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The conservation of the tub from room 86 and the problems of conservation of the pottery from Monastiraki

appendice

V. Lambropoulos
Analyses Performed at the Athens Polytechnic (TEI)

Room 86 of the eastern complex is a basement room in the fill of which the polychrome Kamares style spouted tub presented here was discovered. It was found upside down in level 1. It has a specialized shape as is shown by the horizontal rim which projects both outwards and towards the interior of the vase and by the perforations in the circumference of the rim. It has two horizontal handles at the sides and a smaller, vertical one at the back. It has an elaborate and unusual cruciform decorative synthesis. The decoration consists of red sloping spirals entwined with white vertical ones. There are additional complementing motifs in white and probably a different red hue, usual in Kamares pottery (cf. below). The background is black. The interior bears splashes of red paint (tav. 14: 1-3). The vase has a height of 34 cm. Its base diameter is 26 cm. The rim diameter varies from 44 cm. on its exterior perimeter, to the interior rim diameter which leaves an opening of 28.5 cm.

The fine decoration of the vase precludes its use over a fire, although the spout and specialized shape suggest it contained liquids. Comparable tubs though coarse and without elaborate decoration, with three low feet, are associated with fire-boxes at Mallia. They are of Neopalatial date (Demargne and Gallet de Santerre 1953, pl. XL: 1, 4, 5).

The conservation of this vase highlights the problems conservators face in their work on ceramic material from the palatial centre. The vase was found broken in many fragments (tav. 14:2). Its clay is coarse, pinkish buff in colour and is burnt in parts. Some of the colour variations in the clay and paint may be due to firing.

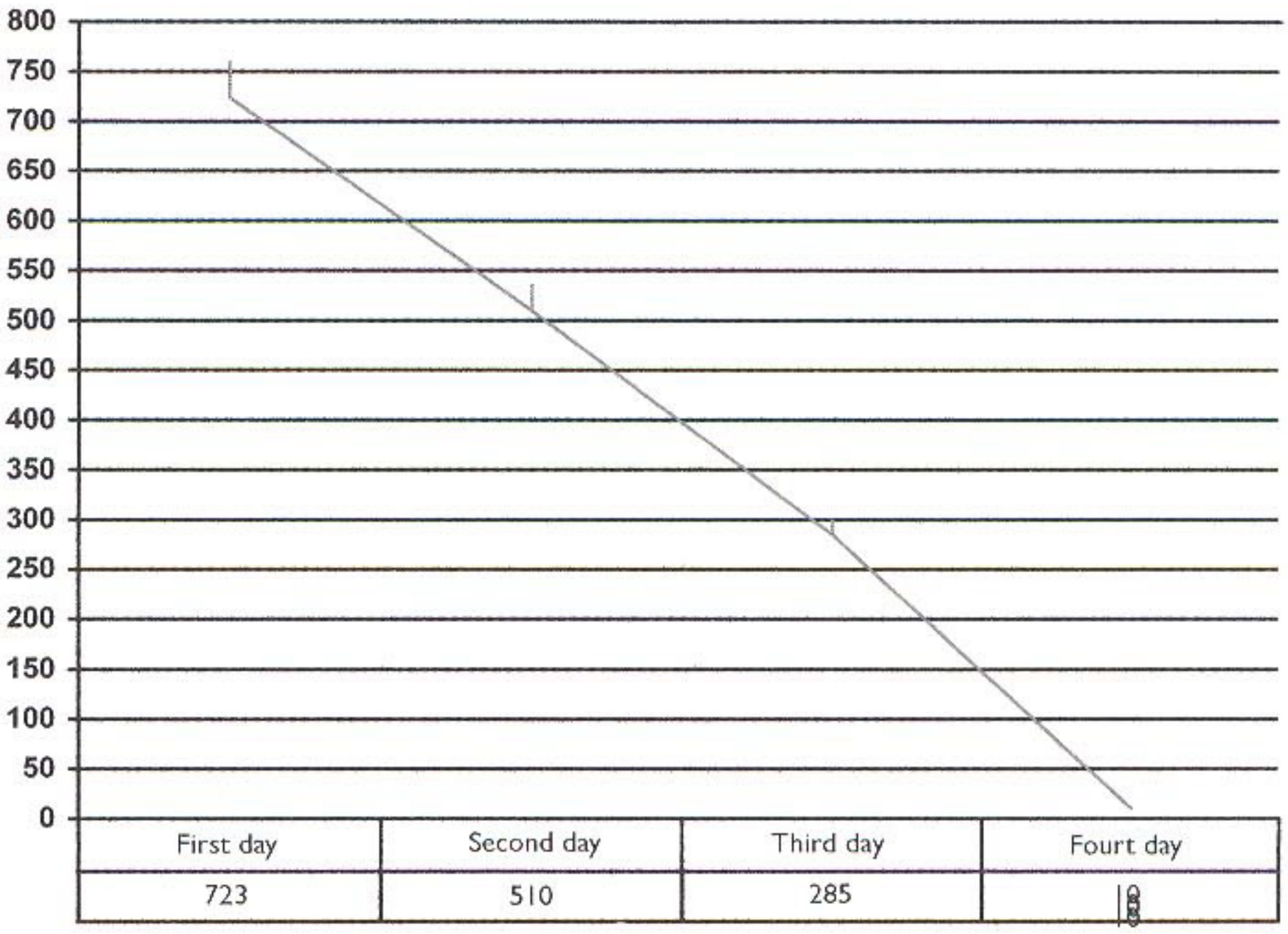
The usual procedure of analysis and documentation of the condition and preservation of the vase was followed and the pathology and types of damage were noted (cf. Lambropoulos 1996).

Description of the condition and damage

After macroscopic and microscopic examination, the exterior surface showed disintegration and the paint was flaking off. There were also crystallized insoluble salts (Skoulikidis 2000, 219, 234) and efflorescence of soluble salts on the surface and particularly below the rim of the vase, in parts covering its decoration (tav. 14: 3, tav 15: 4). It was deemed necessary to carry out a series of physicochemical analyses of its materials and pathology before completing its conservation and mending. These tests were conducted in the Department of Conservation of Antiquities and Works of Art of the Athens Polytechnic (TEI) by the chemical engineer Associate Professor Dr. Vasileios N. Lambropoulos, co-author of this paper and by his assistant, Athanasios Karambotsos, conservator of Antiquities and Works of Art. The results of the analyses are shown in an appendix at the end of this paper.

Treatment

Soluble salts, which obscure the decoration and surface of the vase and form mechanical tendencies for eroding and flaking off, were removed by continuous ablutions with deionized water and continuous counting of the conductivity of the water. The original measurement was 723



ms/cm2 (Lambropoulos 1992, 29). The procedure stopped when the conductivity was stabilized at low levels.

Cd (ms/cm2)

Crystallized salts, after various trials were removed with "Pasta Mora" (cf. Lambropoulos 1996; Kontou, Kotsamani and Lambropoulos 1995, 169; Kouzeli 1992, 1147; Nonfarmale 1979, 67) which proved to be very effective. Lastly, mechanical cleaning with the aid of deionized water was employed where necessary (tav. 15:5). In order to stabilize the surface of the sherds the following procedure was practiced using materials which were reversible, thus enabling the evaporation of moisture and avoiding alterations to the aesthetic appearance of the vase. Samples were submerged and or coated with polyvinylic alcohol, paraloid B 72, Primal AC 33 and Mowvilith. The sherds were then placed in a solution of 15% sulphuric natrium and natrium chloride in 200 continuous cycles of submerging and drying. The results were as follows:

MATERIAL	RESULT	CHANGE IN WEIGHT
a. polyvinylic alcohol	low ability to stabilize	11.1 gr.->11.5gr
b. Paraloid B72 up to 4% in acetone	excellent fixative and aesthetic results	5.1 gr.-> 5.3 gr.
c. Primal AC33 5% in water	shrinking of the sample	10.3 gr.-> 10.9 gr.
d. Mowvilith 4% in Acetone	strong yellowing of Surface becoming an Opaque film	10.8 gr-> 11.1 gr.

According to the above shown results, Paraloid B 72 in acetone (Horie 1987, 107, 205) was chosen and applied by submersion in consecutive solutions of different densities to achieve a better penetration, starting from very weak to stronger solutions up to 4%.

Joining and restoration

Uhu Hart and Paraloid B72 were chosen for joining the fragments because of their strong adhesive and quick stabilizing properties as well

as their reversibility. The mending started upside down from the rim, as fragments of the base are missing. 55 sherds were joined but there are some missing fragments (tav. 15:6-7). In order to strengthen the static stability of the vase the missing fragments were filled with plaster of Paris, $CaSO_4$ (Legakis, 1954, 149. Skoulikidis 2000, 251) after the edges of the existing sherds were insulated with Paraloid B 72 to prevent corrosion by the soluble sulphuric salts present in the plaster (tav. 15:8). The surface in the relevant places was covered by a latex solution which was removed after the completion of the process. The plaster was smoothed over and some small plaster spots on the vase fragments were removed by soft white drawing eraser. Subsequently, the plastered surfaces were painted over with water colours with the addition of Primal AC 33. The colour chosen is somewhat lighter than that of the original surface of the vase, so that the intervention is immediately visible (tav. 15:9).

Concerning the analyses which are included in the appendix certain preliminary observations emerge. The first and second analysis of red colour samples, which were of a slightly different shade, one from the rim, the second from the body, show variations in the amount of iron content which may indicate two different pigments. There is also the possibility that the same red pigment base was used in the lighter shade, but diluted with a clay slip or a white pigment, which has been used in the decoration of the vase. This may be indicated by the higher content in Magnesium (Mg) in the lighter shade of red. In the third analysis the amounts of Magnesium (Mg) and Calcium (Ca) indicate the contents of the white pigment. The siliceous salts on the vase may be due to the earth in which the vase was buried.

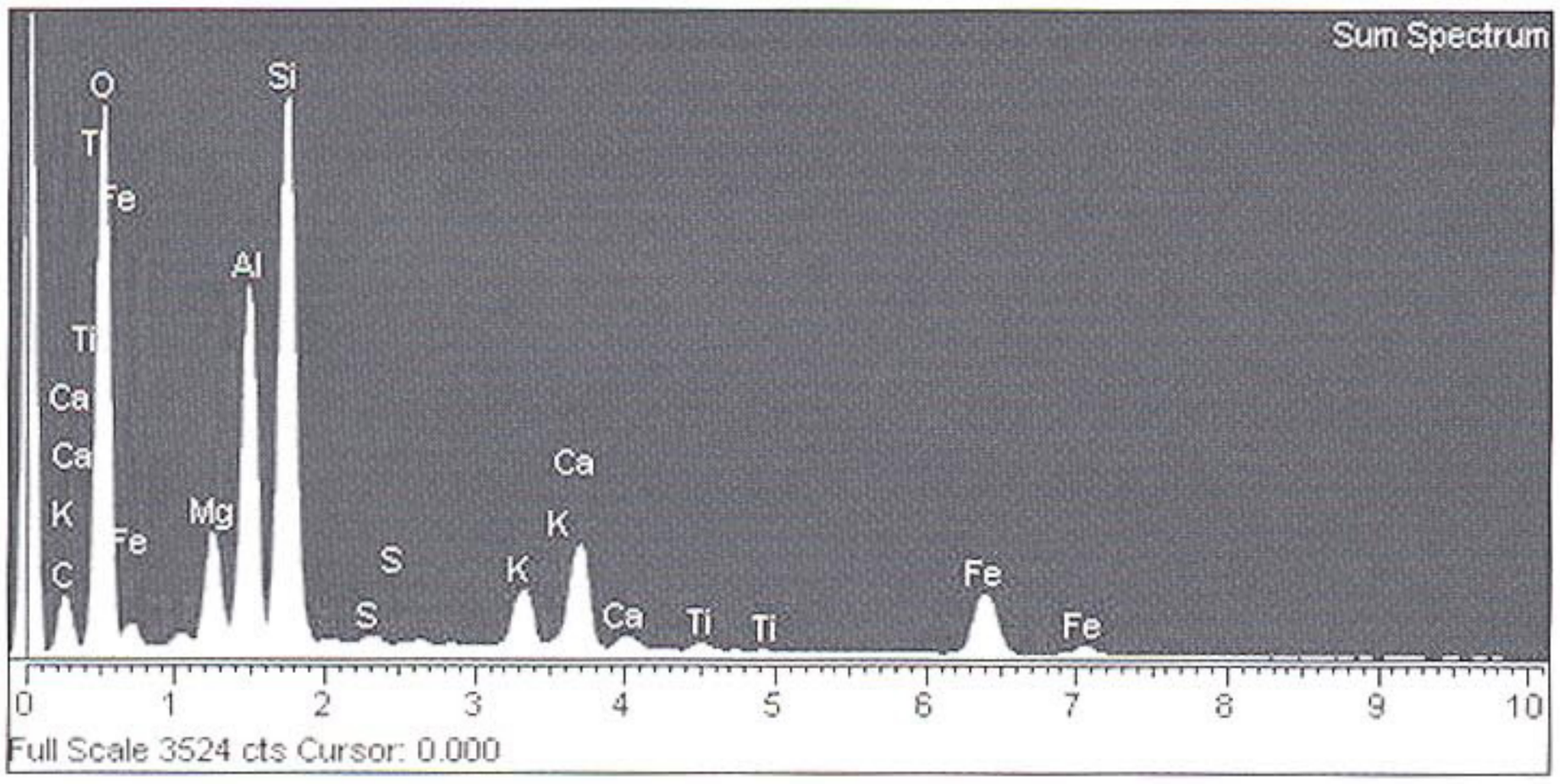
Appendix
Analyses Performed at the Athens Polytechnic (TEI)

PROJECT 1 (RED A)

Spectrum processing:
No peaks omitted

Processing option: Oxygen by stoichiometry (Normalized)
Number of ions calculation based on 8.00 anions per formula
Number of iterations = 4

Element	App	Intensity	Weight%	Weight%	Atomic %	Compd%	Formula	Number
	Conc.	Corrn.		Sigma				of ions
C K	13.17	0.3851	12.95	0.72	19.17	47.46	CO2	2.39
Si K	21.91	0.7602	10.92	0.18	6.91	23.35	SiO2	0.86
Al K	12.97	0.7350	6.68	0.12	4.40	12.63	Al2O3	0.55
Mg K	4.27	0.6447	2.51	0.07	1.84	4.16	MgO	0.23
Fe K	9.71	0.8147	4.52	0.13	1.44	5.81	FeO	0.18
Ca K	7.18	0.9632	2.82	0.07	1.25	3.95	CaO	0.16
K K	3.71	1.0149	1.38	0.05	0.63	1.67	K2O	0.08
S K	0.45	0.8055	0.21	0.03	0.12	0.53	SO3	0.01
Ti K	0.57	0.8086	0.27	0.04	0.10	0.44	TiO2	0.01
O			57.74	0.73	64.15			8.00
Totals			100.00					
							Cation sum	4.47

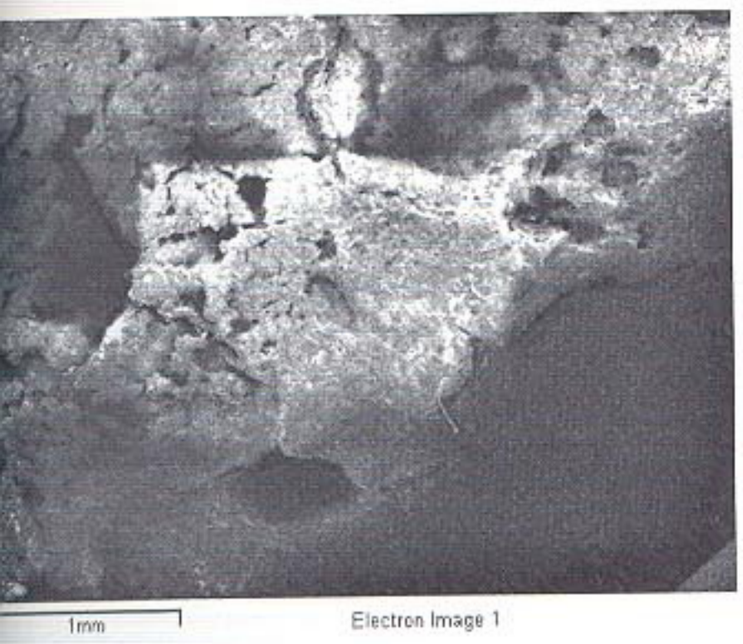


PROJECT 1 (RED B)

Spectrum processing :
No peaks omitted

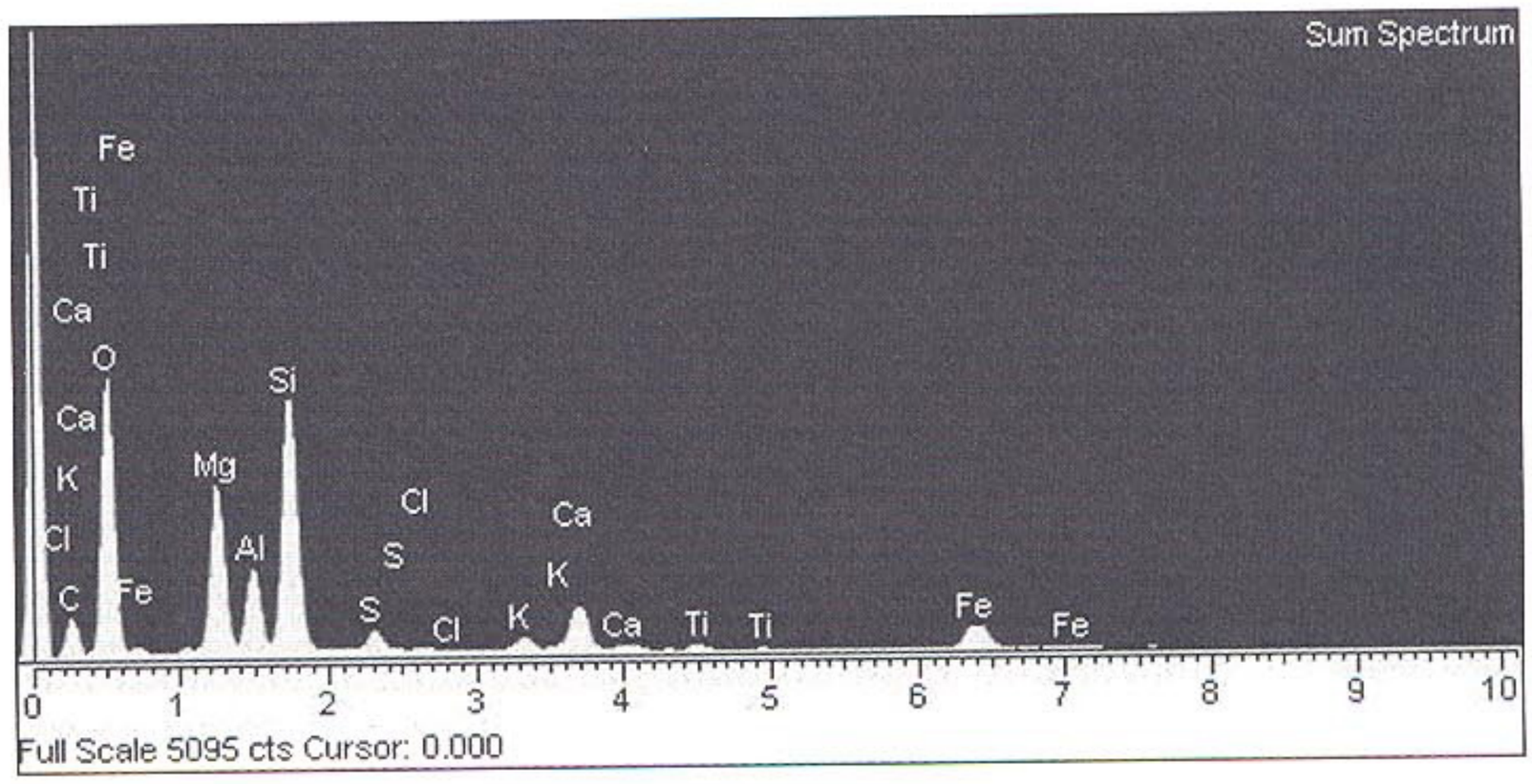
Processing option : Oxygen by stoichiometry (Normalized)
Number of ions calculation based on 8.00 anions per formula

Number of iterations = 5



Electron Image 1

Element	App	Intensity	Weight%	Weight%	Atomic %	Compd%	Formula	Number
	Conc.	Corrn.		Sigma				of ions
C K	15.85	0.3970	14.29	0.82	20.59	52.37	CO2	2.57
Si K	19.76	0.7597	9.31	0.18	5.74	19.92	SiO2	0.72
Mg K	12.73	0.6521	6.99	0.15	4.97	11.59	MgO	0.62
Al K	5.94	0.6859	3.10	0.08	1.99	5.86	Al2O3	0.25
Fe K	7.48	0.8114	3.30	0.12	1.02	4.25	FeO	0.13
Ca K	5.93	0.9653	2.20	0.07	0.95	3.08	CaO	0.12
S K	1.49	0.8152	0.65	0.04	0.35	1.63	SO3	0.04
K K	1.41	1.0123	0.50	0.04	0.22	0.60	K2O	0.03
Ti K	0.76	0.8086	0.34	0.04	0.12	0.56	TiO2	0.02
Cl K	0.30	0.7403	0.15	0.03	0.07	0.00		0.01
O			59.17	0.83	63.98			7.99
Totals			100.00					
							Cation sum	4.49



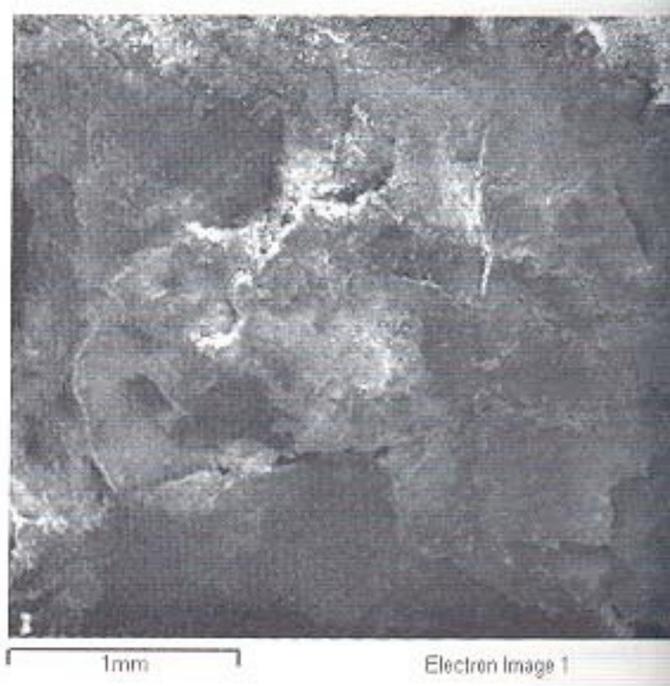
PROJECT 1 (WHITE)

Spectrum processing :
No peaks omitted

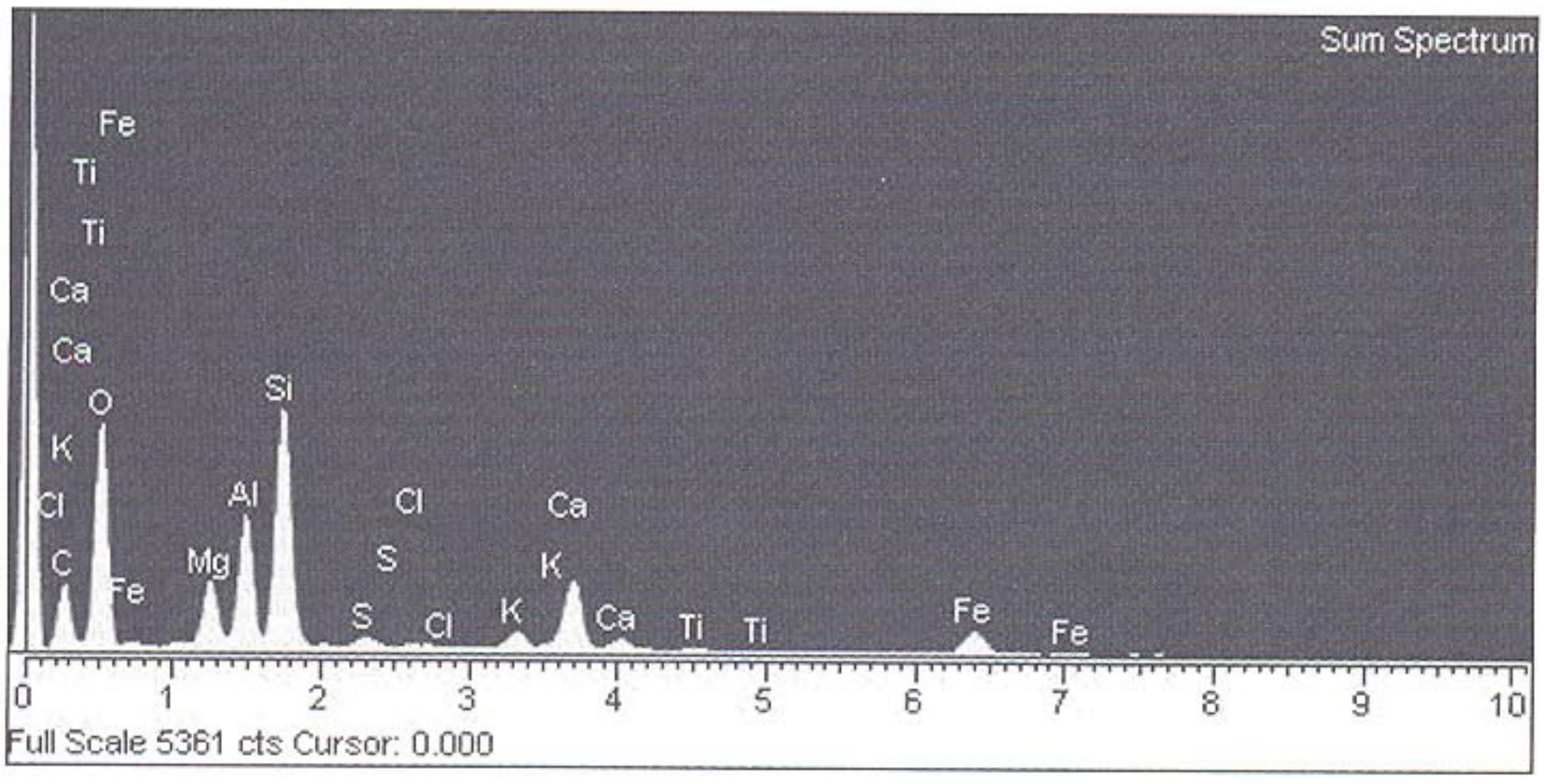
Processing option: Oxygen by stoichiometry (Normalized)
Number of ions calculation based on 8.00 anions per formula

Number of iterations = 6

Element	App	Intensity	Weight%	Weight%	Atomic %	Compd%	Formula	Number
	Conc.	Corrn.		Sigma				of ions
C K	26.69	0.4666	17.09	0.62	23.81	62.61	CO2	2.93
Si K	19.92	0.7813	7.62	0.12	4.54	16.30	SiO2	0.56
Al K	9.67	0.7251	3.99	0.08	2.47	7.53	Al2O3	0.30
Mg K	5.21	0.6340	2.45	0.06	1.69	4.07	MgO	0.21
Ca K	9.78	0.9707	3.01	0.07	1.26	4.21	CaO	0.15
Fe K	6.96	0.8070	2.58	0.10	0.77	3.31	FeO	0.10
K K	1.96	1.0251	0.57	0.03	0.24	0.69	K2O	0.03
S K	0.97	0.8395	0.35	0.03	0.18	0.87	SO3	0.02
Ti K	0.54	0.8055	0.20	0.04	0.07	0.34	TiO2	0.01
Cl K	0.21	0.7584	0.08	0.02	0.04	0.00		0.00
O			62.07	0.63	64.93			8.00
Totals			100.00					
							Cation sum	4.31



Electron Image 1



PROJECT 1 (ENCRUSTATIONS)

Spectrum processing :
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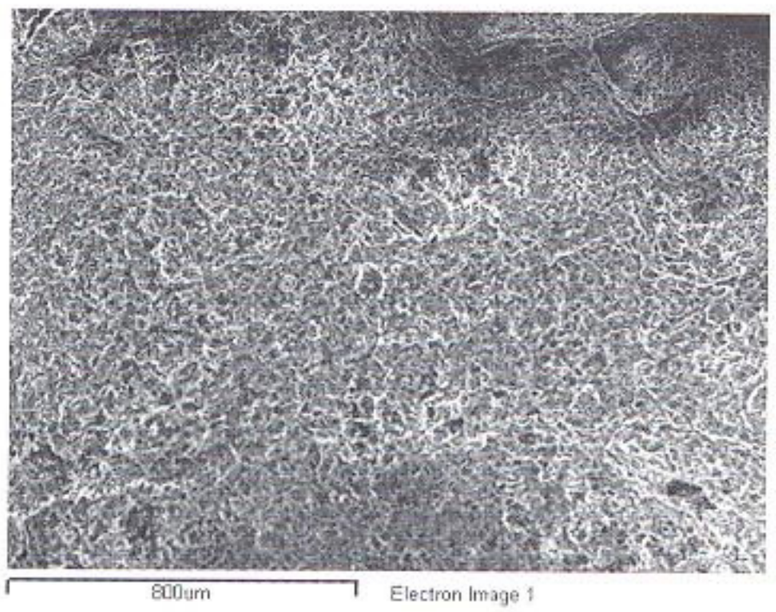
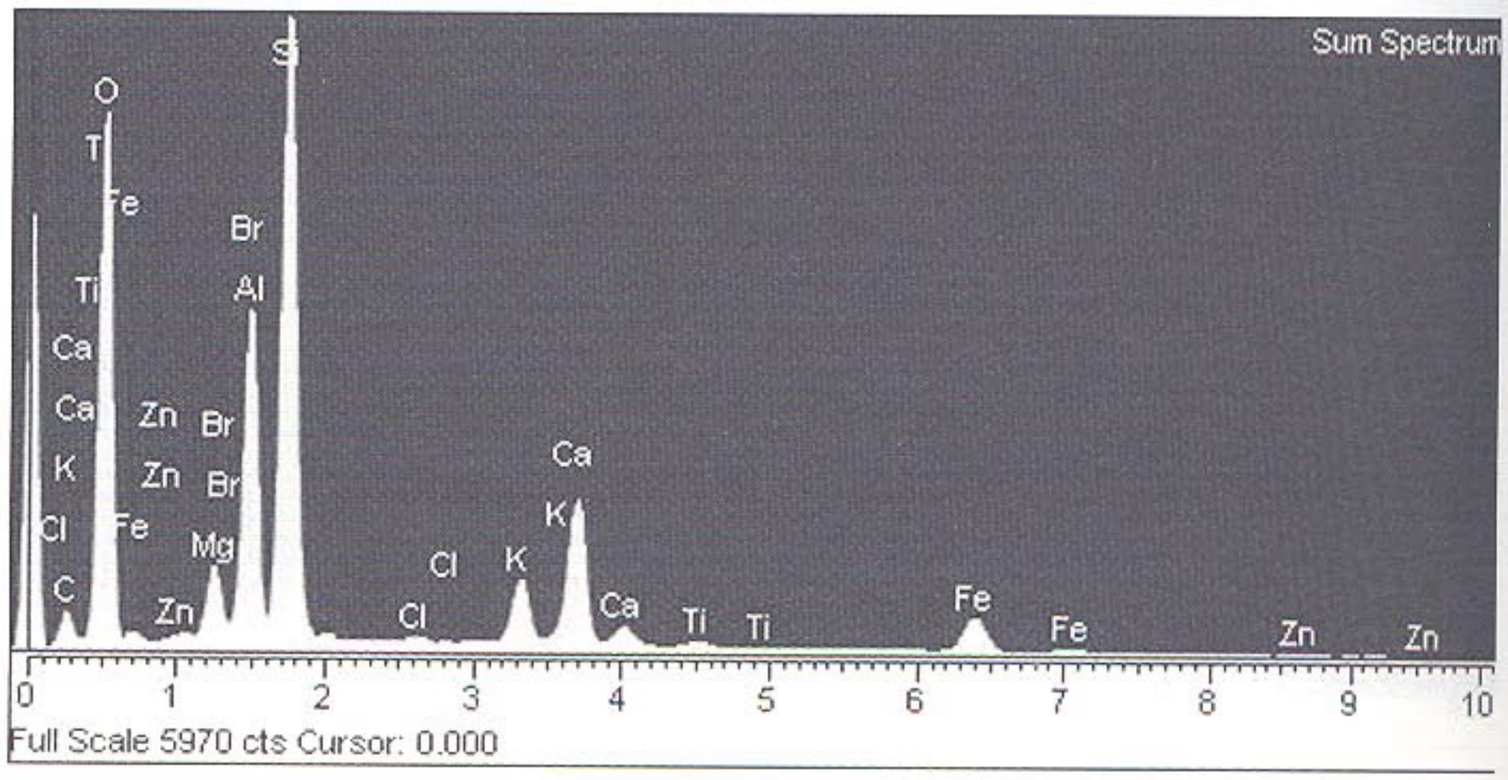
Processing option : Oxygen by stoichiometry (Normalized)
Number of ions calculation based on 8.00 anions per formula

Number of iterations = 4



Electron Image 1

Element	App	Intensity	Weight%	Weight%	Atomic %	Compd%	Formula	Number
	Conc.	Corrn.		Sigma				of ions
C K	8.32	0.3418	10.74	0.70	16.59	39.35	CO2	2.07
Si K	25.19	0.7651	14.53	0.26	9.60	31.09	SiO2	1.20
Al K	10.35	0.7702	5.93	0.39	4.08	11.21	Al2O3	0.51
Ca K	10.18	0.9560	4.70	0.10	2.18	6.58	CaO	0.27
Mg K	2.69	0.6722	1.77	0.05	1.35	2.93	MgO	0.17
Fe K	5.43	0.8177	2.93	0.09	0.97	3.77	FeO	0.12
K K	3.96	1.0078	1.73	0.05	0.82	2.09	K2O	0.10
Br L	3.77	0.7176	2.32	0.78	0.54	0.00		0.07
Ti K	0.57	0.8002	0.32	0.03	0.12	0.53	TiO2	0.02
Cl K	0.23	0.7242	0.14	0.02	0.07	0.00		0.01
Zn K	0.00	0.7836	0.00	0.00	0.00	0.00	ZnO	0.00
O			54.89	0.87	63.67			7.92
Totals			100.00					
							Cation sum	4.45



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