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Late medieval pottery production in South Western Crimea: laboratory investigations of ceramics from Cembalo (region of Sebastopol / Chersonesos)

Sylvie Yona Waksman, N. Ginkut

► **To cite this version:**

Sylvie Yona Waksman, N. Ginkut. Late medieval pottery production in South Western Crimea: laboratory investigations of ceramics from Cembalo (region of Sebastopol / Chersonesos). Actas do X Congresso Internacional a cerâmica medieval no Mediterrâneo, Oct 2012, Silves & Mértola, Portugal. pp.719-723. hal-02010502

HAL Id: hal-02010502

<https://hal.univ-lyon2.fr/hal-02010502v1>

Submitted on 6 Feb 2020

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X ACTAS DO
Congresso
Internacional
**A CERÂMICA MEDIEVAL
NO MEDITERRÂNEO**
SILVES 22 a 27.outubro'12



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Edição de:

Silves
câmara municipal



**X CONGRESSO INTERNACIONAL A CERÂMICA MEDIEVAL NO MEDITERRÂNEO SILVES - MÉRTOLA, AUDITÓRIO DA FISSUL,
22 A 27 DE OUTUBRO DE 2012**
*10TH INTERNATIONAL CONGRESS ON MEDIEVAL POTTERY IN THE MEDITERRANEAN. SILVES & MÉRTOLA, 22-27 OCTOBER
2012*

ORGANIZAÇÃO: CÂMARA MUNICIPAL DE SILVES, CAMPO ARQUEOLÓGICO DE MÉRTOLA
EM COLABORAÇÃO COM: AIECM2 E CEAUCP
APOIOS: FUNDAÇÃO PARA A CIÊNCIA E A TECNOLOGIA, FUNDAÇÃO CALOUSTE GULBENKIAN

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**ACTAS DO X CONGRESSO INTERNACIONAL A CERÂMICA MEDIEVAL NO MEDITERRÂNEO. SILVES - MÉRTOLA, 22 A 27 DE
OUTUBRO DE 2012**
*PROCEEDINGS OF 10TH INTERNATIONAL CONGRESS ON MEDIEVAL POTTERY IN THE MEDITERRANEAN. SILVES &
MÉRTOLA, 22-27 OCTOBER 2012*
SILVES, OUTUBRO DE 2015

EDIÇÃO /// PUBLISHER: CÂMARA MUNICIPAL DE SILVES & CAMPO ARQUEOLÓGICO DE MÉRTOLA
COORDENAÇÃO EDITORIAL /// EDITOR: MARIA JOSÉ GONÇALVES E SUSANA GÓMEZ-MARTÍNEZ
DESIGN GRÁFICO /// GRAPHIC DESIGN: RUI MACHADO
IMPRESSÃO /// PRINTING: GRÁFICA COMERCIAL DE LOULÉ

ISBN 978-972-9375-48-4
DEPÓSITO LEGAL /// LEGAL DEPOT ??????
TIRAGEM /// PRINT RUN: 500

INDICE

TEMA: 1 **AS CERÂMICAS NO SEU CONTEXTO** **POTTERY WITHIN ITS CONTEXT**

SUSANA GÓMEZ MARTÍNEZ | MARIA JOSÉ GONÇALVES | ISABEL INÁCIO | CONSTANÇA DOS SANTOS | CATARINA COELHO | MARCO LIBERATO | ANA SOFIA GOMES | JACINTA BUGALHÃO | HELENA CATARINO | SANDRA CAVACO | JAQUELINA COVANEIRO | ISABEL CRISTINA FERNANDES

1. A CIDADE E O SEU TERRITÓRIO NO GHARB AL-ANDALUS ATRAVÉS DA CERÂMICA 19
ROLAND-PIERRE GAYRAUD | JEAN-CHRISTOPHE TREGLIA
2. LA CÉRAMIQUE D'UNE MAISON OMEYYADE DE FUSTÂT - ISTABL 'ANTAR (LE CAIRE, ÉGYPTE). VAISSELLES DE TABLE, CÉRAMIQUES COMMUNES ET CULINAIRE, JARRES DE STOCKAGE ET AMPHORES DE LA PIÈCE P5 (PREMIÈRE MOITIÉ DU VIII^e S.) 51
VÍCTOR CAÑAVATE CASTEJÓN | SONIA GUTIÉRREZ LLORET
3. CERÁMICA, ESPACIO DOMÉSTICO Y VIDA SOCIAL: EL TEMPRANO AL-ANDALUS EN EL SUDESTE PENINSULAR A LA LUZ DE EL TOLMO DE MINATEDA (HELLÍN, ALBACETE) 56
JOSÉ AVELINO GUTIÉRREZ GONZÁLEZ | JOSÉ LUIS HERNANDO GARRIDO | HORTENSIA LARRÉN IZQUIERDO | FERNANDO MIGUEL HERNÁNDEZ | JUAN ZOZAYA STABEL-HANSEN | CARMEN BENÉITEZ GONZÁLEZ
4. NOTAS SOBRE LA CERÁMICA EN LA ICONOGRAFÍA CRISTIANA DEL NORTE PENINSULAR (SS. X-XII) 68
VANESSA FILIPE
5. ISLAMIC POTTERY FROM THE ÉVORA MUNICIPAL MUSEUM 84
MARCELLA GIORGIO
6. CERAMICS AND SOCIETY IN PISA IN MIDDLE AGES 93
MÁRIO VARELA GOMES | ROSA VARELA GOMES
7. A CERÂMICA E O SAGRADO, NO RIBÂT DA ARRIFANA (ALJEZUR, PORTUGAL) (SÉC. XII) 106
FRANCESCO M. P. CARRERA | BEATRICE FATIGHENTI | CATERINA TOSCANI
8. LE CERAMICHE E LE ATTIVITÀ PRODUTTIVE. RECENTI ACQUISIZIONI DA UN QUARTIERE ARTIGIANALE DI CHINZICA (PI) 114
VESNA BIKIĆ
9. CONTEXT, CHARACTER AND TYPOLOGY OF POTTERY FROM THE ELEVENTH AND TWELFTH CENTURY DANUBE FORTRESSES: CASE STUDIES FROM MORAVA AND BRANIČEVO 125
VALENTINA VEZZOLI
10. THE AREA OF BUSTAN NASSIF (BAALBEK) BETWEEN THE 12TH AND THE EARLY 15TH CENT.: THE CERAMIC EVIDENCE 133
ELENA SALINAS
11. USO Y CONSUMO DE LA CERÁMICA ALMOHADE EN CÓRDOBA (ESPAÑA) 139
MARCELLO ROTILI
12. ASPETTI DELLA PRODUZIONE IN CAMPANIA NEL BASSO MEDIOEVO 148
ALESSANDRA MOLINARI | VALERIA BEOLCHINI | ILARIA DE LUCA | CHIARA DE SANTIS
EMANUELA FRESI | LAURA ORLANDI | GIORGIO RASCAGLIA | MARCO RICCI | JACOPO RUSSO
13. STILI DI VITA, PRODUZIONI E SCAMBI: LA CITTÀ DI ROMA A CONFRONTO CON ALTRI SITI DEL LAZIO. SECOLI IX-XV 158
SILVINA SILVÉRIO | ELISABETE BARRADAS
14. A CERÂMICA MEDIEVAL E TARDO-MEDIEVAL NA BEIRA INTERIOR: MATERIAIS PROVENIENTES DOS CASTELOS DE CASTELO NOVO E PENAMACOR (SÉCS. XII – XVI) 180
ISABEL MARIA FERNANDES
15. A CERÂMICA E SEU USO EM PORTUGAL, A PARTIR DE POSTURAS, TAXAS E REGIMENTOS DE OLEIROS (SÉC. XII A XVIII): A ANÁLISE DE ALGUMAS PEÇAS 188
MARGHERITA FERRI | CECILIA MOINE | LARA SABBIONESI
16. THE SOUND OF SILENCE. SCRATCHED MARKS ON LATE MEDIEVAL AND EARLY MODERN POTTERY FROM NUNNERIES: PRACTICE AND SIGNIFICANCE 203

	HENRI AMOURIC LUCY VALLAURI	
17.	LA VIE DE CHÂTEAU D'UN VAISSELIER : ROQUEVAIRE PRÈS MARSEILLE, 1593	215
	ALEXANDRA GASPAR ANA GOMES	
18.	RECIPIENTES DE MEDIDAS DA CIDADE DE LISBOA	229
	ANDREIA AREZES	
19.	FORMAS CERÂMICAS E SEU SIGNIFICADO SIMBÓLICO NA ALTA IDADE MÉDIA	236
	VICTORIA AMORÓS RUIZ	
20.	LA ESTRATIGRAFÍA COMO HERRAMIENTA	242
	CRISTINA CAMACHO CRUZ	
21.	CANDILES DE PIQUERA. USO Y MORFOLOGÍA EN LA CÓRDOBA DEL SIGLO X	248
	SARA ALMEIDA ALEXANDRE VALINHO JOÃO NUNO MARQUES	
22.	CONJUNTO MEDIEVAL CERÂMICO NO CONTEXTO DA LINHA DE MURALHA DE CACELA VELHA (PORTUGAL)	253
	SILVINA SILVÉRIO ELISABETE BARRADAS	
23.	OCUPAÇÃO ISLÂMICA NA VERTENTE SUDOESTE DA VÁRZEA DE ALJEZUR – O SÍTIO DA BARRADA E A ENVOLVENTE DA IGREJA MATRIZ DE N. SRA. DA ALVA	257
	MARIA JOÃO DE SOUSA	
24.	UMA HABITAÇÃO DO SÉCULO XI/XII SOB A MURALHA DO CASTELO DOS MOUROS DE SINTRA – EVIDÊNCIAS ARQUEOLÓGICAS DE UM CONTEXTO DOMÉSTICO	262
	MANUEL JESÚS LINARES LOSA	
25.	UN NUEVO LOTE CERÁMICO DEL POBLADO FORTIFICADO MEDIEVAL DE “EL CASTILLEJO” (LOS GUÁJARES, GRANADA). LA CASA 7	266
	MARIA INÊS RAIMUNDO VANESSA DIAS	
26.	AL-MADAN E O SEU CONTEXTO NA PENÍNSULA IBÉRICA	271
	VANESSA FILIPE CLEMENTINO AMARO	
27.	CASTLE OF TORRES VEDRAS. ARCHAEOLOGICAL PERSPECTIVES ON A MEDIEVAL CONTEXT	275
	ALBERTO GARCÍA PORRAS MANUEL JESÚS LINARES LOSA MOISÉS ALONSO VALLADARES LAURA MARTÍN RAMOS	
28.	DE CASTILLO FRONTERIZO NAZARÍ A FORTALEZA CASTELLANA. LOS MATERIALES CERÁMICOS DEL ENTORNO DE LA TORRE DEL HOMENAJE DEL CASTILLO DE MOCLÍN (GRANADA)	279
	PILAR LAFUENTE IBÁÑEZ	
29.	CERÁMICA MUDÉJAR SEVILLANA HALLADA EN LA EXCAVACIÓN DEL SOLAR Nº 16 DE LA CALLE CERVANTES DE CORIA DEL RÍO (SEVILLA, ESPAÑA). LOS MATERIALES DEL POZO B	285
	SARA ALMEIDA SUSANA TEMUDO	
30.	CERÂMICA DO SÉCULO XIII, NO CONTEXTO DO BAIRRO JUDAICO DE COIMBRA (PORTUGAL)	291
	TÂNIA MANUEL CASIMIRO TELMO SILVA DÁRIO NEVES CAROLINA SANTOS*	
31.	CERÁMICAS MEDIEVAIS DA RUA DA CORREDOURA (ÉVORA)	298
	ALBERTO LÓPEZ MULLOR	
32.	LA CERÁMICA DEL MAS MONTGRÒS, EL BRULL (BARCELONA), SIGLOS XI-XV	303
	ANTÓNIO MANUEL S. P. SILVA MANUELA C. S. RIBEIRO	
33.	CERÁMICAS MEDIEVAIS (SÉCS. IX-XII) DO CASTELO DE AROUCA (N. PORTUGAL)	310
	M. CARMEN RIU DE MARTÍN	
34.	LADRILLEROS BARCELONESES DE LA PRIMERA MITAD DEL SIGLO XV	318
	ALEXANDRA GASPAR ANA GOMES	
35.	CERÁMICAS PINTADAS A BRANCO DO SÉCULO XV/XVI ENCONTRADAS NO CASTELO DE S. JORGE, LISBOA, PORTUGAL	326
	LUÍS SERRÃO GIL	
36.	ENTRE TACHOS E PANELAS: CERÂMICA MEDIEVAL DO SILO DO CASTELO DE PORTO DE MÓS	333

- MARIA RAFFAELLA CATALDO
37. CERAMICA RIVESTITA DAL CASTELLO DI CIRCELLO (BENEVENTO) 340
- GONÇALO LOPES | JOSÉ RUI SANTOS
38. CERÂMICAS ISLÂMICAS DA NATATIO DAS TERMAS ROMANAS DE ÉVORA 346
- MARIA JOSÉ GONÇALVES
39. CONTRIBUTO PARA O ESTUDO DOS UTENSÍLIOS DO QUOTIDIANO DE UM ARRABALDE ISLÂMICO DE SILVES: A CERÂMICA DECORADA A VERDE E MANGANÊS 353

TEMA: 2

CERÂMICA E ALIMENTAÇÃO

POTTERY AND FOOD

- JOANITA VROOM
40. THE ARCHAEOLOGY OF CONSUMPTION IN THE EASTERN MEDITERRANEAN: A CERAMIC PERSPECTIVE 359
- F. CANTINI | S. G. BUONINCONTRI | B. FATIGHENTI
41. CERAMICA E ALIMENTAZIONE NEL MEDIO VALDARNO INFERIORE MEDIEVALE: IL CASO DI SAN GENESIO (SAN MINIATO-PI) 368
- JAQUELINA COVANEIRO | SANDRA CAVACO
42. ENTRE TACHOS E PANELOS: A EVOLUÇÃO DAS FORMAS DE COZINHA (TAVIRA) 377
- JUAN ZOZAYA
43. CACHARROS, FUEGOS, COMIDAS, SERVICIOS, ESCRITURAS... 387
- TÂNIA MANUEL CASIMIRO | LUÍS DE BARROS
44. DE QUEM SÃO ESTAS OLLAS? COMER, BEBER, ARMAZENAR EM ALMADA NO SÉCULO XIII 392

TEMA: 3

O MEDITERRÂNEO E O ATLÂNTICO

THE MEDITERRANEAN AND THE ATLANTIC

- ANTÓNIO MANUEL S. P. SILVA | PEDRO PEREIRA | TERESA P. CARVALHO
45. CONJUNTOS CERÂMICOS DO CASTELO DE CRESTUMA (VILA NOVA DE GAIA, N. PORTUGAL). PRIMEIROS ELEMENTOS PARA UMA SEQUÊNCIA LONGA (SÉCS. IV-XI) 401
- JORGE DE JUAN ARES | YASMINA CÁCERES GUTIÉRREZ | MARÍA DEL CRISTO GONZÁLEZ MARRERO | MIGUEL ÁNGEL HERVÁS HERRERA | JORGE ONRUBIA PINTADO
46. OBJETOS PARA UN ESPACIO Y UN TIEMPO DE FRONTERA: EL MATERIAL CERÁMICO DE FUM ASACA EN SBUYA, PROVINCIA DE SIDI IFNI, MARRUECOS (SS. XV-XVI) 420
- HUGO BLAKE | MICHAEL J. HUGHES
47. THE MEDITERRANEAN AND THE ATLANTIC ARCHAOMETRICAL RESEARCH ON THE PROVENANCE OF 'MEDITERRANEAN MAIOLICA' AND ITALIAN POTTERY FOUND IN GREAT BRITAIN 432
- HENRI AMOURIC | GUERGANA GUIONOVA | LUCY VALLAURI
48. CÉRAMIQUES AUX ÎLES D'AMÉRIQUE. LA PART DE LA MÉDITERRANÉE (XVIIIE-XIXE S.) 440
- RODRIGO BANHA DA SILVA | ADRIAN DE MAN
49. PALÁCIO DOS CONDES DE PENAFIEL: A SIGNIFICANT LATE ANTIQUE CONTEXT FROM LISBON 455
- MARCO LIBERATO | HELENA SANTOS
50. CIRCULAÇÃO DE MATERIAIS SETENTRIONAIS NA SANTARÉM MEDIEVAL 461
- MIGUEL BUSTO ZAPICO | JOSÉ AVELINO GUTIÉRREZ GONZÁLEZ | ROGELIO ESTRADA GARCÍA
51. LAS LOZAS DE LA CASA CARBAJAL SOLÍS, PUNTO DE ENCUENTRO ENTRE EL MEDITERRÂNEO Y EL NORTE DE EUROPA 466
- ARMANDO SABROSA† | INÊS PINTO COELHO | JACINTA BUGALHÃO
52. AS PORCELANAS DA SÉ DA CIDADE VELHA, ILHA DE SANTIAGO, CABO VERDE 473

TEMA: 4
EVOLUÇÃO E TRANSFERÊNCIA DAS TÉCNICAS
EVOLUTION AND TRANSFER OF TECHNIQUES

- JOAN NEGRE PÉREZ
53. PRODUCCIONES CERÁMICAS EN EL DISTRITO DE ȚURȚUȘA ENTRE LA ANTIGÜEDAD TARDÍA Y EL MUNDO ISLÁMICO (SIGLOS VI-XII) 483
- KONSTANTINOS T. RAPTIS
54. BRICK AND TILE PRODUCING WORKSHOPS IN THE OUTSKIRTS OF THESSALONIKI FROM FIFTH TO FIFTEENTH CENTURY: A STUDY OF THE FIRING TECHNOLOGY THAT HAS BEEN DIACHRONICALLY APPLIED IN THE CERAMIC WORKSHOPS OF A LARGE BYZANTINE URBAN CENTER 493
- LÍDIA FERNANDES | JOÃO COROADO | MARCO CALADO | CHIARA COSTANTINO
55. OCUPAÇÃO MEDIEVAL ISLÂMICA NO MUSEU DE LISBOA -TEATRO ROMANO DE LISBOA: O CASO DO APROVEITAMENTO DO *POST SCAENIUM* NO DECURSO DO SÉCULO XII 509
- ROSALIND A WADE HADDON
56. WHAT WAS COOKING IN ALEPPO IN THE TWELFTH AND THIRTEENTH CENTURIES? 519
- IBRAHIM SHADDOUD
57. PRODUCTION DE POTERIE CHEZ LES NIZARITES DE SYRIE : L'ATELIER DE MASSYAF (MILIEU XII^e-PREMIER TIERS DU XIV^e SIÈCLE) 525
- SERGIO ESCRIBANO-RUIZ | JOSE LUIS SOLAUN BUSTINZA
58. LA INTRODUCCIÓN Y NORMALIZACIÓN DE LA CERÁMICA VIDRIADA EN EL CANTÁBRICO ORIENTAL A LA LUZ DEL REGISTRO CERÁMICO DE VITORIA-GASTEIZ (SIGLOS XII-XV) 534
- JAUME COLL CONESA | JOSEP PÉREZ CAMPS | MARTA CAROSCIO | JUDIT MOLERA
TRINITAT PRADELL | GLÓRIA MOLINA
59. ARQUEOLOGÍA, ARQUEOMETRÍA Y CADENAS OPERATIVAS DE LA CERÁMICA DE MANISES LOCALIZADA EN EL SOLAR FÁBRICAS Nº 1 (BARRI D'OBRADORS, MANISES, CAMPAÑA 2011) 549
- JACQUES THIRIOT | DAVID OLLIVIER | VÉRONIQUE RINALDUCCI
60. FOUILLER LES ENCYCLOPÉDISTES : TRANSFERT DE MODÈLES AUX ANTILLES FRANÇAISES 560
- ELENA SALINAS | JUAN ZOZAYA
61. PECHINA: EL ANTECEDENTE DE LAS CERÁMICAS VIDRIADAS ISLÁMICAS EN AL-ANDALUS 573
- GUERGANA GUIONOVA | ROCCO RANTE
62. APERÇU SUR LA PRODUCTION DES ATELIERS DE PAYKEND, OASIS DE BUKHARA, OUZBÉKISTAN 577
- KRINO P. KONSTANTINIDOU | KONSTANTINOS T. RAPTIS
63. ARCHAEOLOGICAL EVIDENCE OF AN ELEVENTH-CENTURY KILN WITH RODS IN THESSALONIKI 589
- LAURA APARICIO SÁNCHEZ
64. EL ALFAR CORDOBÉS DE OLLERÍAS Y SUS PRODUCCIONES (SIGLOS XII-XIII) 596
- SERGEY BOCHAROV | ANDREY MASLOWSKIY
65. THE EASTERN CRIMEAN CENTERS OF GLAZE POTTERY PRODUCTION IN 13TH AND 14TH CENTURIES 604
- JAUME COLL CONESA | CLODOALDO ROLDÁN GARCÍA
66. COMPOSICIÓN DEL PIGMENTO DE COBALTO Y CRONOLOGÍA DE LA AZULEJERÍA MEDIEVAL DE MANISES (VALENCIA) CONSERVADA EN EL MUSEO NACIONAL DE CERÁMICA 608
- JULIA BELTRÁN DE HEREDIA BERCERO | CLAUDIO CAPELLI | ROBERTA DI FEBO
MARISOL MADRID I FERNÁNDEZ | ROBERTA DI FEBO | JAUME BUXEDA I GARRIGÓS
67. IMITACIONES DE CERÁMICAS À TACHES NOIRES EN BARCELONA EN EL S. XVIII. DATOS ARQUEOLÓGICOS Y ARQUEOMÉTRICOS 613
- ANNA RIDOVICS | BERNADETT BAJNÓCZI | GÉZA NAGY | MÁRIA TÓTH
68. THE TRANSFER OF THE TIN-GLAZED FAIENCE TECHNOLOGY BY HUTTERITE ANABAPTISTS TO EAST-CENTRAL EUROPE DURING 16TH AND 17TH CENTURIES 619

TEMA: 5

CERÂMICA E COMÉRCIO

CERAMICS AND TRADING

YASEMIN BAGCI VROOM

69. A NEW LOOK ON MEDIEVAL CERAMICS FROM THE OLD GÖZLÜKULE EXCAVATIONS: A PRELIMINARY PRESENTATION 627

EVELINA TODOROVA

70. POLICY AND TRADE IN THE NORTHERN PERIPHERY OF THE EASTERN MEDITERRANEAN: AMPHORA EVIDENCE FROM PRESENT-DAY BULGARIA (7TH-14TH CENTURIES) 637

ISABEL CRISTINA FERNANDES | CLAIRE DÉLÉRY | SUSANA GÓMEZ | MARIA JOSÉ GONÇALVES | ISABEL INÁCIO | CONSTANÇA DOS SANTOS | CATARINA COELHO
MARCÓ LIBERATO | ANA SOFIA GOMES | JÁCINTA BUGALHÃO | HELENA CATARINO
SANDRA CAVACO | JAQUELINA COVANEIRO

71. O COMÉRCIO DA CORDA SECA NO GHARB AL-ANDALUS 649

CLAUDIO FILIPPO MANGIARACINA

72. LA SICILIA ISLAMICA: PRODUZIONE, CIRCOLAZIONE E CONSUMO DI CERAMICA (IX-PIENO XI SECOLO) 667

GUERGANA GUIONOVA

73. CÉRAMIQUE D'IMPORTATION DU XIVE AU XVIIIE S. EN BULGARIE 681

INÉS M^ª CENTENO CEA | ÁNGEL L. PALOMINO LÁZARO | MANUEL MORATINOS GARCÍA
M^ª J. NEGREDO GARCÍA | J.E. SANTAMARÍA GONZÁLEZ

74. CERÂMICA DE COCINA RUGOSA DE PASTAS CLARAS/CAMPURRIANA VERSUS CERÂMICA GRANÍTICA/ZAMORANA. PATRONES DE DISTRIBUCIÓN Y EXPANSIÓN EN ÉPOCA BAJOMEDIEVAL Y EN LA TRANSICIÓN A LA EDAD MODERNA EN EL NORTE DE CASTILLA Y LEÓN 692

VASSILEIOS D. KOROSIS

75. CONSUMPTION AND IMPORTATION OF CERAMICS IN A FAIRLY UNKNOWN SITE OF LATE ROMAN GREECE. A CASE STUDY FROM MEGARA, ATTICA, GREECE 701

NATALIA GUINKUT | VICTOR LEBEDINSKI | JULIA PRONINA

76. MEDIEVAL AMPHORAE FROM SHIPWRECKS NEAR CHERSONES TAURICA 707

VICTOR FILIPE | MARCO CALADO | SANDRA GUERRA | ANTÓNIO VALONGO
JOÃO LEÓNIDAS | ROMÃO RAMOS | MARGARIDA ROCHA | JACINTA COSTA | NATALIA GINKUT

77. A CERÂMICA DE IMPORTAÇÃO NO ARRABALDE OCIDENTAL DE LUXBUNA (LISBOA). DADOS PRELIMINARES DA INTERVENÇÃO REALIZADA NO HOTEL DE SANTA JUSTA 711

SYLVIE YONA WAKSMAN

78. LATE MEDIEVAL POTTERY PRODUCTION IN SOUTH WESTERN CRIMEA: LABORATORY INVESTIGATIONS OF CERAMICS FROM CEMBALO (REGION OF SEBASTOPOL / CHERSONESOS)* 719

RAFFAELLA CARTA

79. LA CERAMICA ITALIANA INDICATORE DEL COMMERCIO TRA IL MEDITERRANEO OCCIDENTALE E L'ATLANTICO (SECOLI XV-XVII) 724

JULIA BELTRÁN DE HEREDIA BERCERO | NÚRIA MIRÓ I ALAIX

80. BARCELONA Y EL COMERCIO INTERIOR DE CERÂMICA EN EL SIGLO XVII Y PRINCIPIOS DEL XVIII: VILAFRANCA DEL PENEDÉS (BARCELONA), TERUEL, VILLAFELICHE Y MUEL (ZARAGOZA), VALENCIA, TALAVERA DE LA REINA (TOLEDO), SEVILLA Y PORTUGAL 729

TEMA: 6

NOVAS DESCOBERTAS

NEW DISCOVERIES

RICARDO COSTEIRA DA SILVA

81. MEDIEVAL POTTERY FROM THE FORUM OF AEMINIUM (COIMBRA, PORTUGAL) : A PROPOSAL OF CHRONO-TYOLOGICAL EVOLUTION 739

	ABDALLAH FILI	
82.	LE DÉCOR DE LA CÉRAMIQUE DE FÈS À L'ÉPOQUE MÉRINIDE, TYPOLOGIE ET STATISTIQUES	750
	SOPHIE GILOTTE YASMINA CÁCERES GUTIÉRREZ JORGE DE JUAN ARES	
83.	UN AJUAR DE ÉPOCA ALMORÁVIDE PROCEDENTE DE ALBALAT (CÁCERES, EXTREMADURA)	763
	MARCO LIBERATO	
84.	A PINTURA A BRANCO NA SANTARÉM MEDIEVAL. SÉCULOS XI A XVI	777
	THIERRY JULLIEN MOHAMED KBIRI ALAOU VIRGINIE BRIDOUX ABDELFATTAH ICHKHAKH EMELINE GRISONI CÉLINE BRUN SÉVERINE LECLERCQ HICHAM HASSINI HALIMA NAJI	
85.	LES CÉRAMIQUES MÉRINIDES DE KOUASS (ASILAH-BRIECH, MAROC)	792
	ELVANA METALLA	
86.	LA CÉRAMIQUE MÉDIÉVALE EN ALBANIE : RELATIONS ENTRE LES PRODUCTIONS BYZANTINES ET ITALIENNES	807
	ANDRÉ TEIXEIRA AZZEDDINE KARRA PATRÍCIA CARVALHO	
87.	LA CÉRAMIQUE MÉDIÉVALE D'AZEMMOUR (MAROC) : DONNÉES PRÉLIMINAIRES SUR DES VESTIGES DE PRODUCTION POTIÈRE	819
	EBRU FATMA FINDIK	
88.	MEDIEVAL GLAZED CERAMICS FROM MYRA AND NEW RESULTS	831
	SERGEY BOCHAROV ANDREY MASLOWSKIY AIRAT SITDIKOV	
89.	THE KASHI POTTERY IN THE WESTERN REGIONS OF GOLDEN HORDE	840
	ÉLVIO DUARTE MARTINS SOUSA FERNANDO CASTRO	
90.	NOVOS DADOS QUÍMICOS DE FORMAS DE PÃO-DE AÇÚCAR PRODUZIDAS EM PORTUGAL: SÉCULOS XV A XVI	846
	ALEXANDRA GASPAR ANA GOMES	
91.	CERÂMICAS COMUNS DA ANTIGUIDADE TARDIA PROVENIENTES DO CLAUSTRO DA SÉ DE LISBOA – PORTUGAL	851
	M ^{re} TERESA XIMÉNEZ DE EMBÚN SÁNCHEZ	
92.	TIPOS Y CONTEXTOS CERÁMICOS EN EL YACIMIENTO EMIRAL DEL CABEZO PARDO (SAN ISIDRO, ALICANTE). UNA BREVE REFLEXIÓN SOBRE LA CULTURA MATERIAL EN EL SE PENINSULAR	861
	CRISTINA GONZALEZ	
93.	QUINTA DA GRANJA 1: CERÂMICA EMIRAL DE UM POVOADO DA ÉSTREMADURA	866
	DÉBORA MARCELA KISS	
94.	LA CERÁMICA DEL TOSSAL DEL MORO (BENILLOBA, ALACANT). PRIMEROS RESULTADOS DEL ESTUDIO DE LOS FONDOS DEPOSITADOS EN EL CENTRE D'ESTUDIS CONTESTANS	875
	CRISTINA GARCIA PATRÍCIA DORES CATARINA OLIVEIRA MIGUEL GODINHO	
95.	TIPOLOGIA E FUNCIONALIDADE NAS CERÂMICAS DA CASA I DO BAIRRO ISLÂMICO DO POÇO ANTIGO EM CACELA-A-VELHA	882
	MANUEL RETUERCE VELASCO MANUEL MELERO SERRANO	
96.	AZULEJOS ALMOHADES VIDRIADOS A MOLDE DE CALATRAVA LA VIEJA (1195-1212)	887
	ANA CRISTINA RAMOS MIGUEL SERRA	
97.	NOVOS DADOS SOBRE HALQAL-ZAWIYA (LAGOS, PORTUGAL)	893
	KAREN ÁLVARO M. DOLORES LÓPEZ ESTHER TRAVÉ	
98.	UNA NUEVA CONTRIBUCIÓN AL ESTUDIO DE LA LOZA BARCELONESA DECORADA EN VERDE Y MANGANESO	900
	CARLOS BOAVIDA	
99.	MEDIEVAL POTTERY FROM THE CASTLE OF CASTELO BRANCO (PORTUGAL)	906
	FRANCISCO MELERO GARCÍA	
100.	POTTERY OF THE NASRID PERIOD OF CÁRTAMA (MÁLAGA)	912

CONSTANÇA GUIMARÃES DOS SANTOS | ELISA ALBUQUERQUE

101. A CAPELA DE SÃO PEDRO DA CAPINHA ATRAVÉS DOS MATERIAIS: A CERÂMICA MEDIEVAL 917

RICARDO COSTEIRA DA SILVA

102. "TRAÇOS MOURISCOS" NA CERÂMICA DO SÉCULO XV DO ANTIGO PAÇO EPISCOPAL DE COIMBRA
(MUSEU NACIONAL DE MACHADO DE CASTRO) 924

IRYNA TESLENKO

103. CRIMEAN LOCAL GLAZED POTTERY OF THE 15TH CENTURY 928

MARIA JOSÉ GONÇALVES

104. CERÂMICA EM CORDA SECA DE UM ARRABALDE ISLÂMICO DE SILVES: CONTRIBUTO PARA O SEU ESTUDO 934

TEMA: 5

CERÂMICA E COMÉRCIO
CERAMICS AND TRADING

LATE MEDIEVAL POTTERY PRODUCTION IN SOUTH WESTERN CRIMEA: LABORATORY INVESTIGATIONS OF CERAMICS FROM CEMBALO (REGION OF SEBASTOPOL / CHERSONESOS)*

Abstract: Evidence of pottery manufacture in the late medieval period in the Genoese fortress of Cembalo (Balaklava, Crimea) gave the opportunity to define a new chemical reference group and to reconsider pottery production in South Western Crimea, in the region of Chersonesos.

Résumé: Les vestiges d'ateliers de potiers datés de la fin de la période médiévale mis au jour par les fouilles de la forteresse génoise de Cembalo (Balaklava, Crimée) ont donné la possibilité de définir un nouveau groupe de référence chimique et de reconsidérer les productions de céramiques du Sud Ouest de la Crimée, dans la région de Chersonèse.

Recent excavations carried out by the National Preserve of Tauric Chersonesos in the Genoese fortress of Cembalo (Balaklava, district of Sebastopol, Crimea) provided evidence of glazed pottery production dated back to the second half of the 14th - 15th centuries (Ginkut, 2012). These finds give the opportunity to reconsider the question of pottery production in the region of Chersonesos in the late medieval period, as part of more extensive research on local and imported pottery in the Crimea in the framework of a French-Ukrainian “Dnipro” program¹.

Chemical analyses carried out at the “Laboratoire de Céramologie” in Lyon were used to investigate ceramics productions. The definition of a new chemical reference group, based on the analysis of kiln furniture and unfinished wares from Cembalo, would give a new perspective on previous data on Crimean material, and especially on ceramics found in Chersonesos (Waksman and François, 2004-2005; Waksman and Romantchuk, 2007). For the latter, we could not rely on reference material *stricto sensu*, but used specific categories of amphorae (Sazanov *et al.*, 1995; Sazanov, 1997: type 56), tiles and common wares assumed to be local as potential local references.

SAMPLING

Reference samples for Cembalo consisted of tripod stilts (BZY166-168) and biscuit fired wares (BZY159-165, Fig.1 top left). The sampling also included a range of finished products (BZY169-187), several of which were found together with their unfinished counterpart (Fig.1 middle left and bottom right). Samples presented various techniques of decoration: plain glazed wares (BZY178-179, Fig.1 top right), monochrome and polychrome sgraffito wares (BZY169-177, 180, 184-187, Fig.1), slip painted wares (BZY181-184, Fig.1 bottom right) sometimes associated with notches (BZY181-182). Two examples presenting the same monogram (BZY186-187, Fig.1 middle right) were included in the sampling as well (BZY186: Mytz 2005, p.303 fig.7).

Samples previously analyzed from Chersonesos are presented elsewhere (BYZ295-300, 310-330, 334, 357, 361-366, 368: Waksman and Romantchuk 2007). They included table wares with styles and techniques of decoration fairly similar to Cembalo's examples, together with fragments of amphorae, tiles, common wares and a fishing net weight (BYZ357, 361-366, 368) taken as potential representatives of the local production. The latter point was justified by the close chemical features of these different functional categories (Waksman and Romantchuk, 2007). Furthermore, the particularly fine texture of the amphorae and common wares fabric made them suitable as comparative material for table wares. This feature was true to a lesser extent for the tiles and fishing net weight, and is not the general case, as different raw material are commonly used at a given production site to manufacture different categories of wares.

CHEMICAL ANALYSIS AND CLASSIFICATION OF SAMPLES ACCORDING TO CHEMICAL COMPOSITION

Chemical analysis of the samples was carried out by Wavelength Dispersive - X Ray Fluorescence (WD-XRF) at the “Laboratoire de Céramologie” in Lyon (e.g. Waksman, 2011). Twenty-four elements are quantified, seventeen of which are usually taken as active variables in multivariate statistical treatments used to classify ceramics into groups of similar chemical composition. These include eight major and minor elements in ceramics (MgO, Al₂O₃, SiO₂, K₂O, CaO, TiO₂, MnO, Fe₂O₃) and nine trace elements (V, Cr, Ni, Zn, Rb, Sr, Zr, Ba, Ce).

Classification of samples was obtained by hierarchical clustering analysis applied to standardized data, using euclidean distance and average linkage (e.g. Picon, 1984). The corresponding diagram, called a dendrogram, initially represents each sample as a vertical bar at the bottom of the figure (Fig.2). The two samples the most alike in elemental composition are connected by a horizontal link, which

* With the collaboration

¹ This project is directed by I. Teslenko (Academy of Science of Ukraine) and S.Y. Waksman (CNRS). The support of the French Ministry of National Education, the French Ministry of Higher Education and Research and the State Agency for the Problems of Science, Innovation, and Informatization of Ukraine is gratefully acknowledged.

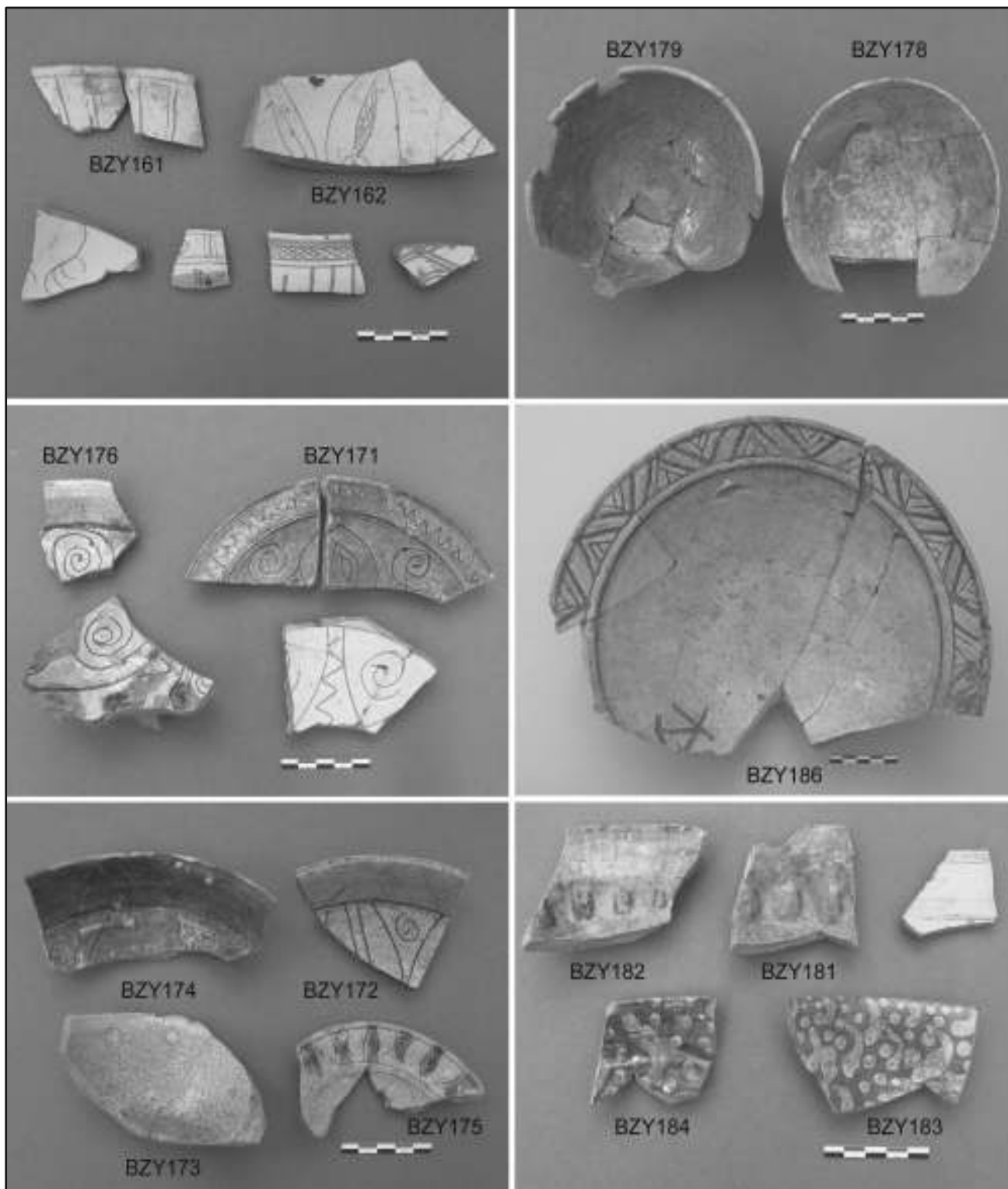


Fig.1 Examples of ceramics analyzed from Cembalo, some shown with their unfinished counterpart: top left, middle left (bottom right), bottom right (top right).

lies all the lower as the samples are chemically similar. The two samples are then fused into a “pseudo sample” of average composition. The same process is repeated, with the linkage being formed at growing heights, until all the samples are connected. The resulting diagram constitutes the dendrogram. It shows clusters of samples of similar composition linked at a lower level, all the clusters being

ultimately linked together at the top of the diagram. This representation is however not sufficient in itself to define compositional groups, as it does not take into account the significance of elemental differences between clusters. Further examination of the raw data is still needed in order to be able to interpret classifications in terms of pottery productions and workshops (Picon, 1993).

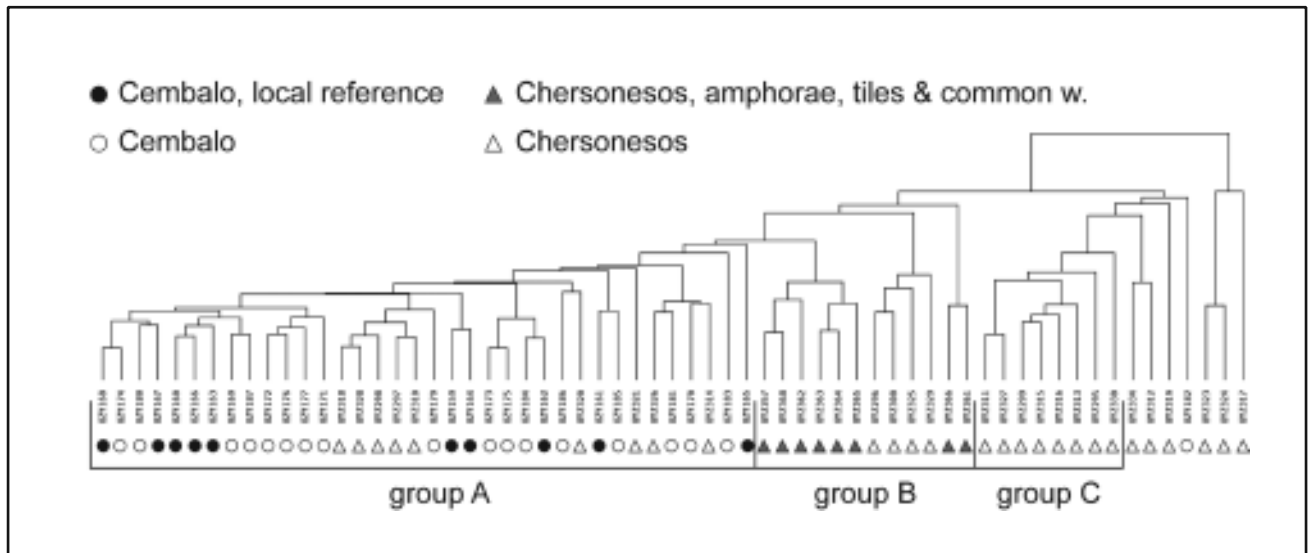


Fig.2 Classification according to chemical compositions of ceramics found in Cembalo and Chersonesos. Symbols indicate sites, point out local references, or indicate amphorae, tiles and common wares in the case of Chersonesos. The main chemical group (A) and sub-groups (B, C) are underlined.

RESULTS

The classification (Fig.2) does not show well differentiated groups. It consists of a main group, two smaller structures and a number of marginal samples which appear on the right hand side of the figure. The main group (group A) gathers some samples from Chersonesos and all those from Cembalo except one, including the local references (indicated by black dots in figure 2). The structure indicated as “group B” is distinguished from group A by its lower contents of manganese and strontium (Fig.3). These elements are usually not considered discriminant, especially as they may be affected by pollutions (e.g. Picon, 1987)². However, the fact that this group gathers all the amphorae, common wares, etc. likely to represent Chersonesos products (indicated by grey triangles in figure 2), together with some of the glazed wares, may be significant. Another possible structure (group C) is characterized by lower manganese and higher magnesium contents, compared to group A (Fig.3). It includes samples found in Chersonesos, but ongoing research suggests that it shares chemical features with wares from other sites as well, related to “Caffa style”. The binary plot magnesium - manganese (Fig.4) shows some features distinguishing the three structures, together with samples marginals to each of them.

All three groups may correspond to pottery manufactured with clays taken from the same geological formations, whose chemical composition would slightly differ from one location to another. In the case of Cembalo and Chersonesos, related to groups A and B respectively, it is very likely the case given the close proximity of the two sites. Furthermore,

archaeological evidence for pottery production in the region of Chersonesos in the late medieval period was found in the outskirts of the city, closer to Cembalo, rather than in the city itself. Ceramics from Chersonesos previously considered local (Waksman and Romantchuk, 2007) should rather be attributed to “the region of Chersonesos”, including Cembalo.

Similar geological formations occur in a large part of the Crimea, where they reach the southern coast in the regions of Sebastopol / Chersonesos and of Feodosia / Caffa³. Whether group C could correspond to the products of Caffa would request further research. In any case, these features call for caution in the attribution of ceramic manufactured in sites located within or close to these geological contexts.

CONCLUDING REMARKS

Laboratory investigations of late medieval ceramics, including wasters, excavated in the Genoese fortress of Cembalo (Crimea) made it possible to propose a new chemical reference for the region. The clay material used in Cembalo may however not be very different from the one used in other workshops, located in the same area of Sebastopol / Chersonesos in South Western Crimea, or in other areas sharing similar geological features such as the region of Caffa. Our results also gave the opportunity to reconsider previous attribution to late medieval Chersonesos, and to propose instead an attribution to the “region of Chersonesos”, including Cembalo. They are consistent with archaeological evidence, pointing out the development of more rural workshops in the area at that time.

² but the ratio Ca/Sr may be significant (Waksman 1995, Schneider and Japp 2009).

³ Detailed geological information on the Crimea was however not available to us. We would like to thank Dr. Grytsenko (Department of geology, Kiev National Taras Shevchenko University) for giving us the opportunity to take pictures of a geological map of the Crimea (scale 1/200.000, 1984).

id.	CaO	Fe ₂ O ₃	TiO ₂	K ₂ O	SiO ₂	Al ₂ O ₃	MgO	MnO	(Na ₂ O)	(P ₂ O ₅)	Zr	Sr	Rb	Zn	Cr	Ni	Ba	V	(Ce)
groupe A																			
BZY168	6.61	7.31	0.815	3.63	57.48	20.69	1.99	0.1541	0.76	0.16	164	239	174	134	117	76	425	161	98
BZY174	6.45	7.19	0.813	3.60	57.57	20.69	2.03	0.1474	0.86	0.12	163	222	175	133	119	75	422	169	95
BZY180	6.47	7.29	0.821	3.63	57.59	20.83	2.04	0.1361	0.78	0.17	159	232	177	134	117	85	432	166	108
BZY167	7.27	7.28	0.807	3.62	56.92	20.55	2.09	0.1538	0.96	0.17	162	232	172	135	112	80	475	160	104
BZY160	6.98	7.45	0.812	3.67	56.74	20.88	2.03	0.1410	0.84	0.27	156	231	174	143	120	80	426	150	98
BZY166	6.57	7.36	0.819	3.57	57.25	20.98	2.09	0.1335	0.88	0.09	160	226	178	144	119	85	416	155	93
BZY163	6.62	7.45	0.815	3.46	57.05	20.92	2.10	0.1488	1.09	0.11	158	226	173	142	115	78	449	142	101
BZY169	8.12	7.44	0.805	3.56	56.44	20.35	2.00	0.1560	0.82	0.12	157	250	171	136	117	80	428	157	90
BZY187	7.05	7.34	0.813	3.61	56.93	20.94	2.04	0.1367	0.74	0.17	155	242	178	136	117	78	439	162	90
BZY172	6.56	7.48	0.818	3.68	57.11	20.87	2.03	0.1655	0.95	0.12	161	228	181	136	118	82	418	170	94
BZY176	6.44	7.50	0.819	3.68	57.08	21.06	2.06	0.1609	0.82	0.13	160	228	180	130	120	86	444	158	87
BZY177	6.00	7.48	0.813	3.64	57.29	20.99	2.02	0.1492	0.90	0.11	161	212	174	138	124	80	390	164	93
BZY171	5.20	7.37	0.818	3.71	58.63	20.73	2.07	0.1829	0.95	0.11	163	215	174	132	122	83	491	168	98
BYZ318	6.76	7.37	0.815	3.80	56.33	21.24	2.08	0.1441	1.09	0.13	161	232	186	137	120	88	440	171	82
BYZ328	6.95	7.31	0.807	3.76	56.26	21.15	2.02	0.1456	1.19	0.12	162	228	182	128	120	87	452	175	86
BYZ298	7.01	7.36	0.811	3.71	56.00	21.11	2.10	0.1400	1.34	0.15	159	232	176	140	121	87	440	176	92
BYZ297	6.68	7.38	0.820	3.79	56.35	21.14	2.07	0.1371	1.30	0.15	166	236	182	127	114	87	432	175	87
BYZ310	7.32	7.38	0.812	3.71	56.32	20.99	2.00	0.1461	1.01	0.12	165	245	181	131	114	89	421	166	94
BZY179	6.48	7.36	0.815	3.68	57.20	21.00	2.01	0.1570	0.86	0.11	161	224	179	126	118	98	427	165	93
BZY159	6.62	7.46	0.820	3.52	57.05	20.71	2.10	0.1992	1.16	0.12	163	234	173	139	118	94	423	153	95
BZY164	6.28	7.62	0.819	3.40	57.17	21.00	2.08	0.1684	1.04	0.22	160	238	173	140	114	91	417	162	93
BZY173	6.72	7.43	0.814	3.69	57.21	20.69	2.02	0.1804	0.90	0.14	160	232	174	132	117	84	474	164	69
BZY175	6.69	7.44	0.817	3.74	57.20	20.67	1.95	0.1739	0.91	0.16	162	224	175	125	117	81	444	160	65
BZY184	6.98	7.36	0.812	3.56	56.98	20.81	2.02	0.1508	0.86	0.19	160	250	174	137	119	86	429	167	70
BZY162	7.12	7.30	0.808	3.50	56.90	20.73	2.09	0.1417	1.09	0.11	158	233	174	137	125	85	441	164	73
BZY186	7.34	7.30	0.804	3.70	56.52	20.76	2.06	0.1268	0.83	0.34	157	246	174	143	114	77	660	165	90
BYZ320	7.31	7.22	0.799	3.62	55.85	20.82	2.11	0.1405	1.33	0.11	151	222	163	132	117	84	509	185	86
BZY161	8.06	7.24	0.803	3.58	56.51	20.13	2.03	0.1812	1.07	0.20	159	241	170	124	112	86	405	168	111
BZY185	7.58	7.29	0.805	3.49	56.35	20.77	2.04	0.1538	1.17	0.10	156	240	174	140	115	84	434	158	119
BYZ321	6.96	7.31	0.812	3.66	55.98	21.07	2.17	0.1369	1.35	0.10	156	221	176	134	131	88	471	178	96
BYZ326	8.56	7.20	0.786	3.55	55.13	20.68	2.05	0.1443	1.03	0.13	149	218	155	132	113	79	398	166	90
BZY181	8.54	7.11	0.791	3.55	55.80	20.34	2.12	0.1241	1.18	0.11	154	231	164	133	118	85	436	154	82
BZY170	10.10	7.11	0.784	3.46	55.14	20.12	1.98	0.1267	0.79	0.19	154	261	170	121	115	87	474	161	91
BYZ314	9.13	7.23	0.785	3.68	54.97	20.49	2.08	0.1309	1.09	0.12	159	241	174	129	113	84	425	175	80
BZY183	6.20	7.67	0.793	3.57	58.08	19.96	1.95	0.1926	1.03	0.19	164	220	165	120	119	70	440	166	88
BZY165	3.84	7.37	0.840	3.79	59.77	20.99	2.08	0.1710	0.81	0.13	170	184	176	132	123	84	471	171	88
m	6.99	7.35	0.810	3.63	56.81	20.77	2.05	0.1522	0.99	0.15	160	231	174	134	118	84	445	165	91
σ	1.07	0.12	0.011	0.10	0.93	0.30	0.05	0.0188	0.18	0.05	4	13	6	6	4	5	45	8	11
sous-groupe B																			
BYZ357	8.95	7.22	0.810	3.42	55.96	20.58	1.77	0.0793	0.93	0.11	155	164	172	112	113	80	469	172	84
BYZ368	9.67	7.30	0.802	3.29	55.33	20.71	1.79	0.0825	0.76	0.08	153	164	177	116	113	77	524	182	86
BYZ362	8.54	7.03	0.820	3.37	57.40	20.04	1.72	0.0897	0.66	0.13	160	173	172	122	107	78	514	170	82
BYZ363	7.24	7.50	0.792	3.69	56.51	21.25	1.75	0.0867	0.85	0.15	158	164	185	128	114	77	506	176	76
BYZ364	7.50	7.58	0.804	3.61	56.01	21.58	1.77	0.0805	0.74	0.14	154	177	186	126	118	82	493	175	82
BYZ365	7.75	7.49	0.821	3.49	56.06	21.36	1.77	0.0752	0.92	0.11	155	159	180	112	117	79	427	160	84
BYZ296	5.56	7.10	0.847	3.36	58.92	21.11	1.75	0.0584	0.88	0.11	175	170	180	136	114	88	*757	178	84
BYZ300	6.21	7.11	0.849	3.55	58.02	21.22	1.79	0.0511	0.84	0.13	175	174	185	139	117	86	558	186	90
BYZ325	6.20	7.21	0.860	3.22	58.16	21.25	1.78	0.0676	0.79	0.11	177	179	160	129	111	86	*824	176	83
BYZ329	5.89	7.46	0.826	3.68	57.95	21.01	1.88	0.0967	0.75	0.13	175	185	178	128	118	88	739	160	83
BYZ366	6.34	8.03	0.791	3.72	55.39	22.69	1.78	0.0784	0.84	0.14	157	172	197	111	122	85	628	193	89
BYZ361	6.27	7.88	0.797	3.75	55.96	22.13	1.75	0.0864	1.04	0.15	154	158	193	128	126	84	505	186	80
m	7.18	7.41	0.818	3.51	56.81	21.24	1.78	0.0777	0.83	0.13	162	170	180	124	116	83	536	176	84
σ	1.33	0.31	0.023	0.18	1.22	0.69	0.04	0.0131	0.10	0.02	10	8	10	9	5	4	89	10	4
sous-groupe C																			
BYZ311	7.88	6.81	0.778	3.77	57.16	18.94	2.59	0.0820	1.32	0.17	160	231	158	111	111	71	502	144	76
BYZ327	6.94	7.08	0.778	3.85	57.40	19.16	2.56	0.0782	1.35	0.16	162	213	157	111	111	73	534	141	77
BYZ299	5.76	7.13	0.801	4.00	58.39	19.41	2.53	0.0600	1.55	0.15	173	221	179	108	111	75	494	164	84
BYZ315	6.46	6.91	0.801	4.00	58.07	19.24	2.57	0.0461	1.39	0.21	166	212	178	113	115	74	583	158	88
BYZ316	6.25	7.09	0.803	3.97	57.93	19.51	2.59	0.0673	1.39	0.14	172	231	181	113	108	77	662	148	82
BYZ313	6.98	7.08	0.785	3.87	57.90	19.28	2.42	0.0859	1.23	0.15	167	213	177	106	107	76	474	162	80
BYZ295	7.36	6.91	0.788	3.86	57.57	19.16	2.61	0.0802	1.23	0.18	166	*333	173	115	114	72	602	151	86
BYZ330	8.85	7.00	0.761	3.79	56.52	18.97	2.45	0.1060	1.09	0.18									

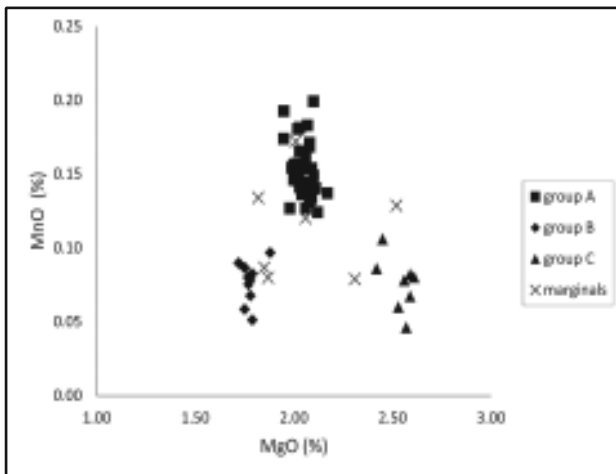


Fig.4 Binary plot magnesium - manganese, showing how the sub-structures groups B and C may be differentiated from each other and from group A. Samples marginal to one or another structure are also shown.

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