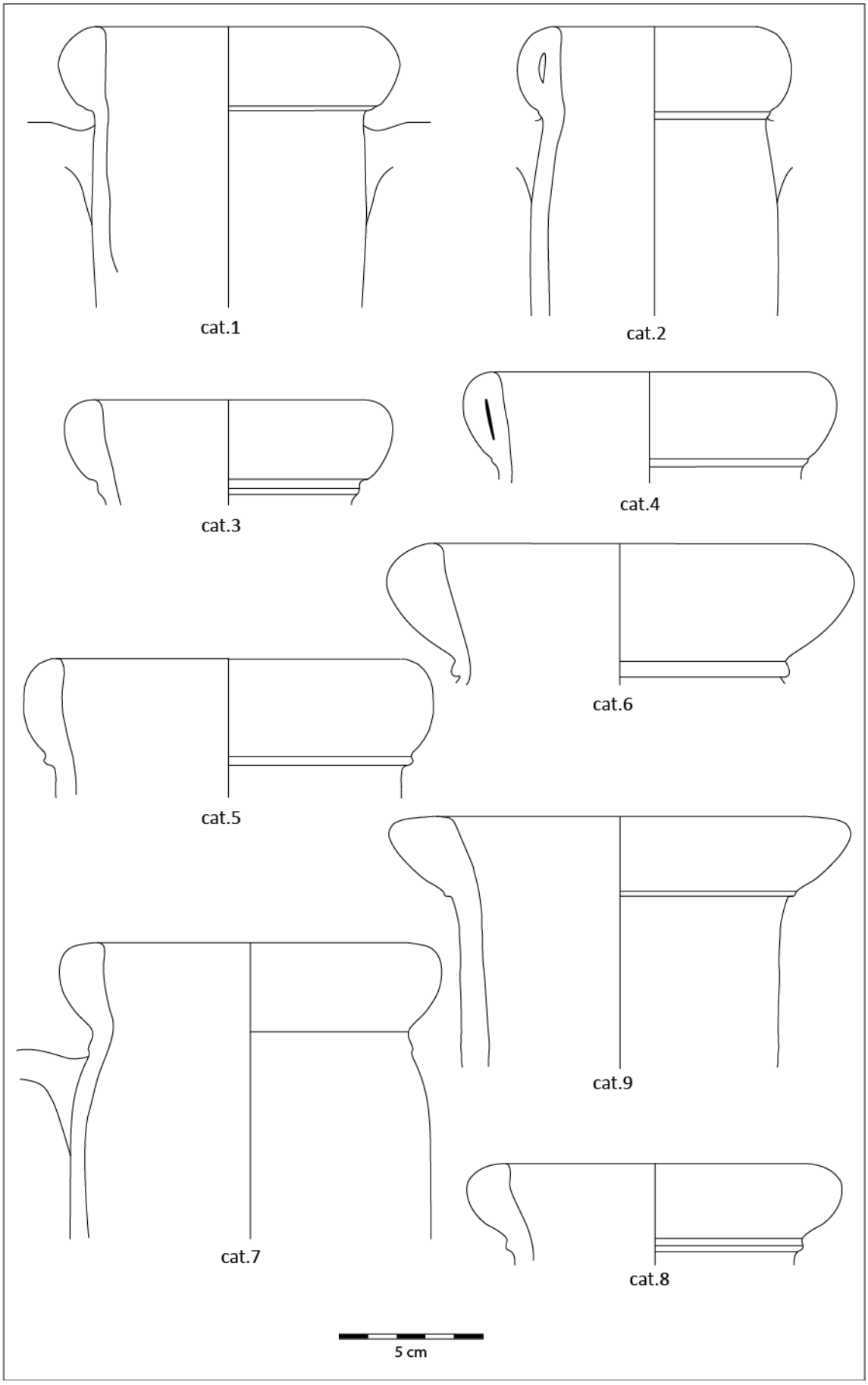
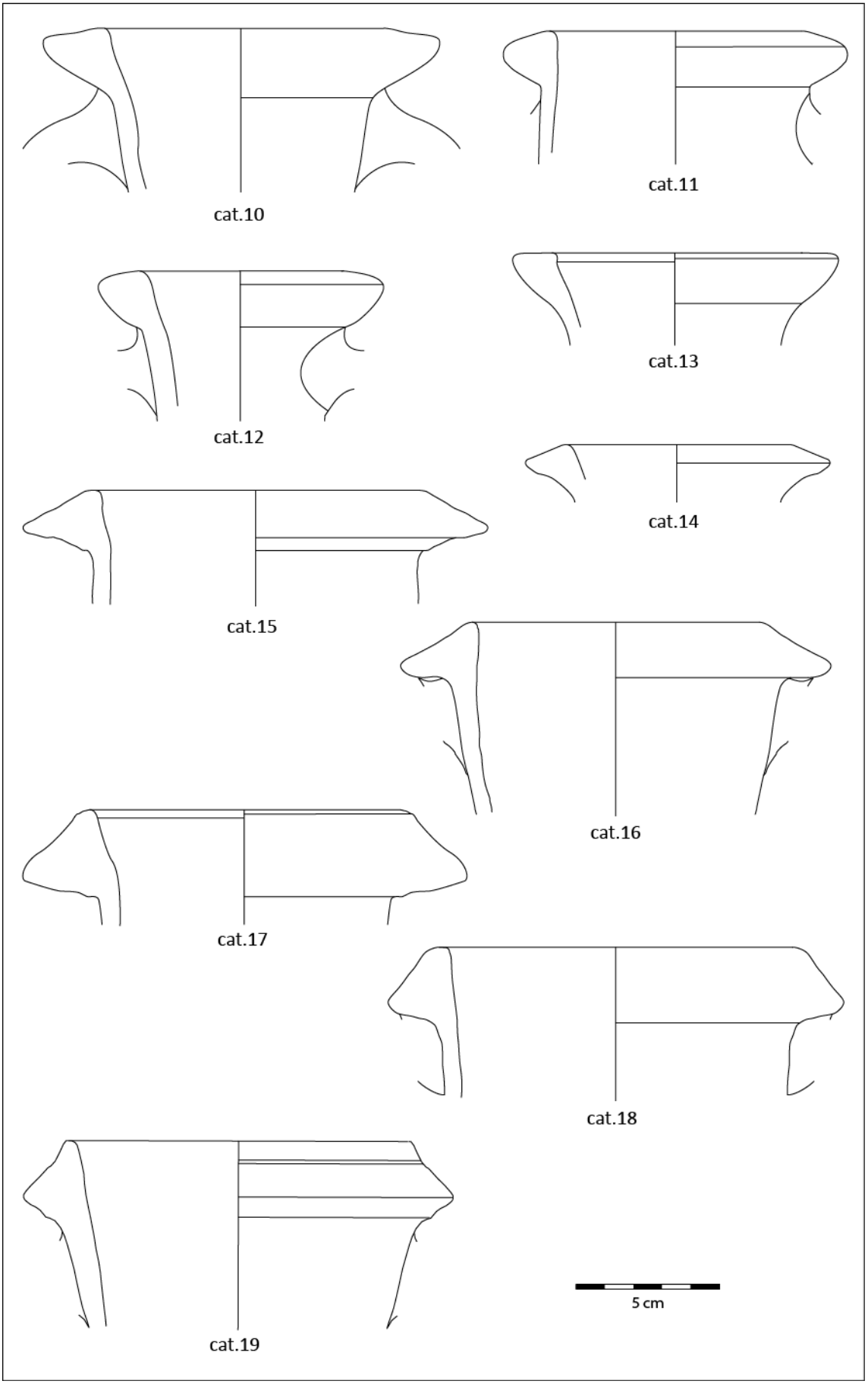
Annex 1: list of samples analyzed by thin section and heavy mineral analysis

Fabric	Petr. Type	No. of Sample	Reg. No.	Form/Description	Context	Pottery phase
VEL-A-3	RVA001	M6/116	27/90-45	Amphora Gassner 3, rim fragment	Lower town, Crossroad	B 2
VEL-A-3	RVA001	M6/3	64/87-9	Amphora Gassner 4, rim fragment Gassner 2003, IIa.204, pl. 24	Lower town	B 1
VEL-A-2	RVA001b	M6/16	51b/90-1	Amphora Gassner 4, rim fragment Gassner 2003, IIa.220, pl. 25	Lower town	B 1
VEL-A-1	RVA001b	M6/55	87/89-46	Amphora Gassner 4, rim fragment	Lower town	B 3
VEL-A-5	RVA001b	M6/82	684/92-3	Amphora MGS II=Gassner 7, rim fragment	Lower town	B 3
VEL-A-4	RVA001a	M6/5	4003/93-13	Amphora MGS II=Gassner 7, rim fragment	Lower town	residual in later context
VEL-A-2	RVA00a	M6/29	38/89-22	Amphora MGS II=Gassner 7, rim fragment	Lower town	C 1
VEL-A-5	RVA001	M10/9	206/91-32	Amphora MGS IV (a), rim fragment	Lower town	residual in later context
VEL-A-5	RVA001a	M10/18	222/89-6	Amphora MGS III/IV, rim fragment	Lower town	residual in later context
VEL-A-5	RVA001a	M10/19	208/89-31	Amphora MGS IV/V, rim fragment	Lower town	residual in later context

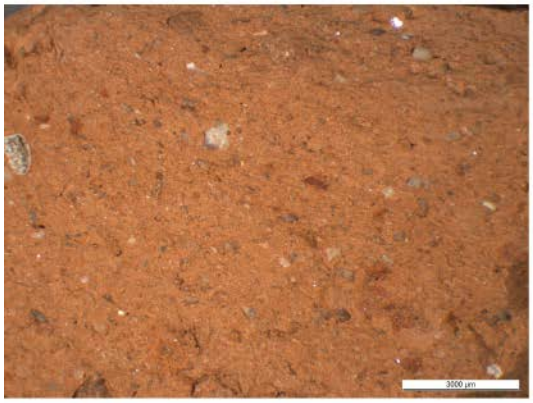
Pl. 1



Pl. 2


cat.10
cat.11
cat.12
cat.13
cat.14
cat.15
cat.16
cat.17
cat.18
cat.19
5 cm

Pl. 3



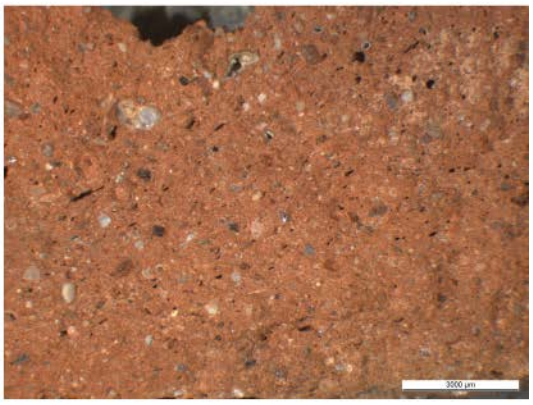
VEL-A-1 (at x8 magnification)

VEL-A-2 (at x8 magnification)

VEL-A-3 (at x8 magnification)

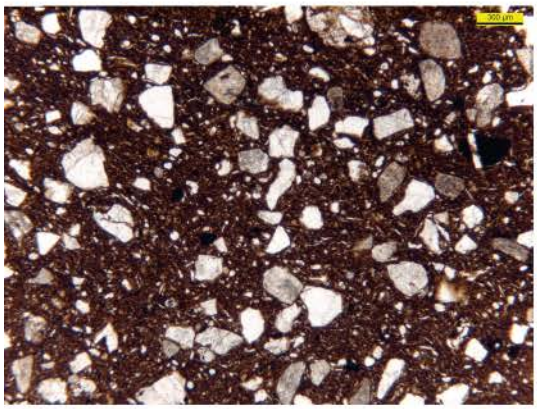
VEL-A-4 (at x8 magnification)

VEL-A-5 (at x8 magnification)

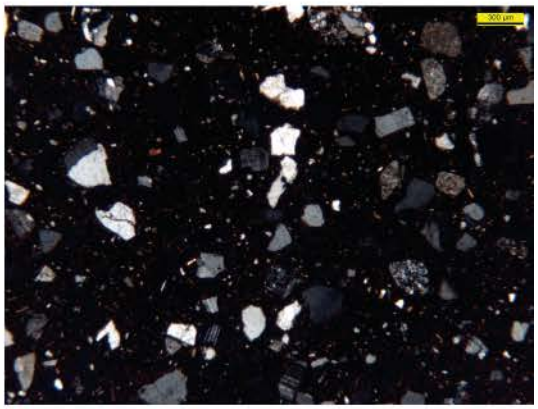


VEL-A-6 (at x8 magnification)

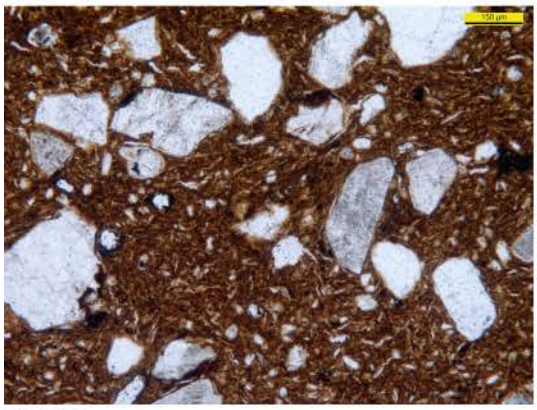
Pl. 4



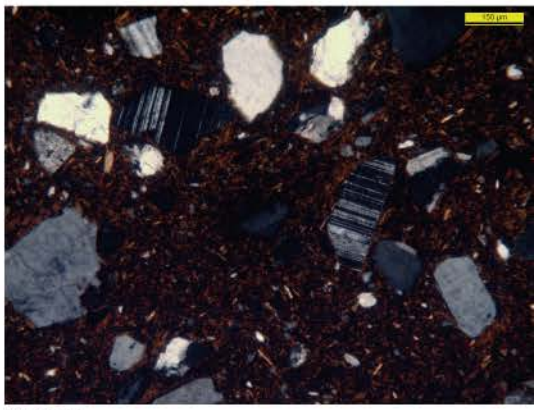
RVA001
VEL-A-3
M6/3
thin section overview; //pol



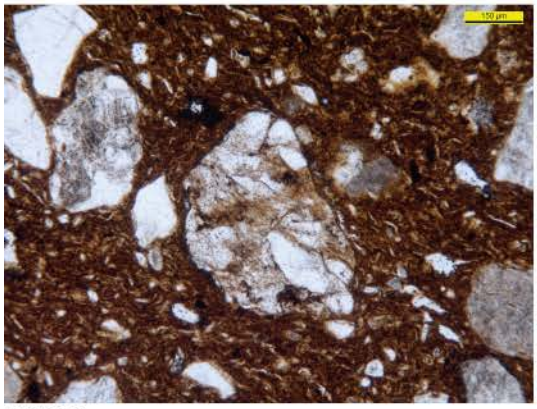
RVA001
VEL-A-3
M6/3
thin section overview; //pol



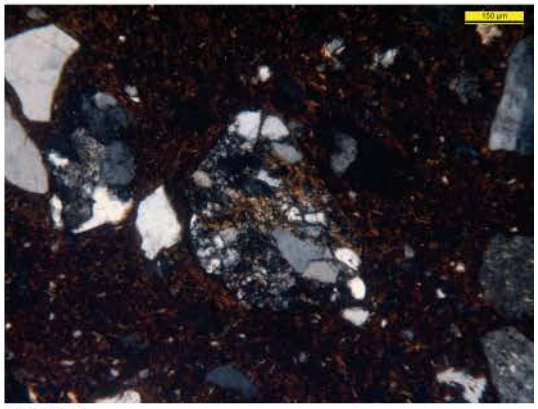
RVA001
VEL-A-3
M6/3
thin section overview; //pol



RVA001
VEL-A-3
M6/3
thin section overview; #pol

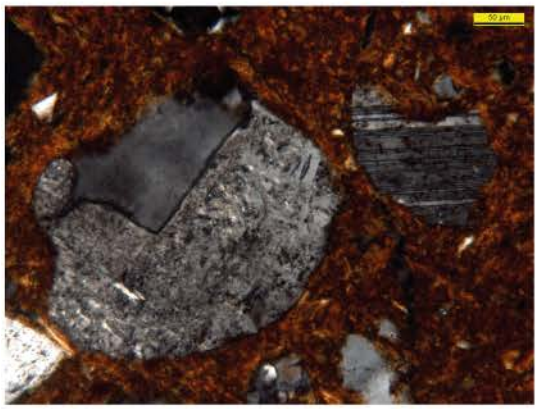


RVA001
VEL-A-3
M6/3
thin section overview; //pol

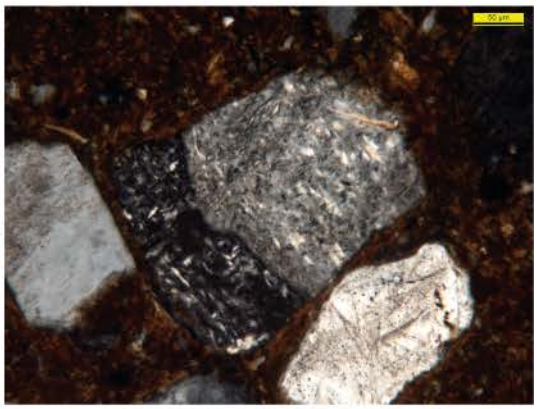


RVA001
VEL-A-3
M6/3
thin section overview; #pol

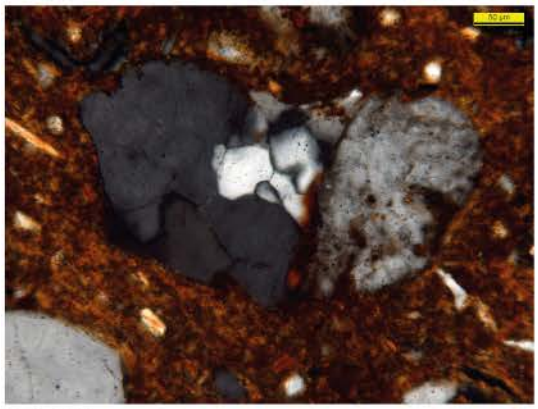
Pl. 5



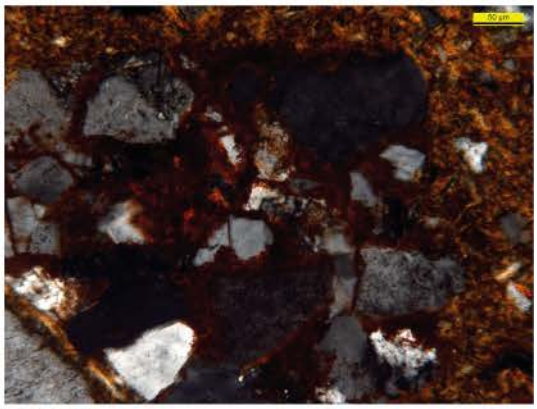
RVA001
VEL-A-3
M6/3
feldspar grains
#pol



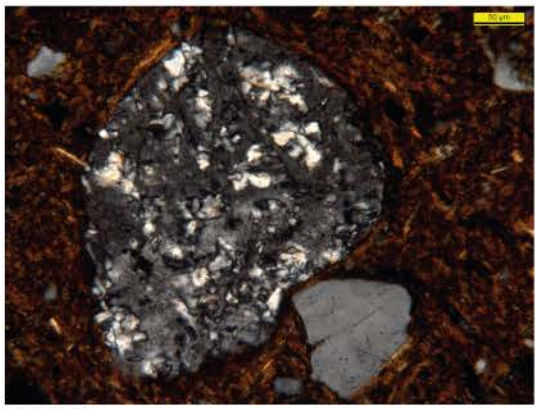
RVA001
VEL-A-3
M6/3
k-feldspar grains with sericite inclusions, quartz
#pol



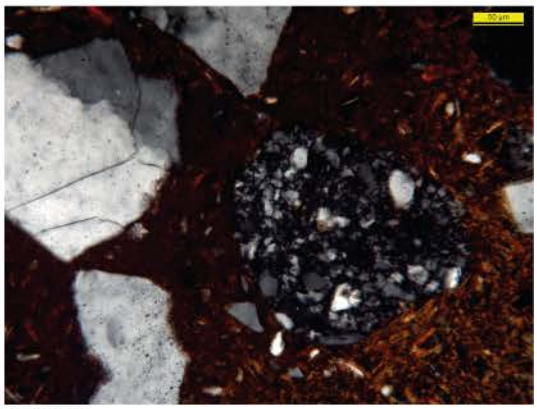
RVA001
VEL-A-3
M6/3
polycrystalline quartz
#pol



RVA001
VEL-A-3
M6/3
ironoxide cemented sandstone particle
#pol

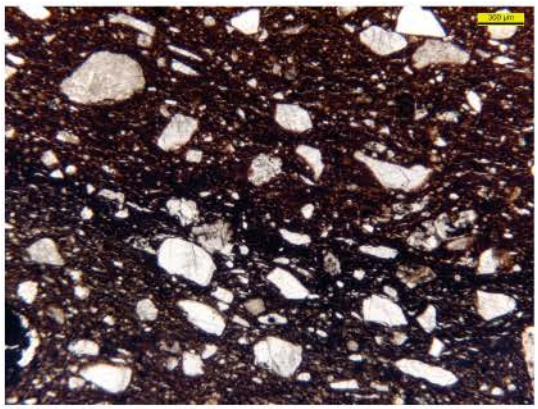


RVA001
VEL-A-3
M6/3
k-feldspar with sericite inculsions, quartz grain
#pol

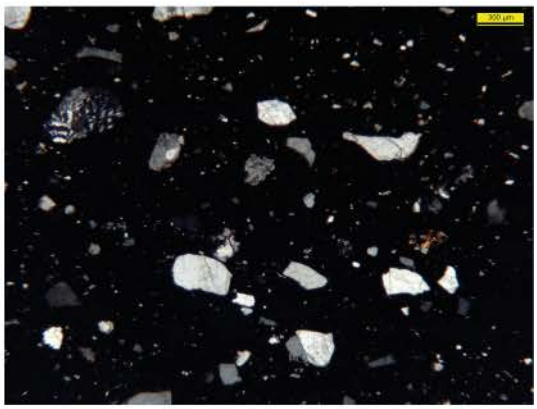


RVA001
VEL-A-3
M6/3
quartz and quartzite grains
#pol

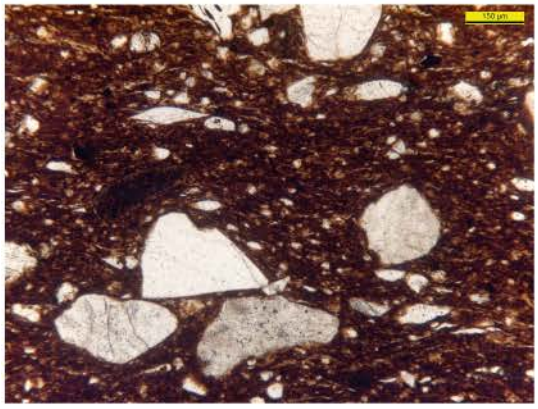
Pl. 6



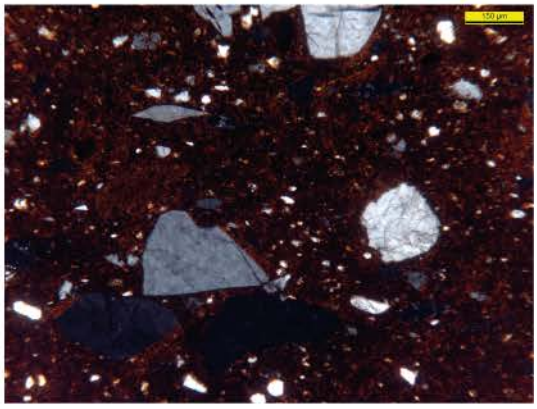
RVA001a
VEL-A-4
M6/5
thin section overview; //pol



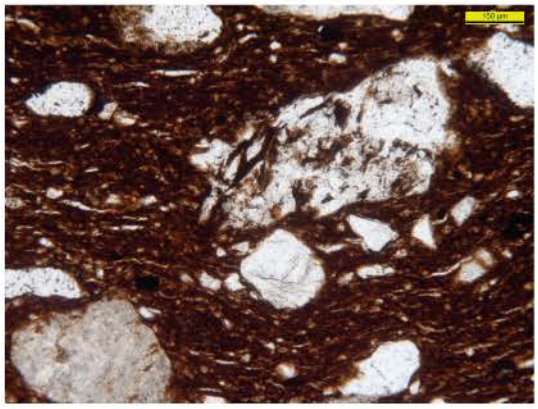
RVA001a
VEL-A-4
M6/5
thin section overview; #pol



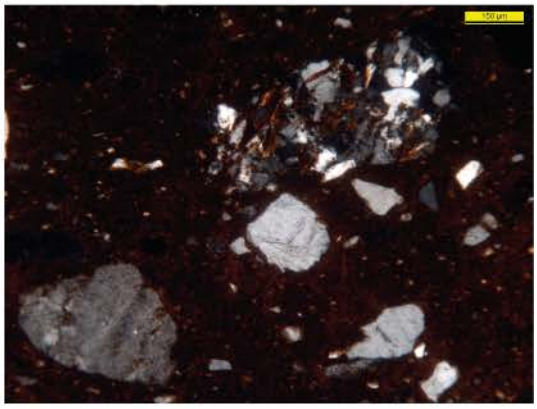
RVA001a
VEL-A-4
M6/5
thin section overview; //pol



RVA001a
VEL-A-4
M6/5
thin section overview; #pol

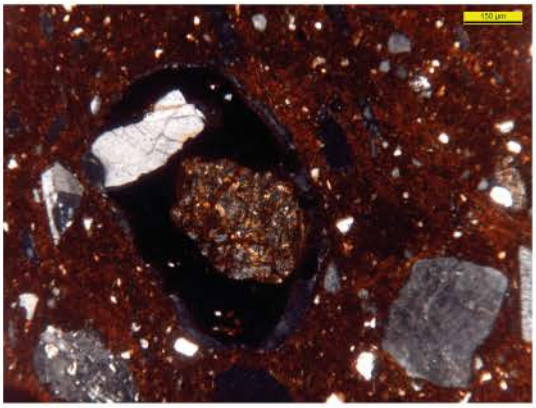


RVA001a
VEL-A-4
M6/5
alkalifeldspar, sandstone and quartz
//pol

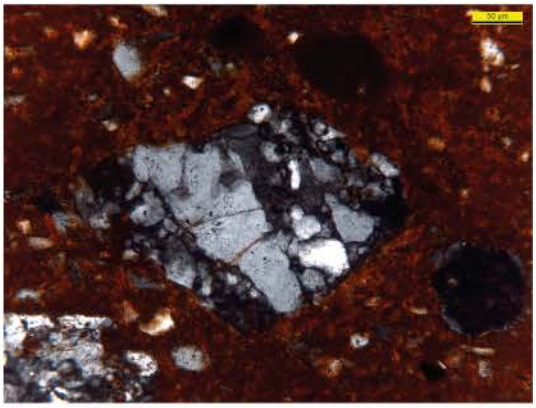


RVA001a
VEL-A-4
M6/5
alkalifeldspar, sandstone and quartz
#pol

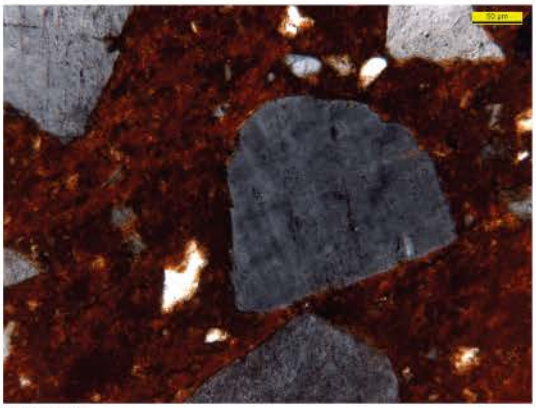
Pl. 7



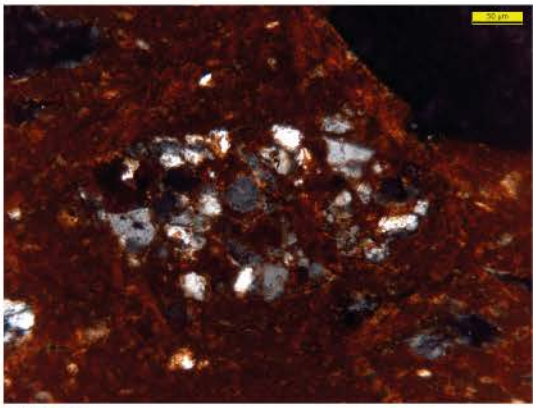
RVA001a
VEL-A-4
M6/5
ironoxide cemented siliciclastic particles
#pol



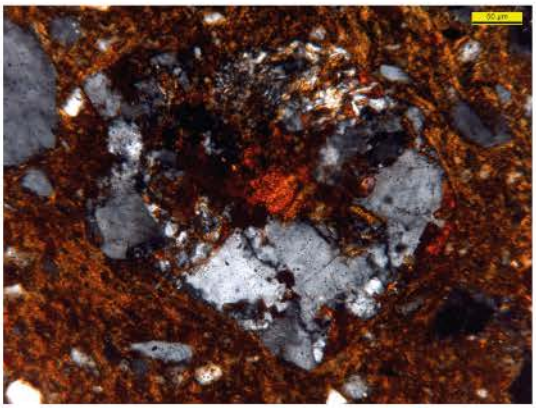
RVA001a
VEL-A-4
M6/5
quartzite
#pol



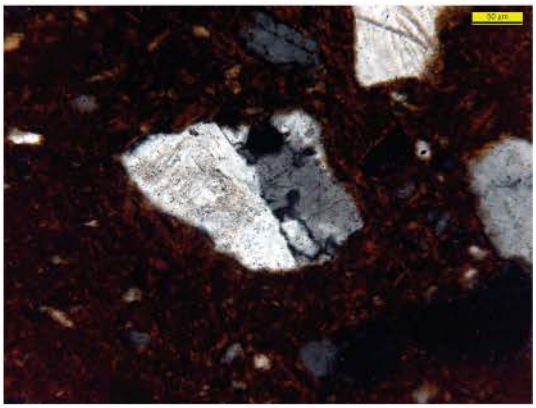
RVA001a
VEL-A-4
M6/5
k-feldspar
#pol



RVA001a
VEL-A-4
M6/5
fine grained sandstone particle
#pol

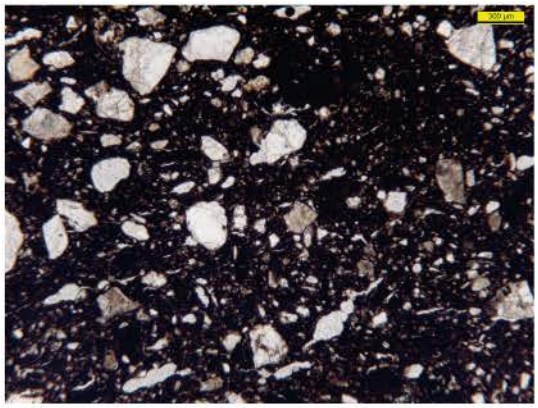


RVA001a
VEL-A-4
M6/5
crystalline rock fragment
#pol

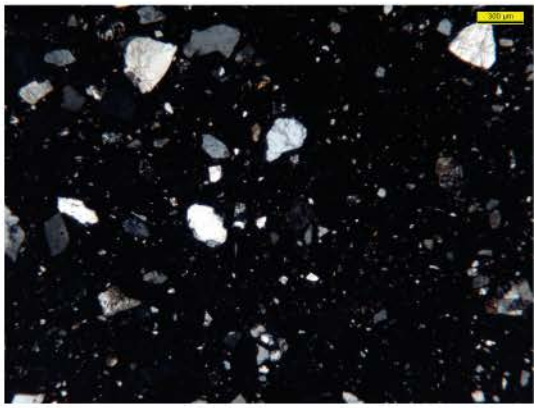


RVA001a
VEL-A-4
M6/5
polycrystalline quartz
#pol

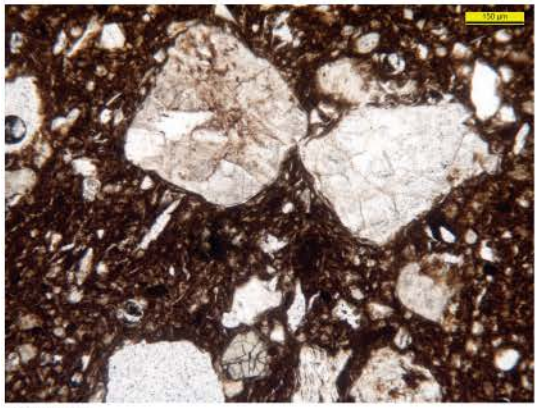
Pl. 8



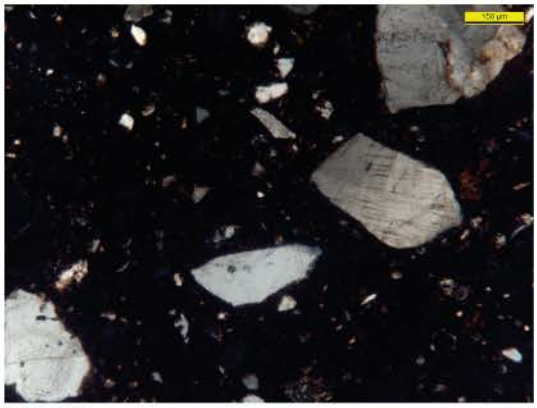
RVA001a
VEL-A-6
M10/2
thin section overview; //pol



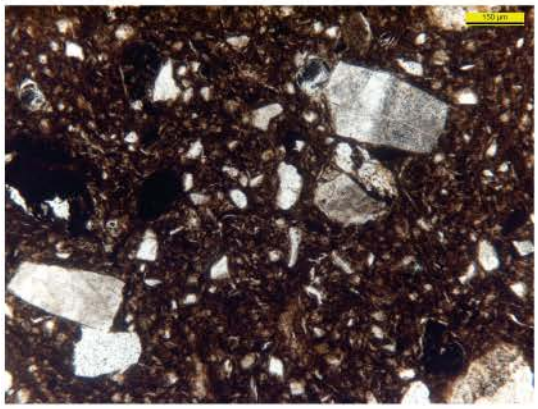
RVA001a
VEL-A-6
M10/2
thin section overview; #pol



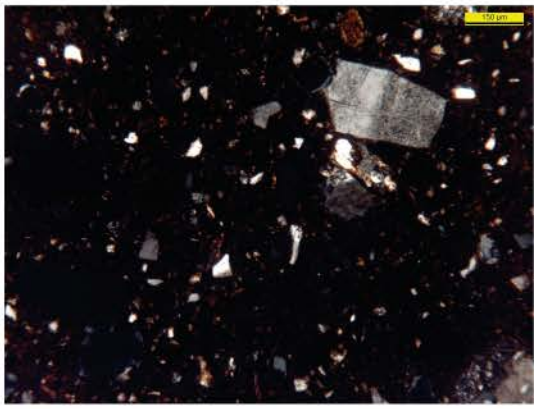
RVA001a
VEL-A-6
M10/2
thin section overview; //pol



RVA001a
VEL-A-6
M10/2
thin section overview; #pol

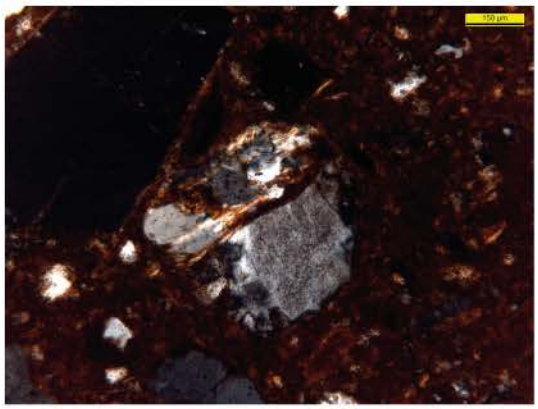


RVA001a
VEL-A-6
M10/2
thin section overview; //pol

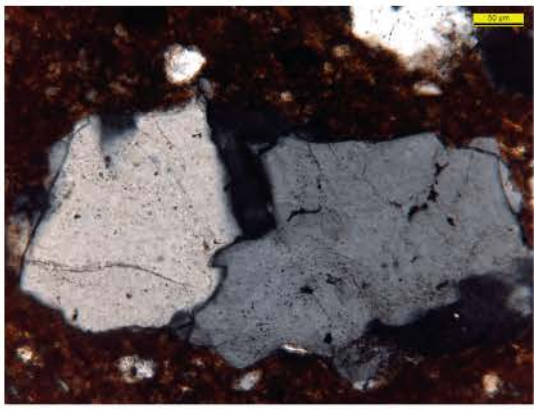


RVA001a
VEL-A-6
M10/2
thin section overview; #pol

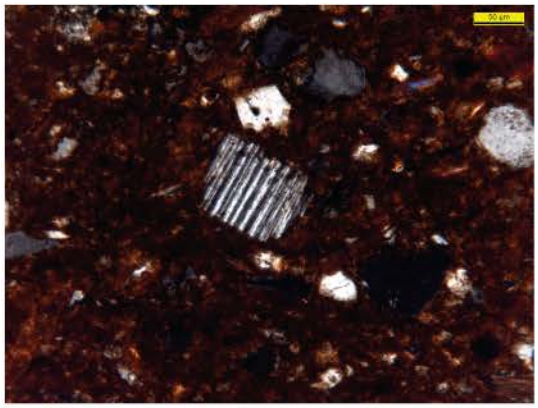
Pl. 9



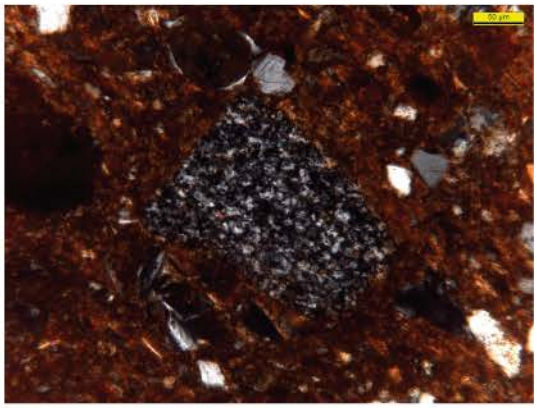
RVA001a
VEL-A-6
M10/2
crystalline rock fragment
thin section overview; #pol



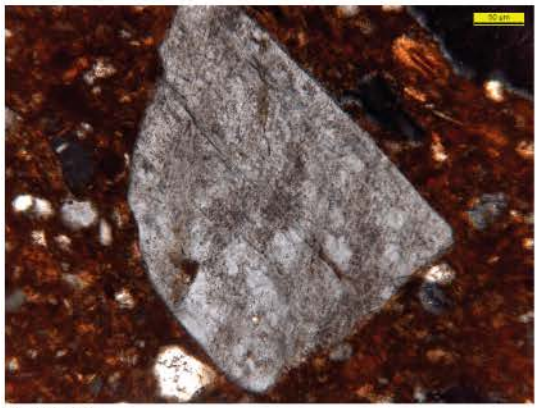
RVA001a
VEL-A-6
M10/2
polycrystalline quartz
thin section overview; #pol



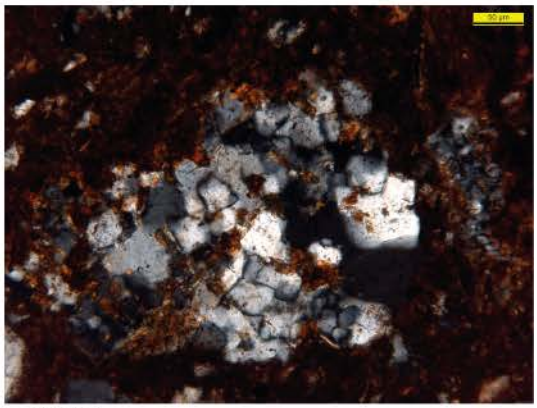
RVA001a
VEL-A-6
M10/2
plagioclase
thin section overview; #pol



RVA001a
VEL-A-6
M10/2
fine grained quartzite
thin section overview; #pol

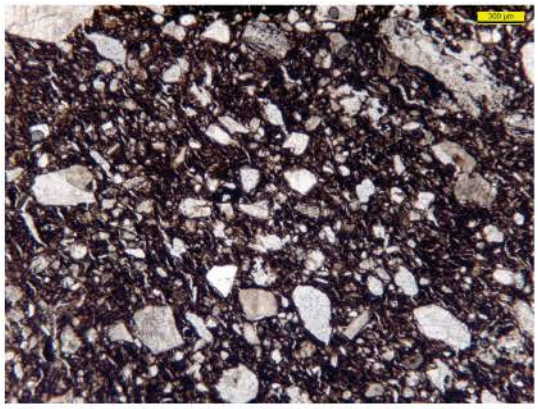


RVA001a
VEL-A-6
M10/2
k-feldspar
thin section overview; #pol

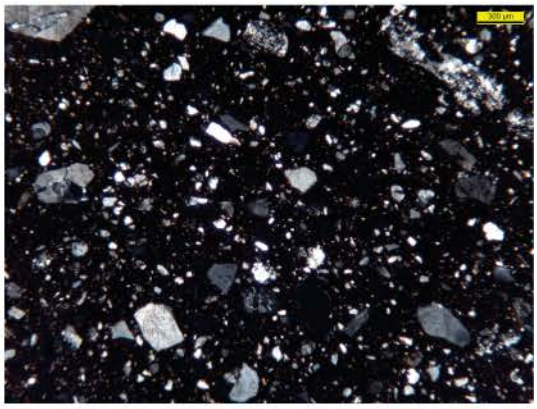


RVA001a
VEL-A-6
M10/2
quartzite
thin section overview; #pol

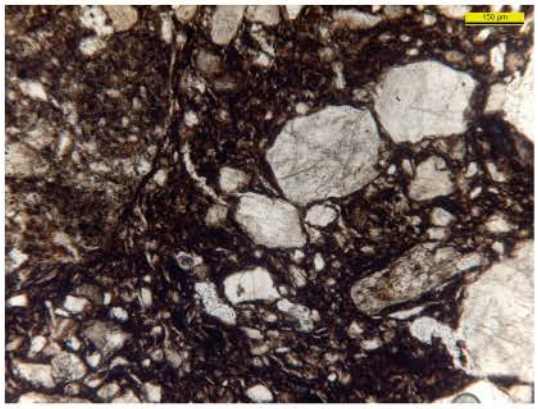
Pl. 10



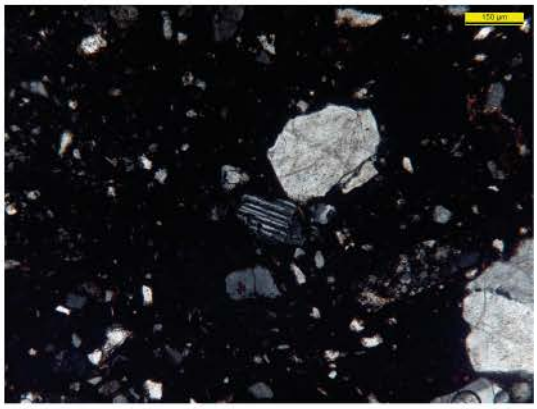
RVA001a
VEL-A-6
M10/11
thin section overview; //pol



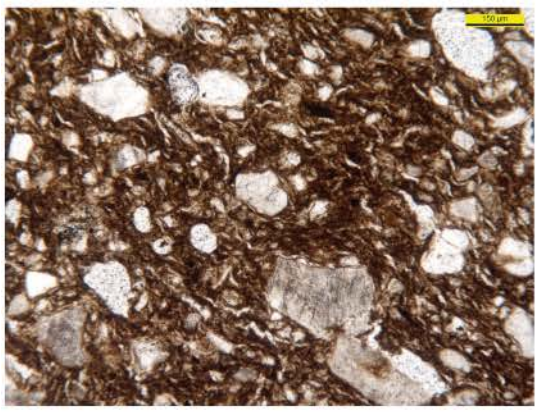
RVA001a
VEL-A-6
M10/11
thin section overview; #pol



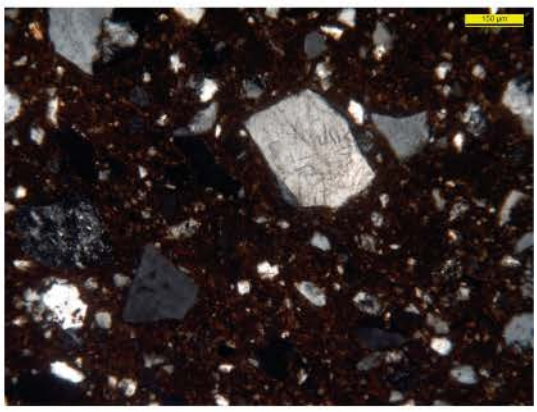
RVA001a
VEL-A-6
M10/11
thin section overview; //pol



RVA001a
VEL-A-6
M10/11
thin section overview; #pol

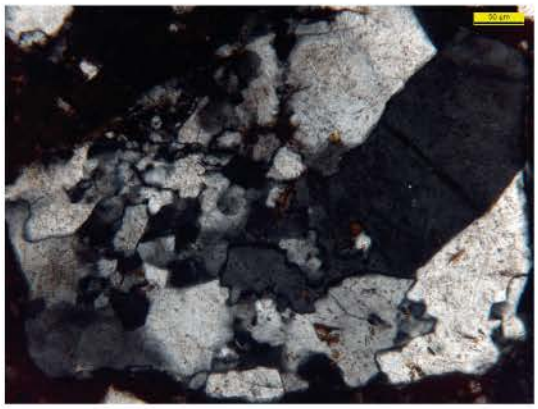


RVA001a
VEL-A-6
M10/11
thin section overview; //pol



RVA001a
VEL-A-6
M10/11
thin section overview; #pol

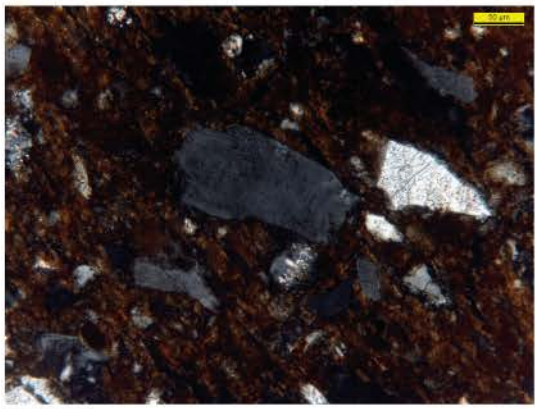
Pl. 11



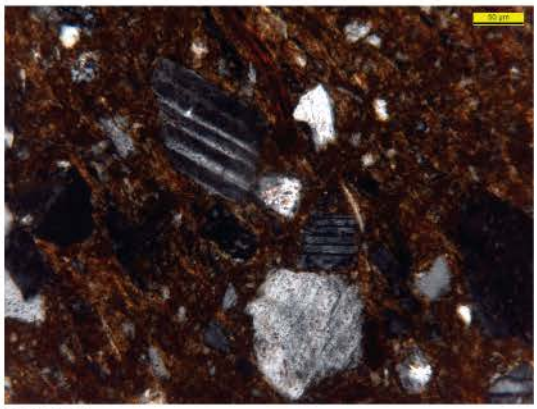
RVA001a
VEL-A-5
M10/11

#pol

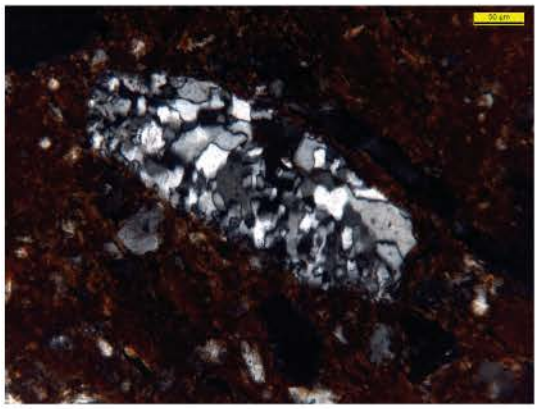
RVA001a
VEL-A-5
M10/11
mica and a mould of a former carbonate particle
#pol



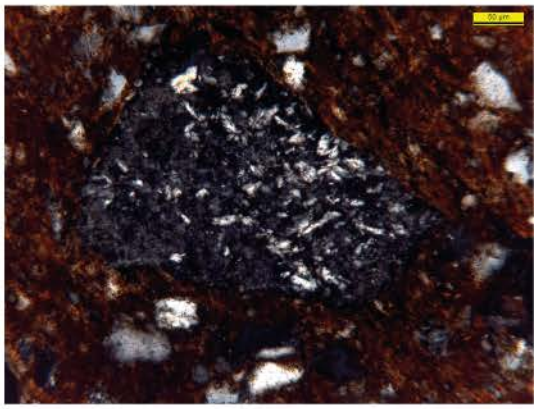
RVA001a
VEL-A-5
M10/11
k-feldspar
#pol



RVA001a
VEL-A-5
M10/11
plagioclase
#pol

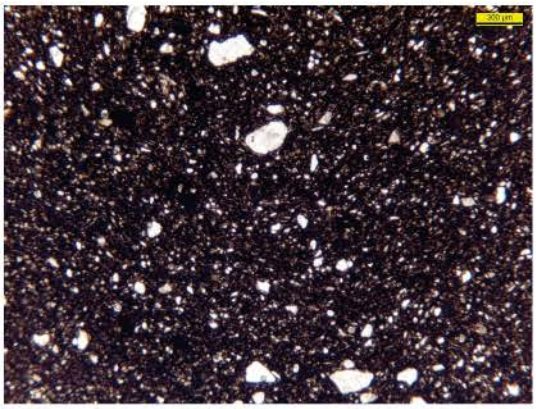


RVA001a
VEL-A-5
M10/11
polycrystalline quartz
#pol

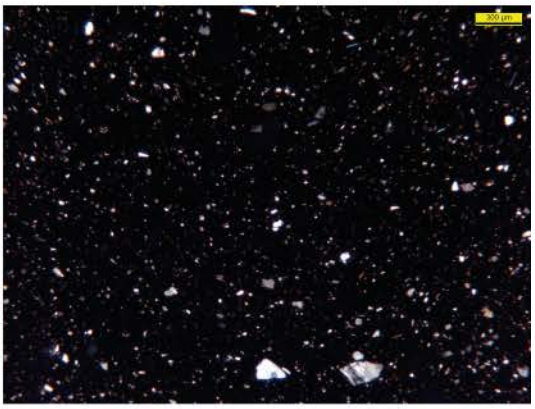


RVA001a
VEL-A-5
M10/11
sericitised feldspar
#pol

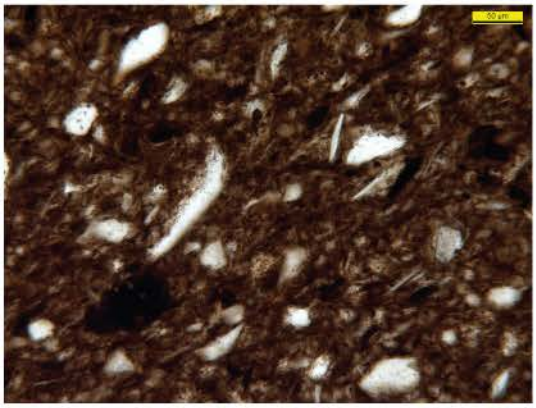
Pl. 12



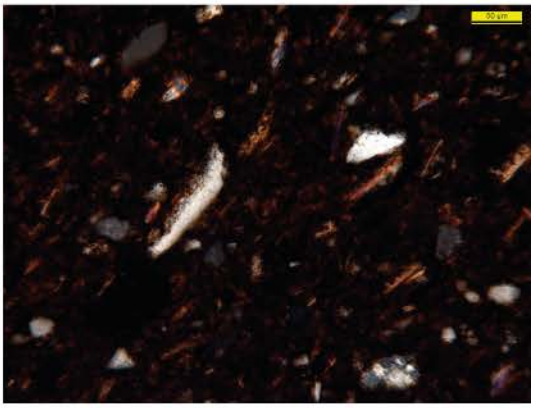
RVA001b
VEL-A-1
M6/55
thin section overview; //pol



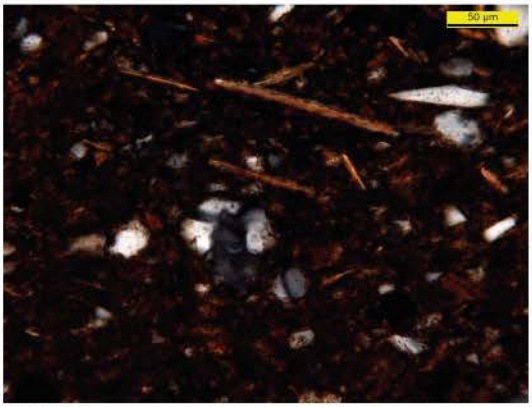
RVA001b
VEL-A-1
M6/55
thin section overview; #pol



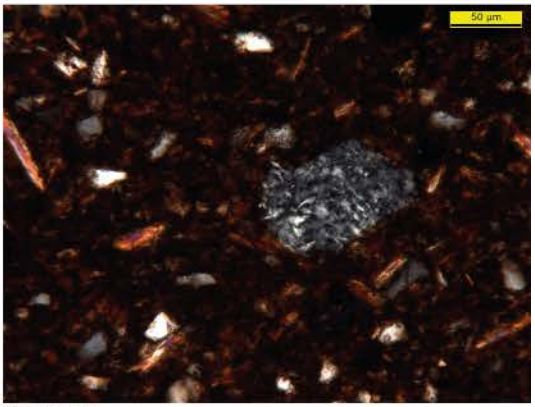
RVA001b
VEL-A-1
M6/55
quartz and mica grains
//pol



RVA001b
VEL-A-1
M6/55
quartz and mica grains
#pol



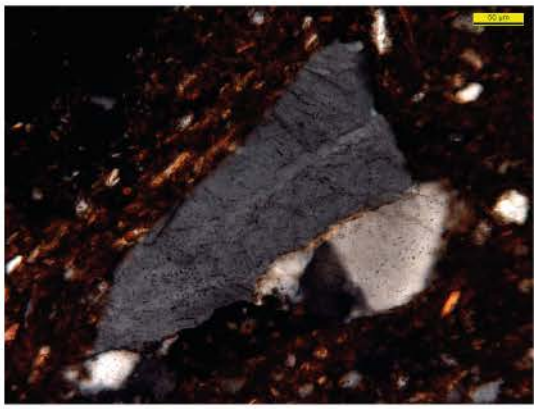
RVA001b
VEL-A-1
M6/55
quartz and mica grains
thin section overview; #pol



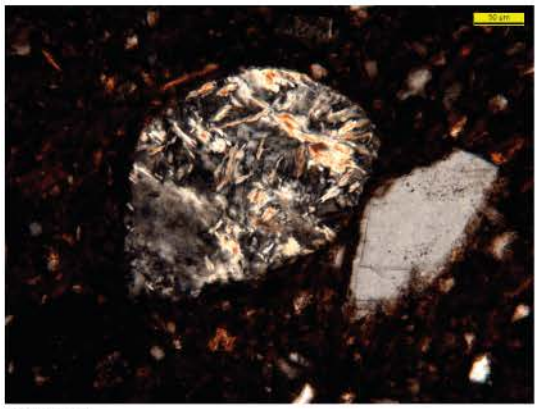
RVA001b
VEL-A-1
M6/55
k-feldspar grain, mica
thin section overview; #pol

Pl. 13

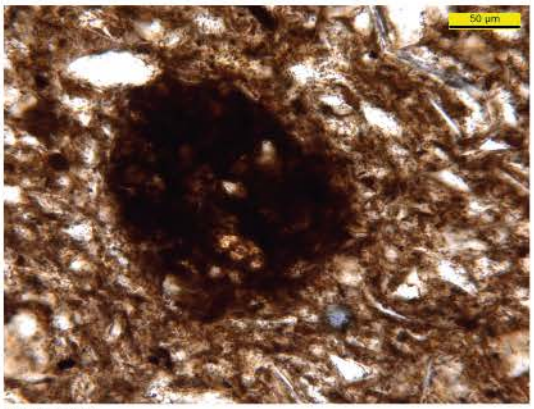
RVA001b
VEL-A-1
M6/55
k-feldspar grain
#pol



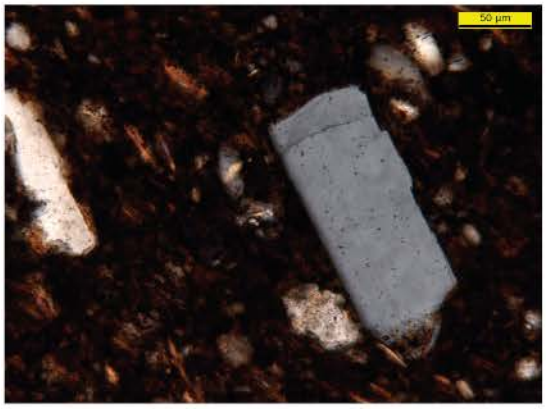
RVA001b
VEL-A-1
M6/55
polycrystalline quartz
thin section overview; #pol



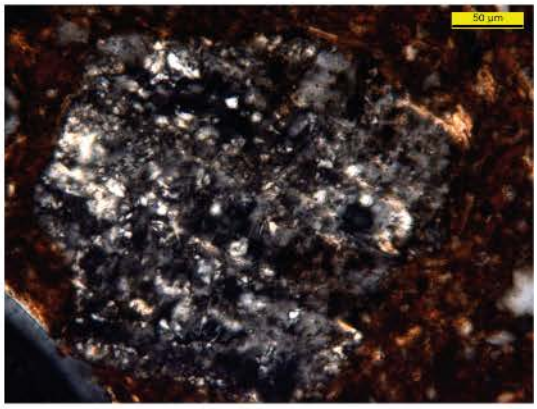
RVA001b
VEL-A-1
M6/55
k-feldspar grain strongly sericitised
#pol



RVA001b
VEL-A-1
M6/55
k-feldspar grain
#pol

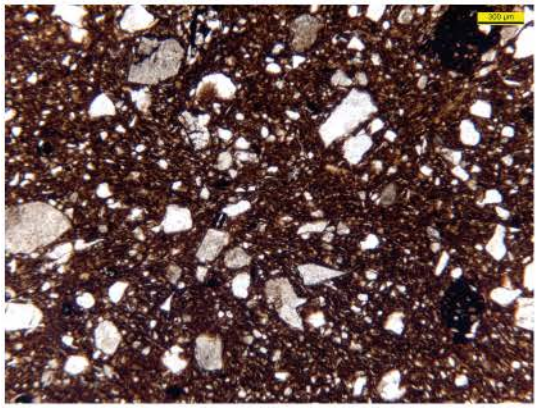


RVA001b
VEL-A-1
M6/55
k-feldspar grain
thin section overview; #pol

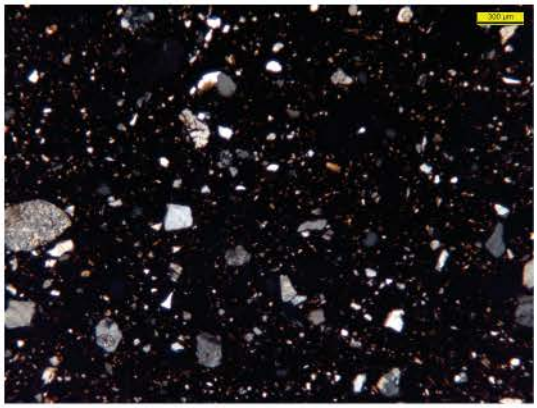


RVA001b
VEL-A-1
M6/55
sericitised feldspar grain
thin section overview; #pol

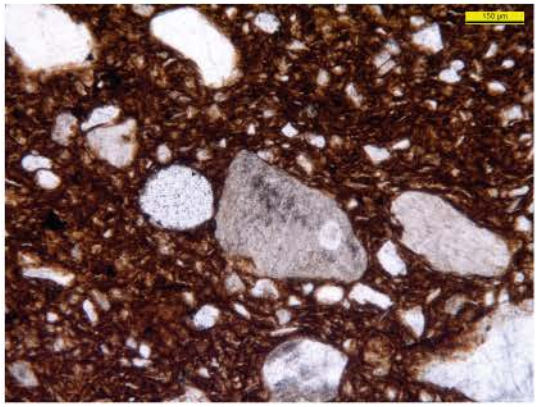
Pl. 14



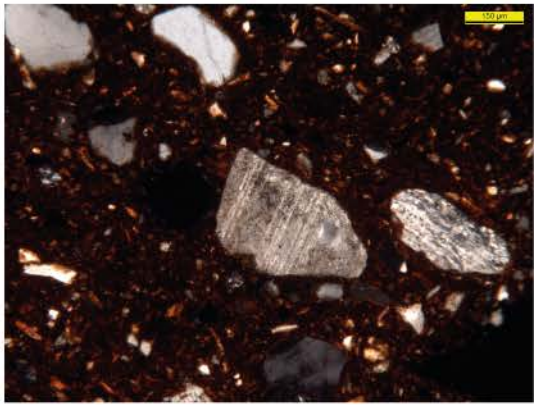
RVA001b
VEL-A-2
M6/84
thin section overview; //pol



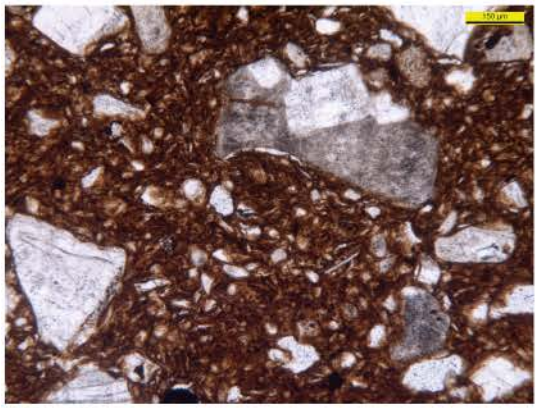
RVA001b
VEL-A-2
M6/84
thin section overview; #pol



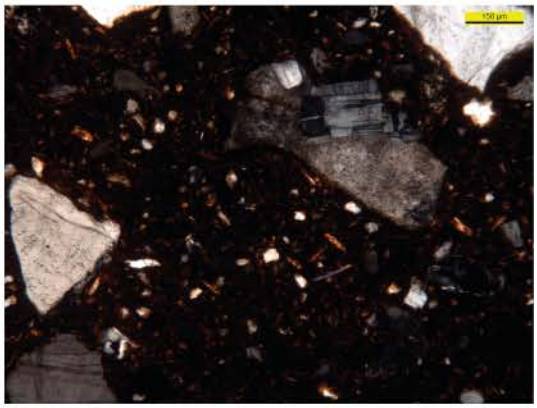
RVA001b
VEL-A-2
M6/84
feldspar (plagoiclase), quartz grains
thin section overview; //pol



RVA001b
VEL-A-2
M6/84
feldspar (plagoiclase), quartz grains
thin section overview; #pol

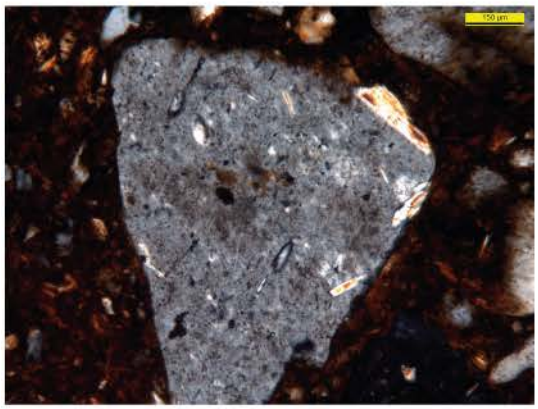


RVA001b
VEL-A-2
M6/84
feldspar, quartz, crystalline rock fragments
thin section overview; //pol

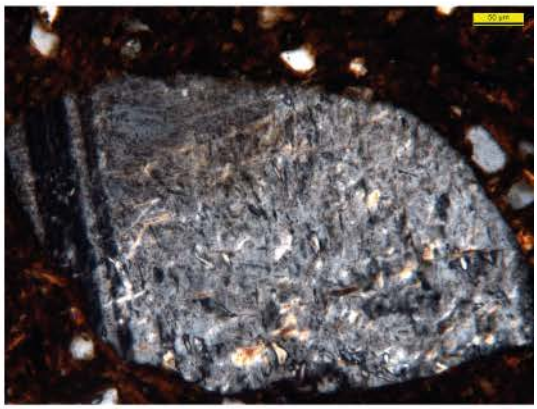


RVA001b
VEL-A-2
M6/84
feldspar, quartz, crystalline rock fragments
thin section overview; #pol

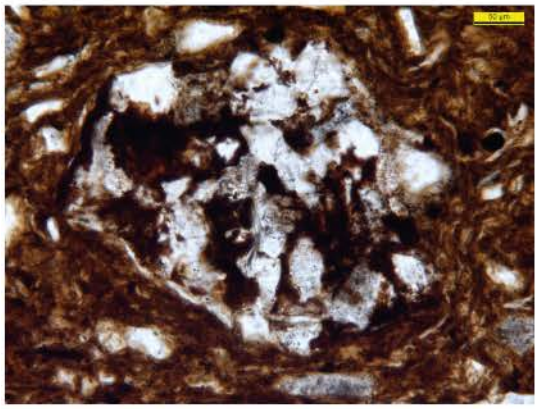
Pl. 15



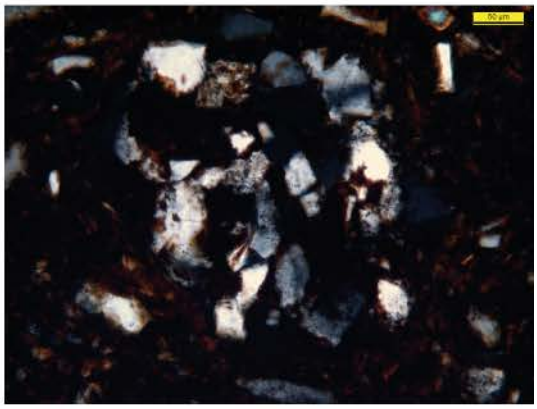
RVA001b
VEL-A-2
M6/84
k-feldspar with sericite inclusions
#pol



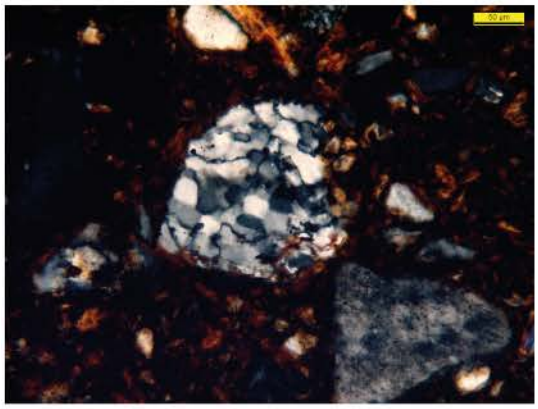
RVA001b
VEL-A-2
M6/84
plagioclase grain with sericite inclusions
#pol



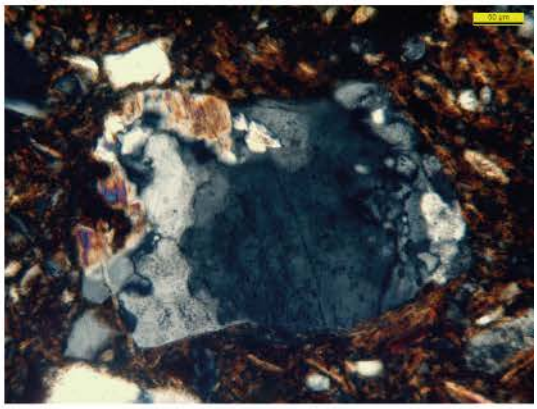
RVA001b
VEL-A-2
M6/84
iron oxide cemented sandstone grain
//pol



RVA001b
VEL-A-2
M6/84
iron oxide cemented sandstone grain
#pol



RVA001b
VEL-A-2
M6/84
quartzite grain
#pol



RVA001b
VEL-A-2
M6/84
crystalline rock fragment