NEA PAPHOS

CHEMICAL COMPOSITION OF CYPRIOT RED SLIP WARE FROM KOURION AND NEA PAPHOS

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A series of 29 samples of Cypriot Red Slip Wares (CRSW) was analyzed to compare finds from Nea Paphos and Kourion[1] (Tables 1 and 2).[2] At first glance, the composition of all CRSW samples analyzed so far is very similar and differs only slightly from Cypriot Sigillata (CS). Using multivariate statistical clustering methods, all dendrograms agree in grouping into two major groups, the last assembling all deviating samples (Fig. 1). The first major group can be divided into four subgroups. Two of the subgroups (I and IV) include nearly all the finds from Kourion. The first group consists only of finds from Kourion, the second includes two finds from Nea Paphos, which in a previous paper had been taken as a subgroup of CRSW from this site (Daszkiewicz et al. 1995). On the other hand, the remaining samples from Nea Paphos (with the exception of D580) make up two other subgroups, together with four samples from Kourion. The samples in the last subgroup are more similar to CS than to CRSW, a fact checked by comparing all analyses of CS and CRSW in a dendrogram. This showed a separation of CS and CSRW with only a few exceptions. This

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[1] Samples for analyses were selected by H. Meyza from the Centre for Mediterranean Archaeology of the Polish Academy of Sciences.

[2] Chemical analyses were made in the laboratory of the Arbeitsgruppe Archaometrie FU Berlin by WD-XRF. Analysis was made of ignited samples, major elements are given in percent by weight, normalized to a constant sum of 100%, the original total is given in the column "Total", loss of ignition at 900° C is given in column "LOI", traces are in ppm, elements in brackets are determined with lower precision.

Tab. 1. Results of chemical analysis, major elements (% by weight).

Groups	Sample	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	(S)	(Cl)	LOI	TOTAL
	D 680	57.54	0.94	19.12	7.78	0.087	2.98	7.07	0.86	3.46	0.18	0.02	0.02	3.31	100.60
	D 681	56.63	0.94	19.62	7.71	0.083	3.13	7.35	0.87	3.49	0.19	0.00	0.02	2.18	101.28
	D 682	56.34	0.93	18.75	7.71	0.088	3.15	8.58	1.03	3.23	0.19	0.01	0.01	2.18	100.37
	D 683	55.55	0.85	18.51	7.48	0.121	3.77	9.09	0.85	3.58	0.19	0.08	0.02	3.95	100.47
	D 685	54.60	0.89	17.83	7.40	0.087	3.37	11.53	0.82	3.28	0.19	0.08	0.01	7.07	100.01
	D 686	55.40	0.87	18.32	7.40	0.126	3.89	9.57	0.75	3.47	0.21	0.04	0.01	4.94	100.49
1,I	D 687	55.98	0.93	19.40	8.04	0.094	3.21	7.86	0.85	3.43	0.20	0.01	0.01	2.86	100.77
	D 688	57.11	0.83	18.60	7.17	0.098	3.19	8.10	1.24	3.48	0.19	0.02	0.02	2.09	101.53
	D 691	55.44	0.83	17.52	6.97	0.094	3.06	11.67	1.07	3.17	0.17	0.10	0.01	5.62	100.95
	D 693	54.51	0.82	17.82	7.07	0.108	3.90	10.88	1.03	3.21	0.66	0.02	0.01	0.64	101.06
	D 695	54.58	0.90	18.62	7.40	0.080	3.19	10.87	0.93	3.23	0.20	0.10	0.01	2.90	98.05
	D 696	56.70	0.90	18.65	7.54	0.098	3.49	8.14	0.91	3.39	0.18	0.02	0.01	2.23	100.53
	D 697	54.87	0.84	18.15	7.24	0.112	4.15	10.09	0.97	3.41	0.17	0.03	0.02	0.62	101.01
	D 702	55.62	0.84	18.82	7.56	0.110	3.56	8.83	0.94	3.56	0.16	0.01	0.01	3.20	100.72
	D 703	55.84	0.83	18.60	7.51	0.110	3.59	8.76	0.92	3.65	0.19	0.01	0.01	2.90	101.24
1,II	D 684	56.38	0.94	19.08	7.78	0.086	2.98	8.34	0.80	3.41	0.21	0.01	0.01	3.83	100.82
	D 689	56.84	0.98	19.21	7.59	0.087	3.39	7.85	0.73	3.14	0.19	0.04	0.02	1.38	100.23
1,III	D 692	57.41	1.03	17.53	7.34	0.091	2.63	10.26	0.76	2.79	0.19	0.00	0.01	1.76	101.13
	D 694	56.18	1.05	19.18	7.69	0.067	2.66	9.15	0.65	3.19	0.19	0.09	0.01	3.89	101.16
	D 698	59.74	0.94	18.22	7.09	0.080	2.94	6.60	0.73	3.45	0.21	0.01	0.02	2.82	100.95
	D 699	58.83	0.94	19.41	7.42	0.057	2.79	6.32	0.71	3.36	0.17	0.05	0.01	1.09	100.82
	D 700	57.80	0.91	18.44	7.14	0.083	2.83	8.33	0.92	3.37	0.18	0.03	0.01	1.04	101.03
1,IV	D 701	58.68	0.88	17.59	6.86	0.069	2.59	8.85	0.87	3.43	0.17	0.00	0.01	4.87	101.93
	D 704	56.86	0.87	17.12	6.74	0.065	2.82	11.34	0.75	3.25	0.18	0.12	0.01	6.61	99.81
	D 705	59.46	0.93	18.42	7.13	0.072	2.83	6.69	0.70	3.59	0.17	0.02	0.01	3.44	100.20
	D 707	58.73	0.94	19.14	7.46	0.058	2.73	6.48	0.69	3.46	0.31	0.05	0.01	2.10	98.91
	D 709	58.97	0.88	17.65	6.95	0.080	3.19	7.86	0.82	3.42	0.18	0.06	0.01	3.41	100.78
2,1	D 690	55.64	1.05	20.91	7.95	0.079	3.55	5.82	0.91	3.92	0.19	0.02	0.01	0.92	100.33
2,2	D 708	54.59	0.84	17.91	7.31	0.115	4.09	11.02	1.79	2.03	0.32	0.02	0.01	0.87	100.69

Tab. 2. Results of chemical analysis, trace elements (ppm).

Groups	Sample	V	Cr	Ni	(Cu)	Zn	Rb	Sr	Y	Zr	(Nb)	Ba	(La)	(Ce)	(Pb)	(Th)
	D 680	151	122	58	37	92	139	237	28	166	27	407	43	96	15	28
	D 681	161	128	58	35	88	148	244	30	166	28	413	48	82	8	31
	D 682	158	125	58	38	91	140	240	29	167	27	390	38	90	13	26
	D 683	146	123	58	42	130	140	323	30	171	26	396	39	82	12	23
	D 685	144	116	53	39	84	132	418	26	167	28	410	35	88	8	27
	D 686	146	120	61	50	84	142	317	26	157	27	392	42	75	17	24
1,I	D 687	150	136	58	38	92	146	269	30	167	29	420	43	85	7	26
	D 688	144	121	62	48	92	148	202	27	150	23	411	36	83	16	26
	D 691	136	118	59	47	81	130	310	29	152	24	426	34	84	13	23
	D 693	149	111	57	57	96	139	260	28	153	27	321	33	76	8	25
	D 695	137	120	56	46	94	131	295	30	162	28	350	25	73	14	24
	D 696	141	130	71	46	90	143	276	30	166	28	397	36	99	15	27
	D 697	144	120	59	46	84	135	222	27	152	26	329	31	88	15	24
	D 702	146	127	62	58	83	148	230	26	146	24	440	40	75	5	25
	D 703	152	124	60	61	88	152	222	29	146	26	451	37	76	10	23
1,II	D 684	138	123	58	41	131	140	322	30	171	28	445	36	92	10	25
	D 689	153	128	64	41	94	129	158	32	182	29	322	40	107	17	27
1,III	D 692	143	144	67	44	79	113	224	30	208	31	363	54	97	17	24
	D 694	153	126	58	37	88	123	241	30	201	32	371	40	105	20	24
	D 698	129	104	55	63	99	146	230	28	197	37	316	45	80	16	29
	D 699	117	110	58	60	107	161	244	28	200	39	338	53	97	14	30
	D 700	125	106	57	59	90	149	305	27	186	34	320	35	96	12	25
1,IV	D 701	111	100	55	58	95	145	339	28	195	38	445	53	101	25	34
	D 704	117	99	51	55	89	138	320	27	179	33	305	46	88	19	30
	D 705	132	103	55	52	91	150	252	27	201	38	331	34	111	8	28
	D 707	113	114	57	72	110	157	277	28	198	39	410	45	100	12	27
	D 709	115	106	55	66	99	145	295	25	193	37	331	51	95	20	25
2,1	D 690	169	124	59	41	104	155	142	34	205	31	483	64	108	24	27
2,2	D 708	151	120	57	49	92	88	232	29	156	26	340	41	82	6	21

Fig. 1. Dendrogram of a cluster analysis of 48 samples of Cypriot Red Slip Ware using Average Linkage clustering with Euclidian Distance of logged data of Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Ba, Ce (Brookhaven Data Handling Programs, kindly provided by E. Sayre); K - Kourion, NP - Nea Paphos.

grouping was checked by using Mahalanobis distances, which, however, cannot be applied to the very small number of samples in the groups of the dendrogram in Fig. 1.

If the analyses are ordered according to the dendrogram, only little differences between the groups can be seen, and these can be interpreted as resulting from different sources within an area of the same geological origin. Secondary burial effects, different at the two sites, are improbable when the distinguishing elements are regarded.

It is difficult to reach a final conclusion bearing in mind that all the samples from Nea Paphos which fell into subgroup II and IV with samples from Kourion are dated to the 6th-7th century, in contrast to samples of Early Cypriot Red Slip Ware from Nea Paphos that form subgroup III.[3]

In this case more analyses are advised to check, if the grouping was indeed connected with sites or with dating.

Bibliography:

M. Daszkiewicz, J. Raabe, G. Schneider (1995), Cypriot Sigillata and Cypriot Red Slip Wares ? a comparison of technological and chemical analyses and thin-section studies, in: B. Fabri (ed.), *The Cultural Ceramic Heritage, Fourth Euro Ceramics,* Vol. 14, pp. 151-171.

[3] Information concerning the investigated samples is given according to H. Meyza, List of samples - CRSW, CS, ESA and IS from Polish excavations at Nea Paphos, submitted for analysis (ms).

