

## Sardis Appendix 2 23-04-2020

List of group members and average concentration values, if not already given in the text, of groups formed with the Sardis sample data.

NAA Data of the samples from Sardis published by Kealhofer et al. 2013 are given in the internet at: <https://opencontext.org/projects/cbd24bbb-c6fc-44ed-bd67-6f844f120ad5> with the list of samples including photos and a link to the csv file for download (<https://opencontext.org/tables/e653f4f9-78a6-40c8-9d85-2a62bd4f48db>). In the csv file the Sardis samples have labels 'Record No', some changed by me to 'ReSard No'. The added 32 samples have labels '17xx Sard'. The Sard in labels 'ReSard' and the Sard in the labels after the '17xx No' point to a membership of this sample in the large AIA KH1 Macrogroup A - local ("Pactolos Group") - (206 members, 203 ceramics, 3 sediments) in the publication 2013.

In some of the groups are also samples from the AIA Kinet Höyük Project published by Grave, Kealhofer et al. 2008 with labels 'Sherd No' or 'Sample No' in the csv file. Data are given at the internet at: <https://opencontext.org/projects/81d1157d-28f4-46ff-98dd-94899c1688f8> with the list of samples including photos and a link to the csv file for download. (<https://opencontext.org/tables/10a33c66-0bc1-40fb-b832-8f55aca970c5.csv>).

A 3rd databank with samples from the Troad and neighbouring areas is also included in the evaluations here, see <https://opencontext.org/projects/45c12f7c-8744-47bb-902a-523d11ce0c32> with the list of samples including photos and a link to the csv file for download (<https://opencontext.org/tables/036dbdc0-5ef6-4576-8421-f09ab0f8cec8>). These samples have labels 'AIA No'.

The letters Record or ReSard or Sherd or AIA of the labels in the given lists of samples are not repeated for the following sample lists, if they do not differ.

The sum of all samples in these 3 databanks is 881 (326 from Sardis 2013, 348 from Kinet Höyük 2008 and 207 from the AIA Troy project, to be published?). The rather strict evaluation resulted in an unusual high number of singles (217) and sample pairs (27). Including samples with single outlying elemental concentration values and with it increasing the spread values at the cost of statistically more often overlapping groups and with it less group discrimination will decrease the number on ungrouped samples. It is surprising that groups formed in one of the 3 data sets have only very rarely members of one of the other sets. The question arises in as far the data of the 3 dataset are comparable. The laboratory where the Kinet Höyük 2008 measurements have been done is not reported. And also the laboratory measuring the Troy dataset is not known to us. Only for the Sardis data the Canadian Becquerel Laboratories are mentioned in the paper and the Canadian McMasters University research reactor is mentioned in the web.

**SaGP**, 61 samples: Average concentration values are given in Table 1 of the text. List of samples and their best relative fit factor with respect to SaGP:

Record 898(0.95), 916(0.96), 919(0.97), 921(0.97), ReSard 930(0.97), 958(0.96), Record 960(0.89), 978(0.93), ReSard 980(0.96), 981(0.98), 3636(1.15), ReSard 3647(1.00), 3648(0.98), 3666(1.01), 3667(1.02), 3670(0.99), 3671(1.03), 3673(0.98), 3677(1.02), 3682(0.99), 3686(1.09), ReSard 3688(0.99), 3694(1.01), 3695(1.01), 3697(0.99), 3698(1.02), 3700(1.03), Record 3704(0.99), ReSard 3708(1.00), 3716(1.03), 3718(0.99), 3726(1.06), Record

3727(0.88),ReSard 3731(0.99),Record 3732(0.99), 3735(0.99),ReSard 3756(0.96),Record 3777(0.95), 3781(0.99), 3784(0.95), ReSard 3903(1.01),Record 3905(1.07),1725 Sard(1.01),1726 Sard(0.99),1727 Sard(1.04),1730 Sard(1.01),1733 Sard(1.03),1735 Sard(0.99),1737 Sard(0.96),1742 Sard(0.99), 1744 Sard(0.98),1746 Sard(0.98),1747 Sard(1.03),1748 Sard(0.95),1749 Sard(1.02),1750 Sard(1.02),1751 Sard(1.00),1752 Sard(0.96),1754 Sard(0.98),1757 Sard(1.01), 1763 Sard(1.07)

All members are from the site Sardis. Members with label Record are not in the AIA KH1 Macrogroup A.

**SaGQ**, 8 samples: Average concentration values see Table 2 of the text. Sample list and best relative fit factor with respect to SaGQ:

Record 893(0.99),ReSard 896(1.00),Record 906(1.03), 907(1.02), 909(1.00), 911(1.00), 937(0.95), 952(0.98)

Only sample ReSard 896 is in the AIA KH1 Macrogroup A.

**SaGS**, 4 samples: Average concentration values see Table 1 of the text. Sample list and best relative fit factor with respect to SaGS:

ReSard 984(1.01), 985(1.03), 986(1.01), 987(0.94)

These samples are in in the AIA KH1 Macrogroup A. They are closest in composition to group SaGY, but differ in the elements Fe, Sc, Cs, and Cr. Archaeometrically their provenance from Sardis is not proven, but archaeologically they are certainly from Lydia.

**excuse: KeGA**, 28 samples: Average concentration values see Table 2 of the text. Sample list and best relative fit factor with respect to KeGA:

Sherd 748(0.95), 809(1.05), 811(0.97), 814(0.95), 815(0.88), 816(0.96), 822(1.04), 823(1.08) 827(0.99), 828(0.98), 829(0.95), 834(1.01), 837(0.96), 838(1.14), 839(0.94), 844(0.96), 846(0.93), 852(1.13), 854(0.94), 855(0.95), 1688(1.23), 1691(1.01), 1692(0.96), 1693(1.04), 1699(0.97), 1703(0.94), 1709(1.02), 1710(1.04).

All members are in the Kinet Höyük dataset.

**SaGU**, 50 samples: Average concentration values see Table 3 of the text. Sample list and best relative fit factor with respect to SaGU:

ReSard 899(0.94),Record 922(0.98),ReSard 924(0.99), 926(0.97),Record 935(0.90), 947(0.96), 948(0.97), 949-(0.95), 957(0.91),ReSard 961(0.96),Record 962(0.96),ReSard 964(0.92),Record 966(0.98), 968(0.96),ReSard 969(0.96),Record 971(0.98),972(0.92), 974(0.96),ReSard 975(1.00),Record 976(1.03),977(0.92), 979(1.01),ReSard 982(0.98),983(0.96),Record 3625(1.12),3627(1.10),3663(1.03),ReSard 3676(0.98),Record 3703(1.13),3706(1.12),3719(1.05),ReSard 3724(0.95),Record 3728(1.13), 3729(1.09),ReSard 3742(0.98), 3752(1.06), 3762(0.98), 3775(1.04),Record 3778(0.92),3779(1.00),Record 3780(1.05), 3785(0.94),1724 Sard(1.01),1729 Sard(1.00),1732 Sard(1.02),1734 Sard(0.98),1743 Sard(1.03),1745 Sard(1.02),1755 Sard(1.02),1766 Sard(0.95)

All members are from the site Sardis. Members with label Record are not in the AIA KH1 Macrogroup A.

**SaGV**, 13 samples: Average concentration values see Table 3 of the text. Sample list and best relative fit factor with respect to SaGV:

Record 941(0.88), 942(0.92), 943-(0.85) 944(0.92), 3711(0.91),AIA 1004(1.03), 1059(0.97), 1071(1.17), 1099(0.97), 1118(1.09), 1119(1.04), 1822(1.01), 1825(1.31),

In this group only 5 samples are in the dataset from Sardis, the remaining members are from the Troy dataset with labels AIA. None of the members from the Sardis dataset are in the AIA KH1 Macrogroup A, The large deviations in the Cr and Cs concentrations from the general Sardinian composition and the members from the Troy dataset might point to a origin of this group not from the region of Sardis.

**SaGW**, 5 samples: Average concentration values see Table 4 of the text. Sample list and best relative fit factor with respect to SaGW:

Record 917(0.99), 3631(0.99), 3683(0.97), ReSard 3684(1.02), 3758(1.01)

All members are from the site Sardis. Members with label Record are not in the AIA KH1 Macrogroup A.

**SaGX**, 9 samples: Average concentration values see Table 4 of the text. Sample list and best relative fit factor with respect to SaGX:

Record 908(1.08), 920(1.00), 927(1.01), 929(0.97), 932(0.98), 939(0.93), 946(1.01), 949(0.99), 970(0.98)

All members are from the site Sardis and none is in the AIA KH1 Macrogroup A.

**SaGY**, 24 samples: Average concentration values see Table 4 of the text. Sample list and best relative fit factor with respect to SaGY:

Record 910(0.89), 931(0.90), 936(0.94),ReSard 3661(0.99), 3665(0.95), 3668(1.00), 3687(0.98), 3689(0.97), 3691(1.02), 3692(1.04), 3705(1.03), 3709(0.95), 3710(0.97), 3721(0.99), 3725(0.96),Record 3748(1.25),ReSard 3761(0.95), 3769(0.97),Record 3906(1.29), 3965(1.16),1738 Sard(0.94),1739 Sard(0.98),1741 Sard(0.96),1756 Sard(0.97)

Again all members are from the site Sardis. Members with label Record are not in the AIA KH1 Macrogroup A. Check\*\*\*: Is sample 3965 a sediment?

**TeGB**, 8 samples: Average concentration values see Table 6 of the text. Sample list and best relative fit factor with respect to TeGB:

Record 892(1.04),ReSard 897(0.95),Record 3680(0.96), 3730(1.01), 3733(0.96), 3734(0.96),Sherd 840(1.00), 845(0.99), 847(1.01), 1667(1.05), 1668(1.02), 1669(1.03), 1694(0.96), 1695(1.01)

**EuGA**, 12 samples: Average concentration values see Table 6 of the text. Sample list and best relative fit factor with respect to EuGA:

ReSard 923(0.84),Record 3754(0.98),Sherd 766(0.98), 802(1.14), 856(0.99), 1605(0.96), 1662(0.97), 1697(0.98),AIA 989(0.96), 1042(0.90), 1061(1.10), 1809(1.18)

**MiGD**, 6 samples: Average concentration values see Table 6 of the text. Sample list and best relative fit factor with respect to MiGD:

Sherd 806(1.08), 1685(0.98), 1686(1.09), 1701(0.98), 1704(0.97), AIA 1049(0.89)

**TrGB**, 20 samples: Average concentration values see Table 6 of the text. Sample list and best relative fit factor with respect to TrGB:

AIA 1010(0.97), 1015(1.02), 1023(0.99), 1024(0.93), 1039(0.94), 1096(1.03), 1106(0.93), 1779(1.16), 1795(1.12), 1796(1.04), 1797(1.00), 1800(0.93), 1801(0.94), 1803(0.98), 1810(0.97), 1811(1.11), 1812(0.98), 1813(0.96), 1815(1.05), 1823(0.90)

All members are in the Troy dataset (<https://opencontext.org/tables/036dbdc0-5ef6-4576-8421-f09ab0f8cec8>).

Other groups in the Sardis dataset:

Average concentration patterns of the 6 groups of unknown origin formed from the AIA project data from samples from Sardis. The group members and its best relative fit factor with respect to the group averages are recorded below.

**Table 1:** Given are average concentration values M in  $\mu\text{g/g}$  (ppm), if not indicated otherwise, and their standard deviations (root mean square deviations)  $\sigma$  in %. The individual samples have been corrected with a best relative factor with respect to the grouping values (given below).

	Sa-1 19 samples factor 1.00		Sa-2 5 samples factor 1.00		Sa-3 6 samples factor 1.00	
	M	$\sigma$ (%)	M	$\sigma$ (%)	M	$\sigma$ (%)
As	33.5	35.	29.1	46.	20.2	25.
Ba	737.	9.4	692.	6.2	679.	8.9
Ca\ %	1.33	38.	4.13	23.	4.19	6.9
Ce	87.9	5.0	84.3	5.0	89.5	5.0
Co	22.0	5.0	20.6	5.0	22.8	5.0
Cr	142.	5.0	203.	13.	170.	5.9
Cs	35.7	9.6	25.0	9.9	34.6	9.2
Eu	1.72	6.8	1.45	5.0	1.53	5.0
Fe\ %	5.87	5.0	4.36	5.0	4.92	5.0
Hf	5.42	9.9	5.46	8.4	5.51	5.0
La	44.3	5.0	41.9	5.0	45.1	5.0
Lu	0.49	5.0	0.47	5.0	0.48	5.0
Na\ %	1.06	13.	1.21	26.	1.00	31.
Nd	36.1	10.	32.1	5.0	34.9	5.0
Rb	131.	5.7	127.	12.	151.	5.0
Sb	6.19	10.	3.18	6.4	3.46	32.
Sc	20.5	5.0	15.2	5.0	18.3	5.0
Sm	8.32	5.0	7.84	5.0	7.74	5.0
Ta	1.04	34.	1.24	22.	1.36	14.

Tb	1.06	13.		1.07	12.		1.01	7.1
Th	14.0	5.0		15.3	5.0		17.1	5.0
U	2.40	16.		3.07	10.		2.95	8.9
Yb	3.39	5.0		3.22	5.0		3.20	5.0
K\%	3.04	15.		3.09	8.2		3.43	20.
Zn	99.1	13.		78.2	12.		128.	11.

**sa-1** 19 samples:

Record 3621(1.05), 3633(1.04),ReSard 3634(0.98),Record 3635(1.06), 3638(1.02), 3655(1.08), 3658(0.99),ReSard 3662(0.97),Record 3664(1.03),ReSard 3669(0.94),3672(0.98), 3675(0.95), 3712(0.96),Record 3737(1.02), 3743(0.94),ReSard 3744(0.95),Record 3745(1.01),ReSard 3750(0.93),Record 3776(1.02)

**Sa-2** 5 samples:

Record 3641(1.00), 3642(1.03), 3656(1.02), 3713(0.99), 3764(0.93)

**Sa-3** 6 samples:

Record 3765(0.98), 3766(1.01), 3770(1.00), 3771(1.00), 3773(1.00), 3774(1.00)

**Table 2:** as Table 1

	<b>Sa-4</b> 5 samples factor1.00		<b>Sa-5</b> 11 samples factor1.00		<b>Sa-6</b> 12 samples factor1.00	
	M	$\sigma(\%)$	M	$\sigma(\%)$	M	$\sigma(\%)$
As	34.4	27.	50.2	55.	55. 8	65.
Ba	743.	5.0	748.	16.	801 .	27.
Ca\%	1.19	14.	6.09	19.	3.2 0	31.
Ce	100.	5.0	64.3	5.0	107 .	5.0
Co	24.3	5.0	23.9	5.8	40. 5	53.
Cr	138.	5.0	186.	5.0	239 .	15.
Cs	23.0	7.7	15.4	15.	18. 0	9.7
Eu	1.85	8.6	1.24	6.6	1.9 3	6.8
Fe\%	6.13	5.0	4.78	6.1	6.0 5	5.0
Hf	4.81	8.8	4.09	14.	5.1	8.5

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La	51.0	5.0	33.2	5.0	54.	4	5.0
Lu	0.48	5.0	0.39	5.3	0.5	4	6.6
Na%	1.31	7.3	0.84	23.	0.8	7	18.
Nd	38.9	7.7	28.0	17.	43.	2	12.
Rb	143.	7.5	119.	6.6	142	.	7.9
Sb	5.65	9.9	3.54	7.9	4.7	0	10.
Sc	21.3	5.0	15.6	5.0	20.	4	5.0
Sm	9.50	5.0	6.30	5.0	9.8	3	5.0
Ta	1.11	38.	0.94	31.	2.0	8	85.
Tb	1.41	12.	0.88	14.	1.2	6	17.
Th	16.3	5.0	13.4	5.0	18.	8	8.0
U	2.78	11.	2.96	14.	4.5	5	18.
Yb	3.32	5.6	2.74	5.0	3.6	7	6.1
K%	3.29	6.9	2.72	5.0	3.1	3	10.
Zn	117.	11.	87.4	17.	112	.	22.

**Sa-4, 5 samples:**

ReSard 3643(0.98), 3644(1.02), 3674(0.98), 3751(0.96), 3763(1.04)

**Sa-5, 11 samples:**

Record 955(0.94), 3622(1.06), 3623(0.84), 3626(1.04), 3628(1.11), 3629(0.86), 3637(1.05), 3639(1.10), 3640(0.88), 3653(1.06), 3654(1.11)

**Sa-6, 12 samples:**

Record 890(0.92), ReSard 895(1.11), Record 895-(1.08), 945(1.02), 951(0.93), 3620(1.03), 3624(1.03), 3632(0.97), 3645(1.02), 3646(0.93), 3739(0.93), 3741(0.97)