ORIGINAL PAPER

ELEMENTAL ANALYSIS BY XRF OF COLOR SAMPLES USED BY GIORGIO DE CHIRICO SAMPLED IN THE MASTER'S ATELIER AT THE HOUSE MUSEUM LOCATED IN PIAZZA DI SPAGNA IN ROME

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Abstract. *The aim of this paper is to analyze numerous materials utilized by the esteemed artist Giorgio de Chirico underwent analysis. These materials are housed in the House Museum of Piazza di Spagna in Rome, where the painter spent the last thirty years of his life, thanks to the resources provided by the Giorgio and Isa de Chirico Foundation. Besides samples of resins and oils, including both pure and mixed varieties, approximately one hundred samples of tube colors were extracted from various boxes used by de Chirico, which are displayed in the Maestro's Atelier. Concurrently, ten paintings, with nearly 220 analysis points (one for every five years spanning from the 1930s to the 1970s), located within the House Museum, underwent analysis as well. The main objective is to establish a correlation between the tube colors utilized by the Master and the colors present in his paintings, aiming to identify significant markers that could serve as references for questions regarding the authenticity of his works. Additionally, the study conducts an in-depth investigation into the artistic technique of the great master, who was known for his penchant for experimenting with personal formulations in utmost secrecy. Furthermore, this study aims to contribute to the analysis of color degradation on canvas exposed to specific environmental conditions, in contrast to the original color preserved within the tube. The intriguing findings that have emerged need to be further enriched in the future through additional comparative analyses on a broader range of paintings and extended to contemporary painters. This endeavor aims to establish a technical-scientific database of reference for scholars of 20th Century painting.*

Keywords: *XRF; analysis; colors characterization; paintings; de Chirico.*

1. INTRODUCTION

Giorgio De Chirico (1888-1978) is one of the main exponents of the artistic movement of metaphysical painting. De Chirico's pictorial work took place over approximately seventy years, starting from 1909 until almost his death, through various phases: the Metaphysical Period (1909 – 1919), the Neoclassical Period (1919 – 1945) and the Neometaphysical Period (1945 – 1978) (Fig. 1).

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Figure 1. Stylistic Periods

He is the author of the "Small treatise on Painting Technique - Theory and practice on the return to the craft", a text that became one of the main sources for the history of artistic techniques in the twentieth century. The treatise conceived as a medieval recipe book in which the artist illustrates in a colloquial tone the executive procedures and materials used and testifies to the comparison with tradition and the tempera grassa technique as the best technique.

The objectives of this study are multiple: first of all, a characterization of the pictorial materials used by the great master. In fact, the opportunity to access and directly sample the colors used in his atelier in Piazza di Spagna, where he lived the last 34 years of his life, (Fig. 2) (granted by the Isa and Giorgio de Chirico Foundation) gave the possibility to create a database of the original colors used by the artist and in particular the identification of the minority elements present in the tubes, to be compared in the future with the colors present in the numerous existing original paintings by Giorgio de Chirico and in any fakes, unfortunately numerous, in circulation. The correlation between the chemical composition of the colors used in his atelier and the pictorial films of his works will also allow to better study his artistic technique and in particular the mixtures he himself prepared to make the pictorial paste. The analysis of these materials also allows an in-depth study of the degradation mechanism of modern pictorial binders and their interaction with the pigments present, comparing the original materials with the same artificially aged colours, in order to be able to know in detail the various transformation phases of these materials over time. This information may be useful both for a precise determination of the state of conservation of a painting and for the choices that will then have to be made during the restoration phase.

2. MATERIALS AND METHODS

2.1. MATERIALS

Painting materials analyzed:

a) Original commercial colors in tubes: 103 colors in tubes taken from the Maestro's atelier (Table 1)

Figure 2. House-Museum Isa and Giorgio de Chirico Foundation in Rome

Table 1. List of sampled colors

N*)	Labels	**)	Brand	N*)	Labels	**)	Brand
18	Ivory black	O	Talens	**78**	Chrome yellow light	O	Maimeri
23	Carmin lake red	O	/	**79**	Burnt umber	O	Maimeri
25	Lemon yellow	T	Schmincke	**80**	Burnt sienna	O	Maimeri
26	Pure yellow	T	Schnincke	**81**	Naples yellow	O	Maimeri
27	Orange yellow	T	Schmincke	**82**	Rose brown	/	Maimeri
28	Orange red	T	Schmincke	**83**	Yellow of ZnO e CdS	O	Maimeri
29	Flesh pink	T	Schmincke	**84**	Yellow roman ochre	/	Schmincke
30	Alpine pink	T	Schmincke	**85**	Umber	O	Maimeri
31	Ruby red	T	Schmincke	**86**	Yellow ochre	O	Maimeri
32	Madder pink	T	Schmincke	**87**	Viridian green	O	/
35	Emerald green	T	Schmincke	**88**	Zinc white	O	Maimeri
36	Grass green	T	Schmincke	**89**	Viridian green	O	/
37	Brown red	T	Schmincke	**90**	Ivory black	O	Maimeri
38	Gold ochre	T	Schmincke	**93**	Prussian blue	/	Watteau
39	Brick red	T	Schmincke	**94**	Carmine alizarine red on alumina	O	Lefranc & Bourgeois
40	Burnt sienna	T	Schmincke	**95**	Burnt sienna	/	Paillard
41	Chinese orange	/	Winsor & Newton	**96**	/	/	/
42	Permanent green	/	Winsor & Newton	**104**	/	/	/
43	Viridian green	T	Maimeri	**105**	Winsor violet	O	Winsor & Newton
44	Turquoise blue	T	Maimeri	**106**	/	/	/
45	Natural gray	T	Talens	**108**	/	/	/
46	White	T	Talens	**109**	/	/	/
47	Black	/	Talens	**113**	Prussian blue	/	Paillard
49	Burnt sienna	T	Maimeri	**114**	Carmine red light	/	Artum Color
50	Yellow ochre	T	Maimeri	**116**	Prussian blue	W	Winsor & Newton
51	Sienna	O	Maimeri	**118**	Burnt umber	W	Watteau
52	Opaque white	T	Maimeri	**119**	Viridian green	W	Winsor & Newton
53	Red ochre	T	Maimeri	**120**	Vermilion red	W	Watteau
54	Naples yellow	O	Maimeri	**121**	Natural sienna	W	Watteau
55	White	W	Maimeri	**123**	Mauve violet	W	Winsor & Newton
56	Vermilion red	A	Maimeri	**125**	Naples yellow	T	Maimeri
58	Cadmium yellow	O	Maimeri	**126**	Bright red	/	Paillard
59	Naples yellow light	O	Maimeri	**127**	Ivory black	W	Talens
60	Yellow	O	Maimeri	**128**	Natural sienna	T	Maimeri
61	Earth green	O	Maimeri	**129**	Chinese white	W	Winsor & Newton
62	Emerald green	O	Maimeri	**130**	Natural umber	T	Maimeri
63	Emerald green	O	Maimeri	**131**	Yellow ochre light	/	/
64	Earth green	/	Maimeri	**132**	Yellow ochre	T	Marabu
65	Yellow	O	Maimeri	**133**	Brown	T	Artum Color
66	Yellow ochre light	O	Maimeri	**134**	Burnt sienna	W	Winsor & Newton
67	Burnt sienna	O	Maimeri	**138**	/	O	Maimeri
68	Bitumen black	O	Maimeri	**141**	Vermilion red	A	Talens
69	Vermilion red of cadmium sulfide	O	Maimeri	**142**	Vermilion red light	W	Fontana
70	Green	/	/	**143**	/	/	/
71	Black	/	/	**144**	Chinese white	W	Winsor & Newton
72	Cadmium red medium	O	Maimeri	**145**	Chrome orange	W	Fontana
73	Vermilion red	O	Maimeri	**147**	Chinese white	W	Watteau
74	Burnt umber	O	Maimeri	**148**	Vermilion red	W	Winsor & Newton
75	Yellow ochre light	/	Maimeri	**149**	Ash green	W	Fontana
76	Zinc white	O	Maimeri	**150**	Yellow ochre	W	Winsor & Newton
77	Yellow ochre light	O	Maimeri	**151**	Burnt sienna	W	Winsor & Newton
				152	Yellow ochre	W	Talens

**)N=sample number; **) T=tempera; O=oil; W=watercolor; /= unidentifiable*

b) XRF measuring points on different color backgrounds on original paintings: a selection was made of 10 paintings present in the house museum, one per decade from the 1930s to his death for a total of approximately 220 measuring points (Table 2).

Table 2. List of analyzed paintings.

Numero inventario Fondazione	Immagine	Anno	Didascalia	Lustro
131		1934 - 1935	*La spagnola* olio su tela cm 91x71	VII-VIII
188		1935	*Autoritratto* olio su tela cm 26,5x18	VIII 1935-1939
172		inizio anni Quaranta	*La mano del Maestro* olio su tela cm 16,5x22,5	IX 1940-1944
65		1948	*Autoritratto con corazza* olio su tela cm 50x40	X 1945-1949
182		1954	*Castore con cavallo bianco* olio su tela cm 63,5x80	XI 1950-1954
145		1957	*Lungo l'Arno* olio su tela cm 43,5x53,5	XII 1955-1959
76		1964	*Due cavalli in riva al mare* olio su tela cm 100x80	XIII 1960-1964
44		1968	*Ritorno di Ulisse* olio su tela cm 59,5x80	XIV 1965-1969
53		1973	*La meditazione di Mercurio* olio su tela cm 65x50	XV 1970-1974
306		1975	*Il figliuol prodigo* olio su tela cm 100x70	XVI 1975-1978

2.2. METHODS

The instrument used for the in situ analyzes on the paintings was assembled by the Technical Services Center of the University of Camerino in 2015 and consists of the compact Amptek Mini-X X-ray source (silver anode) and a Thermoelectrically cooled Si-PIN solid state detector, model XR-100CR from Amptek. Two thin converging laser beams identify a focus point which identifies the analysis point and the correct measurement distance. The measurement conditions used for the source are V=35 kV and I=70 μA for an overall integration time t = 60 s. The measurement area has a diameter of 1 mm.

The analyzes on the color samples from the atelier tubes were analyzed with an XRF spectrometer ST1 Titan model 800 or S1 Titan 800 handheld XRF analyzer (Bruker, graphene window detector SDD, 20 mm^2 active area typical resolution, excitation source: Rh target X-ray tube, 4W, 6-50 kV, 5-200 μA, spot size: 8 mm standard, elemental range: Mg – U).

3. RESULTS AND DISCUSSION

Thanks to the acquired database of the elemental characterization of the colors used by the artist in the last 30 years of his activity, it was possible to make some considerations on the identification of materials markers used by the artist, so that in the future it will be possible to carry out new analyzes on other paintings by the artist, aimed at searching for certain chemical elements, even minor ones, which correspond to those found in the palette in his atelier in Rome.

The presence of bromine was detected. Indeed, this element was identified on four measuring points on the panel with inventory number 306, entitled *The Prodigal Son*, in the lower left part, respectively in the points indicated as 01.10, 01.1, 01.12 and 01.13, as shown in the detail of the painting (Fig. 3).

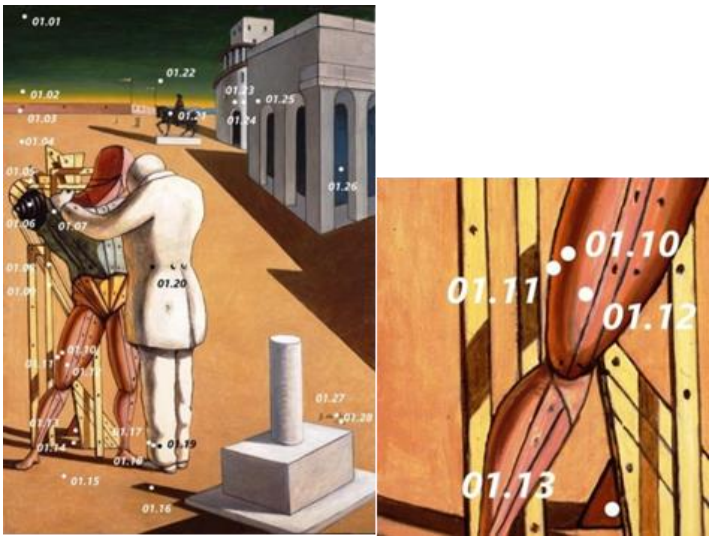

Figure 3. Il figliuol prodigo (The Prodigal Son), 1975, Oil on canvas (100x70 cm)

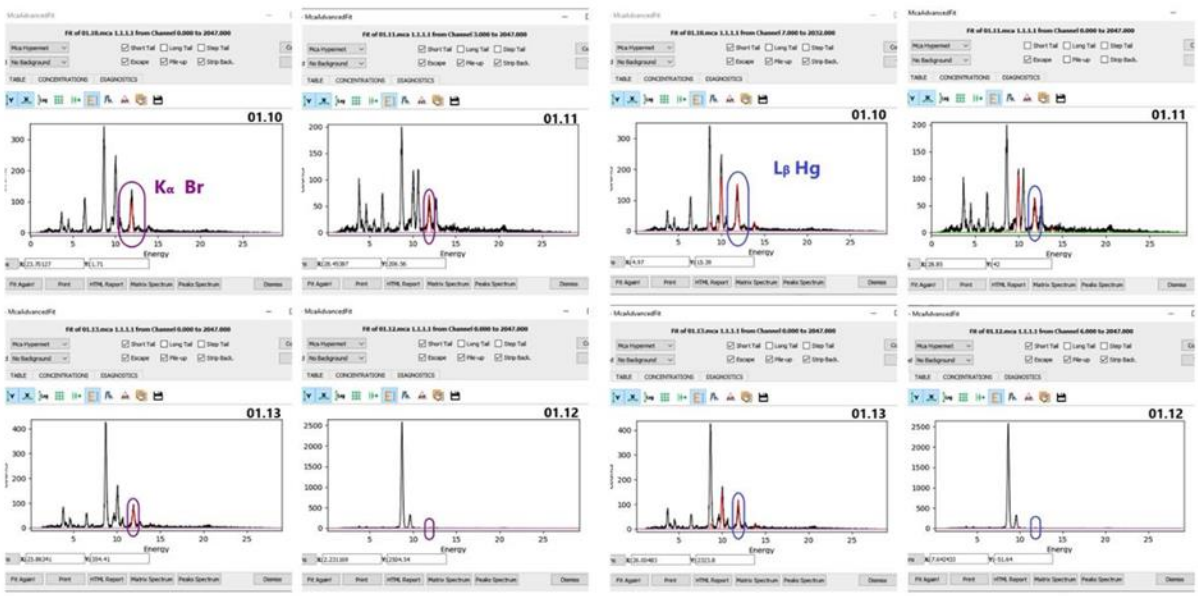

Figure 4. XRF spectra of points 01.10 – 01.11 – 01.12 – 01.13

The presence of bromine (Fig. 4) in the red background indicates that a color based on 6,6'- dibromoindigo (Purple) was most likely used and it was detected in the "alpine pink" sample tube30 where, indeed, the presence of only bromine is shown in the spectrum (Fig. 5). While the characteristic K_β of this element is also clearly visible in the color in the tube, in the analyzes carried out directly in points 01.10, 01.1, 01.12 and 01.13 on the panel, this signal was not identified, due to the small quantity of bromine present.

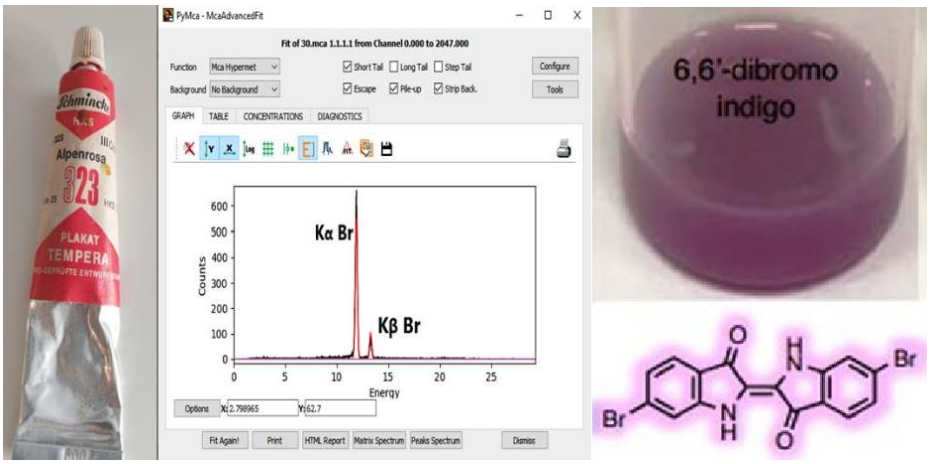

Figure 5. Sample 30 "Alpine Rose", XRF spectra of points 01.10 – 01.11 – 01.12 – 01.13, 6,6'-indigo dibromine.

In the painting with inventory number 65, *Self-Portrait with Armor* (Fig. 6), selenium wasidentified in a red background inside the ear (point 05.09). The presence of this element can be associated with cadmium red.

Among the color samples in tubes present in the Piazza di Spagna studio, there is a medium cadmium red (sample 72) in which were found both selenium, cadmium and sulphur, constituent elements of this pigment (Fig. 7).

Figure 6. Autoritratto con corazza) Self-portrait with Armor), 1948, Oil on canvas (50x40 cm)

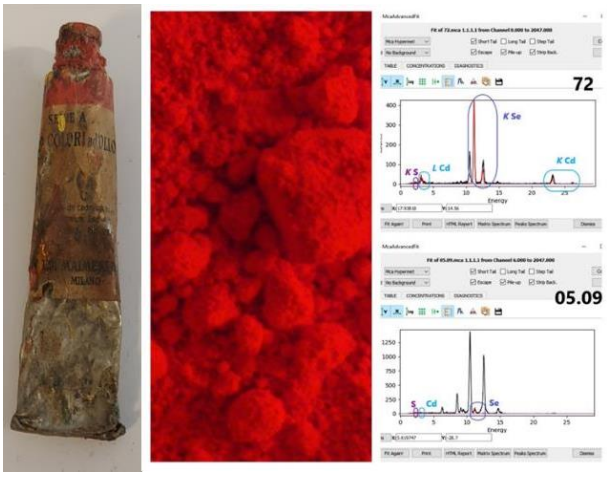

Figure 7. Sample 72 "Medium Cadmium Red", Point 05.09

From the XRF spectrum performed on this sample, it was found Se:Cd ratio was 8:1 (ratio between the intensities of the Kα lines of the two elements). Given the minimal presence of selenium detected in the analyzed point on the painting, the absence of the cadmium signal is justified into the measuring point. This is clearly visible from the relative spectra. Cadmium Red is a pigment with a very bright appearance. It is a cadmium sulfoselenide, CdS(Se), or a mixture of sulfide and cadmium selenide with a Cd content between 15 and 30%. The pigments formed are therefore solid solutions between selenium sulphide and cadmium sulphide. In fact, there is a whole series of sulfoselenides between CdS and CdSe, with shades from yellow to orange to red. Their use, both as oil paints and watercolors, exploded after 1840. In the painting entitled *"The Spanish Woman"* (Fig. 8) the presence of cobalt and arsenic was detected.

Figure 8. La Spagnola (1934/35) (The Spanish Woman) (91x71 cm)

Cobalt, as a blue pigment, is present in Cerulean Blue, a cobalt stannate [$CoO \cdot nSnO_2$], known since the beginning of the nineteenth century, and in Cobalt Blue, a cobalt aluminate [$CoO \cdot Al_2O_3$]. Since the presence of tin was not detected, the use of Cobalt Blue is assumed to be used here. As green pigment, cobalt is present in Cobalt Green, a mixture of zinc and cobalt oxides [CoO+ZnO], also known as Zinc Green or Rinnan Green, which was introduced to the market towards the second half of the 19th Century. In the points investigated in the green field corresponding to points 10.04, 10.11a and 10.12, the presence of both cobalt and zinc was detected; therefore, it can be said that this very pigment was used. As regards the presence of arsenic, this is the characteristic element of two green pigments: Scheele Green and Emerald Green. They may belong to colors used by de Chirico prior to the Roman period, because it was no longer marketed with arsenic. In fact, this element was not found in any of the tube colors present in Piazza di Spagna, nor in the other paintings analyzed in the museum house. The presence, therefore, of arsenic on this painting from the 1930s allows to certainly date its creation to the time when greens containing arsenic were still available.

Another chemical element detected was tungsten in some of the tube colors present in the atelier (tubes no. 31, 32, 42, 65, 82 and 123). This is an interesting fact to highlight, since tungsten compounds are not widely used as pigments, despite the strong coloring of the minerals present in nature. Deposits are not abundant, and the most common mineral, wolframite (Fe, Mn) WO_4 (iron, manganese tungstate), occurs in association with tin ores, but was not easily separated from them until the late 19th century. Although naturally occurring materials have not yet been recognized as pigments, synthetic analogues have been documented. It is known and reported that barium, cadmium, calcium, cobalt, lead and tin tungstates have been used as pigments. Barium tungstate is tungsten white; calcium tungstate is tungsten yellow, and tungsten blue is an oxide (W_3O_8). Tin-tungstate is also known as Thessié blue. Tungstite or tungstic ocher (WO_3) is an earthy deposit associated with surface erosion of tungsten-rich mineral deposits. It is bright yellow or yellow green in color and is potentially a component of yellow ocher, although no identifications have been made. Although the presence of tungsten was not detected in the 10 paintings analyzed, the possible presence of this element in other paintings by the master (made at least in the last period of his life) should be highlighted given the presence of such colors in his atelier. In Fig. 9 are listed the potential tungsten pigments that may have been used in the formulation of the commercial colors used by the Master.

Figure 9. Tungsten commercial pigments

Another noteworthy finding concerns the tube indicated with the number 44, where the co-presence of copper and bromine was found (Fig. 10).

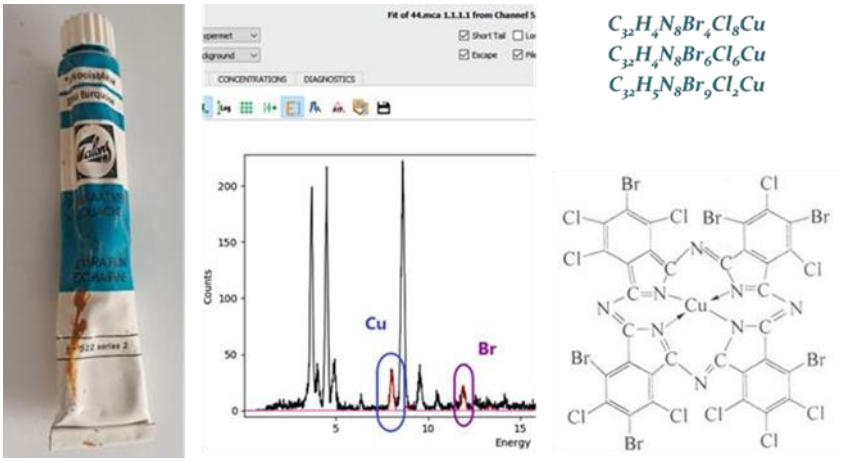

Figure 10. Sample 44" Turquoise Blue", XRF spectrum, Phthalocyanin Green

This indicates the presence of Phthalocyanine Green. Phthalocyanine is a heterocyclic compound whose chemical structure has a central cavity capable of binding hydrogen ions or metal cations through very strong bonds between the ion and the four nitrogen atoms. There are three different compounds with this name. They are synthetic compounds used as dyes since the 1930s, which mostly cover the color spectrum of green and blue.

4. CONCLUSIONS

A scientific investigation, never conducted on the materials used by the Master, has been presented here with a systematic characterization of the chemical elements in the colors used by the Master. The database (Table 3) of colors in the tubes in the studio, where he has been carried out for the last thirty years of his life, represents a unicum for the study of the great artist, but above all it constitutes a first step towards more in-depth investigations

regarding the materials used, the way in which he prepared the paint pastes, their behavior over time, also allowing to delve deeper into the causes and methods of degradation of the colors and, through further analyzes directly on the paintings, such data will also be able to provide useful elements for the identification of any falsifications or attribution confirmations.

Table 3. XRF Analysis Data

N.	Labels			Elements	Lines	Peaks area	Mass fraction
18	Ivory black	O	Talens	Ca	*K*	2.41E+03	0.0006035
				Fe	*K*	2.23E+02	6.54E-06
				Cu	*K*	4.15E+01	1.00E-06
				Zn	*K*	1.41E+02	3.23E-06
				Ti, Cr, Mn, Ni, Pb, Sr, Mo, Rh, In			m.e
23	Carmin lake red	O	/	S	*K*	5.00E+07	0.0003019
				Ca	*K*	2.55E+08	4.56E-02
				Cu	*K*	5.68E+07	1.36E-03
				Zn	*K*	5.10E+07	1.16E-03
				Sr	*K*	1.23E+09	3.56E-02
				Ba	*L*	5.11E+09	0.0004319
				Pb	*L*	5.22E+08	2.82E-02
				Fe, Ni, Zr, Mo, Rh, Cd, Sn, In, Nd			m.e.
25	Lemon yellow	T	Schmincke	S	*K*	6.41E+07	107.9
				Ca	*K*	1.80E+08	7.176
				Cr	*K*	1.45E+06	0.007035
				Zn	*K*	1.72E+08	0.5322
				Sr	*K*	2.83E+09	8.391
				Ba	*L*	5.74E+09	31.6
				Fe, Ni, Cu, Mo, Rh, In, Nd			m.e.
26	Pure yellow	T	Schnincke	Ca	*K*	1.57E+07	2.81E-03
				Cr	*K*	1.07E+07	3.01E-04
				Zn	*K*	8.50E+08	1.93E-02
				Sr	*K*	3.00E+09	8.69E-02
				Ba	*L*	7.10E+09	0.0006006
				Fe, Ni, Cu, Mo, Rh, In, Sn			m.e.
27	Orange yellow	T	Schmincke	Ca	*K*	1.09E+09	0.0001944
				Cr	*K*	1.45E+07	4.08E-04
				Fe	*K*	4.56E+07	7.07E-04
				Zn	*K*	1.38E+08	3.14E-03
				Sr	*K*	6.58E+08	1.91E-02
				Ba	*L*	3.26E+09	0.0002761
				Ni, Zr, Mo, Rh, In, Sn, Nd			m.e.
28	Orange red	T	Schmincke	Ca	*K*	1.56E+09	0.0002792
				Cr	*K*	5.04E+06	1.43E-04
				Fe	*K*	4.88E+07	7.57e-07
				Zn	*K*	3.49E+07	7.91e-07
				Sr	*K*	2.99E+08	8.69E-03
				Ba	*L*	2.69E+09	0.0002276
				Ni, Cu, Zr, Mo, Rh, In, Sn, Nd			m.e.
29	Flesh pink	T	Schmincke	Ca	*K*	8.18E+02	0.000146
				Zn	*K*	2.06E+04	0.0004663
				Sr	*K*	3.14E+02	9.10E-06
				Ba	*L*	4.98E+03	0.0004213
				Fe, Ni, Zn, Rb, Rh, Nd			m.e.
30	Alpine pink	T	Schmincke	Br	*K*	1.18E+10	0.0004446
				Ca, Ba, Cr, Mn, Fe, Ni, Cu, Zn, Mo, Rb,			m.e.
31	Ruby red	T	Schmincke	Ca	*K*	2.56E+08	4.57E-02
				Fe	*K*	1.36E+08	2.10E-03
				Sr	*K*	3.50E+08	1.02E-02
				Ba	*L*	1.90E+09	0.0001604
				W	*L*	2.22E+09	9.41E-02
				S, Cl, Ni, Cu, Mo, Rh, In, Sn			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
32	Madder pink	T	Schmincke	Ca	*K*	7.82E+08	0.0001395
				Sr	*K*	2.03E+08	5.90E-03
				Mo	*K*	2.73E+08	6.08E-03
				Ba	*L*	9.19E+08	7.77E-02
				W	*L*	4.13E+09	0.000175
				Fe, Ni, In, Sn, Nd			m.e.
35	Emerald green	T	Schmincke	Ca	*K*	6.54E+02	0.0001168
				Cu	*K*	2.74E+02	6.54E-06
				Zn	*K*	4.60E+03	0.0001041
				Sr	*K*	3.32E+02	9.64E-06
				Ba	*L*	1.76E+03	0.0001489
				Fe, Ni, Cu, Zn, Zr, Mo, Rh, In, Nd			m.e.
36	Grass green	T	Schmincke	Ca	*K*	9.53E+08	0.0001702
				Cu	*K*	2.21E+07	5.27e-07
				Zn	*K*	3.10E+09	7.01E-02
				Sr	*K*	4.43E+08	1.29E-02
				Ba	*L*	2.56E+09	0.0002168
				Fe, Ni, Zn, Zr, Mo, Rh, In, Sn, Nd			m.e.
37	Brown red	T	Schmincke	Ca	*K*	1.98E+03	0.0003528
				Fe	*K*	1.42E+04	0.0002196
				Ti, Cr, Mn, Ni, Cu, Zn, Bi, Rb, Mo, Rh, In			m.e.
38	Gold ochre	T	Schmincke	Ca	*K*	1.03E+03	0.0001841
				Fe	*K*	7.92E+03	0.0001228
				Ti, Cr, Mn, Ni, Cu, Rb, Mo, Rh, In			m.e.
39	Brick red	T	Schmincke	Ca	*K*	1.22E+03	0.0002183
				Fe	*K*	8.89E+03	0.0001378
				Ba, Cr, Mn, Ni, Cu, Zn, Rb, Mo, Rh, In			m.e.
40	Burnt sienna	T	Schmincke	Ca	*K*	4.72E+02	8.43E-05
				Fe	*K*	5.63E+03	8.73E-05
				Zn	*K*	4.26E+02	9.65E-06
				Ba, Cr, Mn, Ni, Cu, As, Rb, Mo, Rh, In,			m.e.
41	Chinese orange	/	Winsor &Newton	Cr	*K*	2.07E+07	0.0005864
				Sr	*K*	1.96E+09	0.05688
				Ba	*L*	6.38E+09	0.0005404
				Ca, Fe, Ni, Cu, Zn, Mo, Rh, In, Nd			m.e.
42	Permanent green	/	Winsor &Newton	Cr	*K*	2.92E+07	0.0008264
				Sr	*K*	2.42E+08	0.007044
				Mo	*K*	7.15E+08	0.01594
				Ba	*L*	1.94E+09	0.0001647
				W	*L*	1.09E+09	0.04619
				Ca, Fe, In, Sn, Nd			m.e.
43	Viridian green	T	Maimeri	Fe	*K*	6.40E+08	9.92E-03
				Cu	*K*	4.01E+08	9.59E-03
				Zn	*K*	2.52E+09	5.70E-02
				Sr	*K*	3.75E+08	1.09E-02
				Ba	*L*	1.98E+09	0.0001678
				Pb	*L*	3.94E+09	0.000213
				Ca, Ni, Sr, Mo, Rh, In, Nd			m.e.
44	Turquoise blue	T	Maimeri	Ca	*K*	2.98E+03	0.0005327
				Ti	*K*	3.15E+03	0.0002026
				Fe	*K*	1.20E+02	1.86E-06
				Cu	*K*	4.06E+02	9.70E-06
				Zn	*K*	3.58E+03	8.10E-05
				Br	*K*	4.07E+02	1.53E-05
				Pb	*L*	3.81E+02	2.06E-05
				Ba, Sr, Mo, Rh			m.e.
45	Natural gray	T	Talens	Ca	*K*	1.98E+09	0.0003532
				Ti	*K*	6.64E+09	0.0004269
				Cr	*K*	1.30E+08	3.68E-03
				Fe	*K*	6.24E+07	9.67E-04
				Cu	*K*	4.31E+07	1.03e-06
				Pb	*L*	5.91E+08	3.19E-02
				Zn, Mo, Rh			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
46	White	T	Talens	Zn	*K*	1.80E+04	0.0004065
				Sr	*K*	7.39E+02	2.14E-05
				Ba	*L*	7.16E+03	0.0006054
				Fe, Ni, Rh, In			m.e.
47	Black	/	Talens	S	*K*	1.70E+08	0.001025
				Ca	*K*	4.27E+08	0.07614
				Cr	*K*	7.60E+09	0.0002147
				Fe	*K*	1.41E+08	0.002191
				Cu	*K*	1.49E+09	3.57E-02
				Pb	*L*	1.29E+10	0.0006977
				Ti, Ni, Mo, Rh, Sn			m.e.
49	Burnt sienna	T	Maimeri	Fe	*K*	1.24E+04	0.0001916
				Pb	*L*	4.77E+03	0.0002573
				Ca, Ti, Cr, Mn, Ni, Rb, Mo, Rh, Sn			m.e.
50	Yellow ochre	T	Maimeri	Ca	*K*	1.30E+08	2.32E-02
				Fe	*K*	1.45E+10	0.0002245
				Sr	*K*	2.74E+08	7.95E-03
				Ba	*L*	1.64E+09	0.0001388
				Pb	*L*	2.55E+09	0.0001374
				Ni, Cu, Se, Rb, Mo, Rh, Cd, In, Nd			m.e.
51	Sienna	O	Maimeri	Mn	*K*	6.48E+08	1.35E-02
				Fe	*K*	3.68E+10	0.0005711
				Pb	*L*	9.11E+08	4.92E-02
				K, Ca, Ti, Cr, Mo, Rh, In			m.e.
52	Opaque white	T	Maimeri	Ti	*K*	1.20E+04	0.000772
				Zn	*K*	3.22E+02	7.29E-06
				Ca, Cr, Mn, Fe, Ni, Cu, Nb, Mo, Rh, In			m.e.
53	Red ochre	T	Maimeri	Fe	*K*	9.44E+03	0.0001464
				Ba	*L*	9.89E+02	8.37E-05
				Pb	*L*	1.77E+03	9.58E-05
				Ca, Ni, Cu, Zn, Sr, Mo, Rh, In, Nd			m.e.
54	Naples yellow	O	Maimeri	Fe	*K*	6.49E+02	1.01E-05
				Zn	*K*	5.74E+04	0.001301
				Ca, Ti, Cr, Mn, Ni, Cu, Pb, Rh, In			m.e.
55	White	W	Maimeri	Ti	*K*	2.41E+03	0.0001547
				Pb	*L*	1.02E+04	0.0005508
				Ba, Fe, Ni, Cu, Sr, Zr, Mo, Rh, Sn,			m.e.
56	Vermilion red	W	Maimeri	S	*K*	3.98E+08	0.002402
				Zn	*K*	4.11E+09	9.30E-02
				Hg	*L*	4.47E+10	0.002599
				Ca, Ti, Cr, Mn, Fe, Ni, Cu, Pb, Rb, Mo,Rh, In, Sn			m.e
58	Cadmium yellow	O	Maimeri	Zn	*K*	1.05E+10	0.0002378
				Sr	*K*	2.46E+08	7.13e-06
				Cd	*L*	1.03E+09	0.0006378
				Ba	*L*	8.79E+08	7.44E-02
				Pb	*L*	3.95E+09	0.000213
				S, Cr, Fe, Ni, Cu, Mo, Rh, In, Sn, Nd			m.e
59	Naples yellowlight	O	Maimeri	Fe	*K*	1.18E+03	1.84E-05
				Zn	*K*	1.14E+05	0.00259
				Ti, Cr, Ni, Rh, In			m.e.
60	Yellow	O	Maimeri	Ni	*K*	2.92E+09	0.05843
				Se	*K*	1.94E+08	0.008246
				Cd	*K*	9.79E+07	0.005013
				Pb	*L*	8.68E+08	0.04686
				Ca, Ba, Cr, Mn, Fe, Sr, Mo, Rh, In, Sn			m.e.
61	Earth green	O	Maimeri	S	*K*	1.12E+02	0.0006761
				K	*K*	1.65E+02	5.99E-05
				Fe	*K*	4.43E+03	6.87E-05
				Pb	*L*	6.71E+03	0.0003621
				Ca, Ti, V, Cr, Mn, Ni, Cu, Zn, Pb, Zr, Mo,Rh, Cd, In, Sn			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
62	Emerald green	O	Maimeri	V	*K*	4.28E+08	3.62e+01
				Cr	*K*	3.60E+10	1.89e+02
				Fe	*K*	2.78E+08	1.81e+01
				Pb	*L*	2.74E+09	5.29e+01
				Ca, Ti, Ni, Sr, Mo, Rh, In			m.e.
63	Emerald green	O	Maimeri	V	*K*	1.30E+08	2.37e+01
				Cr	*K*	1.62E+10	1.25e+02
				Fe	*K*	6.54E+07	8.42e+00
				Pb	*L*	4.34E+09	6.23e+01
				Ca, Ti, Ni, Zn, Bi, Mo, Sr, Rh, Sn			m.e.
64	Earth green	/	Maimeri	S	*K*	4.32E+07	6.52e+00
				K	*K*	1.13E+08	1.06e+01
				Fe	*K*	4.55E+09	6.69e+01
				Pb	*L*	2.69E+09	5.32e+01
				Ca, Ti, V, Cr, Mn, Ni, Cu, Zn, Rb, Mo,Rh, In, Sn			m.e.
65	Yellow	O	Maimeri	Ca	*K*	1.60E+08	2.85E-02
				Fe	*K*	1.35E+08	2.10E-03
				Mo	*K*	9.50E+08	2.12E-02
				Ba	*L*	3.74E+08	3.17E-02
				W	*L*	6.76E+09	0.0002863
				Pb	*L*	6.56E+09	0.0003542
				Ca, Ba, Cr, Mn, Fe, Yb, Cu, W, Pb, Sr,Mo, Rh, In			
66	Yellow ochre light	O	Maimeri	Ca	*K*	1.17E+03	0.0002092
				Fe	*K*	2.64E+03	4.09E-05
				Zn	*K*	8.59E+01	1.94E-06
				Sr	*K*	3.28E+02	9.51E-06
				Ba	*L*	1.53E+03	0.0001294
				S, Mn, Ni, Cu, Zr, Mo, Rh, In, Nd			m.e.
67	Burnt sienna	O	Maimeri	Ca	*K*	6.22E+08	0.000111
				Fe	*K*	4.87E+10	0.0007543
				Pb	*L*	3.00E+09	0.0001617
				Ti, V, Cr, Mn, Ni, Rb, Sr, Mo, Rh, In, Sn			m.e.
68	Bitumen black	O	Maimeri	S	*K*	4.36E+02	0.002635
				Pb	*L*	2.96E+04	0.001596
				Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Mo,Rh,Pd, Sn, In			m.e.
69	Vermilion red of cadmium sulfide	O	Maimeri	S	*K*	5.92E+01	0.0003573
				Zn	*K*	8.12E+01	1.84E-06
				Sr	*K*	5.57E+02	1.62E-05
				Cd	*L*	4.01E+02	0.0002488
				Ba	*L*	1.97E+03	0.0001669
				Hg	*L*	5.34E+03	0.0003106
				Fe, Ni, Cu, Mo, Rh, In, Sn, Nd			m.e.
70	Green	/	/	Cu	*K*	2.70E+08	6.44E-03
				Zn	*K*	2.73E+10	0.0006176
				Sr	*K*	7.51E+08	2.18E-02
				Ba	*L*	2.99E+09	0.0002531
				Pb	*L*	2.30E+09	0.0001242
				Fe, Ni, Cu, Zn, Rb, Rh, In, Nd			m.e.
71	Black	/	/	Ca	*K*	4.41E+08	7.87E-02
				Fe	*K*	1.32E+08	2.04E-03
				Zn	*K*	2.71E+08	6.13E-03
				Pb	*L*	1.34E+10	0.0007239
				Ti, Cr, Mn, Ni, Cu, Zn, Mo, Rh, Pd, Sn			m.e.
72	Cadmium red medium	O	Maimeri	S	*K*	1.16E+02	0.0006974
				Se	*K*	7.64E+03	0.0003249
				Cd	*L*	8.78E+02	0.0005447
				Pb	*L3*	3.72E+03	0.0003594
				Ca, Ba, Cr, Mn, Fe, Ni, Cu, Zn, Mo,Rh,Sn, In			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
73	Vermilion red	O	Maimeri	S	*K*	3.48E+02	0.002099
				Hg	*L*	4.12E+04	0.002396
				Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Hg, Pb, Rb,Mo, Rh, In			m.e.
74	Burnt umber	O	Maimeri	Ca	*K*	4.07E+08	7.27e-05
				Cr	*K*	6.63E+08	1.87E-02
				Mn	*K*	4.45E+09	9.28E-02
				Fe	*K*	3.72E+10	0.0005772
				Cu	*K*	1.64E+08	3.92e-06
				Pb	*L*	4.69E+08	2.53E-02
				Ti, V, Mn,Ni,Zn,As, Rb, Sr, Mo, Rh,In, Sn			m.e.
75	Yellow ochre light	/	Maimeri	Ca	*K*	2.29E+03	0.0004096
				Fe	*K*	1.07E+04	0.000166
				Zn	*K*	2.35E+03	5.31E-05
				Ba	*L*	1.35E+03	0.0001143
				Mn, Zn, Rb, Sr, Zr, Mo, Rh, In			m.e.
76	Zinc white	O	Maimeri	Zn	*K*	4.81E+04	0.00109
				Ca, Ti, Cr, Fe, Ni, Rh			m.e.
77	Yellow ochre light	O	Maimeri	Ca	*K*	1.88E+03	0.0003352
				Fe	*K*	4.39E+03	6.81E-05
				Zn	*K*	1.47E+02	3.32E-06
				Sr	*K*	5.93E+02	1.72E-05
				Ba	*L*	2.09E+03	0.0001765
				Ni, Cu, Mo, Rh, In, Nd			m.e.
78	Chrome yellow light	O	Maimeri	S	*K*	3.62E+08	0.002185
				Cr	*K*	2.36E+09	6.66E-02
				Zn	*K*	6.50E+08	1.47E-02
				Pb	*L*	4.49E+10	0.002426
				Ca, Ti, Fe, Ni, Cu, Mo, Pd, Cd, Sn			m.e.
79	Burnt umber	O	Maimeri	Ca	*K*	9.05E+02	0.0001616
				Cr	*K*	6.15E+02	1.74E-05
				Mn	*K*	2.17E+03	4.52E-05
				Fe	*K*	1.25E+04	0.000193
				Pb	*L*	7.91E+02	4.27E-05
				Ti, V, Ni, Cu, Zn, Rb, Sr, Mo, Rh, In			m.e.
80	Burnt sienna	O	Maimeri	Ca	*K*	7.33E+08	0.0001309
				Fe	*K*	2.52E+10	0.0003902
				Pb	*L*	2.59E+08	1.40E-02
				Ti, Cr, Mn, Ni, Cu, Sr, Mo, Rh, In			m.e.
81	Naples yellow	O	Maimeri	Fe	*K*	1.35E+03	2.09E-05
				Zn	*K*	1.13E+05	0.002549
				Ca, Ti, Cr, Ni, Cu, Se, Rh, Cd, In			m.e.
82	Rose brown	/	Maimeri	Ca	*K*	2.40E+03	0.0004284
				Fe	*K*	8.43E+01	1.31E-06
				Sr	*K*	2.44E+02	7.08E-06
				Mo	*K*	2.58E+02	5.75E-06
				W	*L*	8.00E+02	3.39E-05
				Ba, Cr, Mn, Yb, Cu, Se, Zr, Rh, In			m.e.
83	Yellow of ZnO e CdS	O	Maimeri	Ti	*K*	1.72E+03	0.0001104
				Zn	*K*	8.55E+04	0.001937
				V, Cr, Fe, Ni, Cu, Se, Rh, Cd			m.e.
84	Yellow roman ochre	/	Schmincke	Ca	*K*	5.03E+08	8.98E-02
				Fe	*K*	3.64E+10	0.000564
				Zn	*K*	1.19E+09	2.69E-02
				Hg	*L*	9.75E+08	5.67E-02
				Pb	*L*	5.00E+08	2.70E-02
				Ti, V, Cr, Mn, Ni, As, Rb, Mo, Rh, In, Sn			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
85	Umber	O	Maimeri	Ca	*K*	6.79E+08	0.0001212
				Cr	*K*	9.89E+08	2.79E-02
				Mn	*K*	3.37E+09	7.03E-02
				Fe	*K*	2.49E+10	0.000386
				Cu	*K*	1.42E+08	3.39E-03
				Zn	*K*	1.64E+08	3.71E-03
				Sr	*K*	2.50E+08	7.25E-03
				Ba	*L*	8.93E+07	7.56E-03
				Pb	*L*	5.45E+09	0.0002941
				Ti, V, Ni, Pb, Rb, Zr, Mo, Rh			m.e.
86	Yellow ochre	O	Maimeri	Ca	*K*	1.60E+03	0.0002851
				Fe	*K*	8.30E+03	0.0001287
				Ba	*L*	6.02E+01	5.10E-06
87	Viridian green	O	/	Cu	*K*	1,26E+08	3.02E-03
				Zn	*K*	1,30E+10	0.0002932
				Sr	*K*	3,09E+08	8.98E-03
				Ba	*L*	1,41E+09	0.0001195
				Pb	*L*	1,33E+09	7.18E-02
				Fe, Ni, Rb, Rh, In, Nd			m.e.
88	Zinc white	O	Maimeri	Zn	*K*	7.50E+04	0.001698
				Ca, Ti, Cr, Fe, Ni, Rh			m.e.
89	Viridian green	O	/	Cu	*K*	5.93E+08	1.42E-02
				Zn	*K*	2.71E+10	0.0006135
				Sr	*K*	6.64E+08	1.93E-02
				Ba	*L*	2.98E+09	0.0002518
				Pb	*L*	1.47E+09	7.96E-02
				Fe, Ni, Cu, Rb, Rh, In			m.e.
90	Ivory black	O	Maimeri	Ca	*K*	2.37E+09	0.0004227
				Cr	*K*	8.84E+07	2,50E-03
				Fe	*K*	6.84E+08	1.06e-05
				Zn	*K*	1.01E+08	2,29E-03
				Hg	*L*	8.19E+08	4,76E-02
				Pb	*L*	3.41E+08	1,84E-02
				Cl, Ti, Mn, Ni, Cu, Br, Mo, Rh, Sn			m.e.
93	Prussian blue	/	Watteau	Fe	*K*	1.42E+04	0.0002196
				Zn	*K*	2.33E+02	5.27E-06
				Pb	*L*	1.43E+04	0.0007717
				K, Ca, Ti, Cr, Mn, Ni, Cu, Rb, Mo, Rh, Sn			m.e.
94	Carmine alizarine red on alumina	O	Lefranc & Bourgeois	S	*K*	3.87E+07	0.0002337
				Ca	*K*	2.79E+08	4,97E-02
				Fe	*K*	2.47E+08	3,82E-03
				Co	*K*	2.10E+08	2,62E-03
				Pb	*L*	2.42E+09	0.0001306
				Ti, Cr, Mn, Ni, Cu, Zn, Mo, Rh, In, Sn			m.e.
95	Burnt sienna	/	Paillard	Ca	*K*	5.13E+08	9,15E-02
				Fe	*K*	1.57E+10	0.0002428
				Zn	*K*	2.27E+08	5,15E-03
				Pb	*L*	8.34E+09	0.0004501
				Ti, V, Cr, Mn, Ni, Cu, Rb, Sr, Mo, Rh, In, Sn			m.e.
96	/	/	/	V	*K*	2.98E+08	1,27E-02
				Cr	*K*	2.55E+10	0.0007203
				Ca, Ti, Fe, Ni, Cu, Zn, Pb, Bi, Br, Mo, Rh, In, Sn			m.e.
104	/	/	/	Ca	*K*	2.27E+03	0.0004053
				Fe	*K*	4.26E+02	6.61E-06
				Zn	*K*	2.59E+04	0.0005868
				Ti, V, Cr, Mn, Ni, Cu, As, Kr, Rh, In			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
105	Winsor violet	O	Winsor &Newton	S	*K*	1.73E+07	0.0001042
				Ti	*K*	3.53E+07	2.27e-06
				Fe	*K*	1.49E+08	2.31e-06
				Ni	*K*	6.42E+07	1,28E-03
				Cu	*K*	7.03E+07	1,68E-03
				Zn	*K*	8.21E+08	1.86e-05
				Pb	*L*	3.26E+08	1,76E-02
				Ca, Ba, Cr, Mn, Mo, Rh, In, Sn			m.e.
106	/	/	/	S	*K*	1.93E+08	0.001165
				Ni	*K*	3.10E+08	6,20E-03
				Cu	*K*	3.09E+08	7.38e-06
				Zn	*K*	1.97E+07	4,46E-04
				Hg	*L*	2.56E+10	0.00149
				Pb	*L*	8.53E+08	4,60E-02
				Ca, Ti, Cr, Mn, Fe, Ni, Mo, Rh, In			m.e.
108	/	/	/	S	*K*	3.98E+08	0.002403
				Cr	*K*	4.08E+08	1,15E-02
				Pb	*L*	2.63E+10	0.001421
				Ca, Ti, Fe, Ni, Cu, Mo, Rh, Pd, Sn			m.e.
109	/	/	/	Fe	*K*	6.13E+08	9,50E-03
				Zn	*K*	7.94E+10	0.001799
				Pb	*L*	1.02E+09	5,51E-02
				Ca, Ti, Cr, Mn, Ni, Cu, Rh, In			m.e.
113	Prussian blue	/	Paillard	Ca	*K*	2.31E+09	0.0004118
				Fe	*K*	4.14E+09	6,41E-02
				Ni	*K*	8.78E+07	1,76E-03
				Cu	*K*	2.85E+09	6,82E-02
				Zn	*K*	2.31E+08	5,23E-03
				Sr	*K*	2.48E+08	7,19E-03
				Pb	*L*	1.19E+10	0.0006402
				Ti, Cr, Mn, Ni, Zr, Mo, Rh, In			m.e.
114	Carmine red light	/	Artum Color Baltimora	Fe	*K*	5.24E+07	8,12E-04
				Zn	*K*	9.83E+08	2,23E-02
				Sr	*K*	5.70E+08	1,65E-02
				Ba	*L*	2.43E+09	0.0002058
				Pb	*L*	1.84E+08	9,92E-03
				Ca, Ni, Mo, Rh, In, Nd			m.e.
116	Prussian blue	W	Winsor &Newton	Ca	*K*	9.37E+02	0.0001673
				Fe	*K*	2.81E+04	0.000436
				Zn	*K*	5.15E+02	1.17E-05
				Ti, Cr,Mn,Ni, Cu, As,Rb, Sr,No, Rh,In, Sn			m.e.
118	Burnt umber	W	Watteau	S	*K*	2.47E+08	0.001489
				Mn	*K*	9.25E+08	1,93E-02
				Fe	*K*	7.40E+09	0.0001147
				Pb	*L*	1.91E+10	0.001029
				Ca, Ti, V, Cr, Ni, Cu, Rb, Sr, Mo, Rh, Pd,Cd, In			m.e.
119	Viridian green	W	Winsor &Newton	Cr	*K*	3.12E+03	8.81E-05
				Ca, Ti, V, Fe, Ni, Cu, Zn, Bi, Br, Kr, Mo,Rh, In, Sn			m.e.
120	Vermilion red	W	Watteau	S	*K*	1.43E+08	0.0008646
				Hg	*L*	1.27E+10	0.0007404
				Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Pb, Zr, Mo, Rh, Pd, Sn			m.e.
121	Natural sienna	W	Watteau	S	*K*	3.35E+02	0.002023
				Cr	*K*	6.24E+02	1.76E-05
				Mn	*K*	4.69E+01	9.77E-07
				Fe	*K*	1.66E+04	0.0002575
				Pb	*L*	3.80E+04	0.002051
				Ca, Ti, Cr, Ni, Cu, Pb, Rb, Mo, Rh, In			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
123	Mauve violet	W	Winsor &Newton	Ca	*K*	1.99E+03	0.000355
				Fe	*K*	2.44E+02	3.79E-06
				Sr	*K*	3.08E+02	8.94E-06
				Mo	*K*	2.70E+02	6.01E-06
				W	*L*	4.22E+03	0.0001788
				Ti, Cr, Mn, Cu, As, Sr, In			m.e.
125	Naples yellow	T	Maimeri	Ca	*K*	3.39E+08	6,05E-02
				Cr	*K*	3.56E+07	1,01E-03
				Fe	*K*	2.56E+08	3.96e-06
				Zn	*K*	4.27E+07	0,0009658
				Sr	*K*	1.72E+08	5,00E-03
				Ba	*L*	1.57E+09	0.0001328
				Pb	*L*	1.39E+09	7,49E-02
				Ni, Mo, Rh, In, Nd			m.e.
126	Bright red	/	Paillard	Ca	*K*	2.02E+09	0.0003601
				Fe	*K*	7.66E+07	1,19E-03
				Zn	*K*	8.03E+08	1,82E-02
				Sr	*K*	2.01E+08	5,84E-03
				Pb	*L*	1.88E+09	0.0001014
				Ti, Cr, Mn, Fe, Cu, W, As, Mo, In			m.e.
127	Ivory black	W	Talens	S	*K*	2.93E+02	0.001769
				Ca	*K*	1.11E+03	0.0001987
				Fe	*K*	2.00E+03	3.11E-05
				Sr	*K*	3.05E+02	8.86E-06
				Pb	*L*	2.47E+04	0.001334
				Ti, Cr, Mn, Cu, Zn, Zr, Mo, Rh, In			m.e.
128	Natural sienna	T	Maimeri	Ca	*K*	8.54E+07	1,52E-02
				Cr	*K*	6.36E+08	1,80E-02
				Fe	*K*	7.56E+09	0.0001172
				Zn	*K*	9.14E+07	2.07e-06
				Hg	*L*	1.01E+08	5,88E-03
				Pb	*L*	2.75E+08	1,48E-02
				Ba, Mn, Ni, Cu, As, Br, Rb, Mo, Rh, In			m.e.
129	Chinese white	W	Winsor &Newton	Zn	*K*	6.81E+04	0.001542
				Pb	*L*	1.57E+03	8.49E-05
				Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Rh, Pd, In			m.e.
130	Natural umber	T	Maimeri	S	*K*	1.59E+02	0.0009591
				Ca	*K*	2.22E+02	3.96E-05
				Cr	*K*	3.50E+03	9.89E-05
				Mn	*K*	2.06E+03	4.29E-05
				Fe	*K*	1.10E+04	0.0001703
				Pb	*L*	5.60E+03	0.0003022
				Ti, V, Ni, Cu, Zn, Br, Rb, SR, Mo, Rh, In			m.e.
131	Yellow ochre light	/	/	Ca	*K*	4.52E+02	8.06E-05
				Fe	*K*	1.61E+04	0.0002495
				Sr	*K*	2.07E+02	6.01E-06
				Ba	*L*	1.11E+03	9.37E-05
				Pb	*L*	1.89E+03	0.0001019
				Ba, Ni, Cu, Rb, Mo, Rh, In, Nd			m.e.
132	Yellow ochre	T	Marabu	Ca	*K*	4.26E+08	0,07604
				Cr	*K*	3.37E+06	9,524E-05
				Zn	*K*	5.55E+09	0.0001257
				Ba	*L*	5.26E+08	0,04456
				Pb	*L*	4.79E+08	0,02586
				Fe, Ni, Sr, Zr, Mo, Rh, In, Nd			m.e.
133	Brown	T	Artum Color Baltimora	Fe	*K*	1.07E+10	0.0001661
				Ba	*L*	4.29E+08	3,63E-02
				Pb	*L*	3.23E+09	0.0001744
				Ca, Mn, Ni, Cu, Zn, Rb, Sr, Mo, Rh, In,Sn, Nd			m.e.
134	Burnt sienna	W	Winsor &Newton	Fe	*K*	4.24E+10	0.0006575
				As	*K*	1.89E+09	8,76E-02
				Pb	*L*	7.46E+08	4,03E-02
				Ca, Ti, Cr, Mn, Ni, Rb, Mo, Rh, In, Sn			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
138	/	O	Maimeri	S	*K*	9.93E+07	0.0005992
				Ca	*K*	1.12E+09	0.0001995
				Fe	*K*	4.58E+09	7,10E-02
				Zn	*K*	1.97E+08	4.45e-06
				Pb	*L*	8.86E+09	0.0004785
				Ti, V, Cr, Mn, Ni, Cu, Ir, Sr, Zr, Mo, Rh,In, Sn			m.e.
141	Vermilion red	W	Talens	Ca	*K*	1.64E+09	0.0002929
				Fe	*K*	8.45E+07	1.31e-06
				Ni	*K*	1.72E+08	3,43E-03
				Cu	*K*	2.48E+08	5,92E-03
				Zn	*K*	1.41E+08	3,19E-03
				Hg	*L*	1.68E+08	9,77E-03
				Pb	*L*	4.62E+08	2,50E-02
				Ba, Cr, Mn, Cu, Sr, Mo, Rh, In			m.e.
142	Vermilion red light	W	Fontana	S	*K*	1.27E+08	0.0007688
				Ca	*K*	1.01E+09	0.0001808
				Fe	*K*	1.57E+08	2,43E-03
				Zn	*K*	1.35E+08	3,06E-03
				Sr	*K*	1.18E+09	3,42E-02
				Ba	*L*	2.53E+08	2,14E-02
				Pb	*L*	1.11E+10	0.0006003
				Cr, Mn, Ni, Cu, Mo, Rh,			m.e.
143	/	/	/	Zn	*K*	1.24E+05	0.002818
				Ca, Ti, Cr, Mn, Fe, Ni, Rh, In			m.e.
144	Chinese white	W	Winsor &Newton	Zn	*K*	7.25E+04	0.001642
				Ca, Ti, Cr, V, Mn, Fe, Ni, Cu, Pb, Sr, Zr, Mo, Rh, In, Sn			m.e.
145	Chrome orange	W	Fontana	Ca	*K*	1.24E+09	0.000221
				Cr	*K*	7.77E+06	0,0002196
				Fe	*K*	8.27E+07	0,001283
				Zn	*K*	1.42E+08	0,003215
				Sr	*K*	7.16E+08	0,02078
				Mo	*K*	1.43E+08	0,003186
				Ba	*L*	1.36E+08	0,01156
				Pb	*L*	1.50E+09	0,08136
147	Chinese white	W	Watteau	Zn	*K*	9.25E+04	0.002093
				Ca, Ti, Cr, Mn, Fe, Ni, Cu, As, Rh, In			m.e.
148	Vermilion red	W	Winsor &Newton	S	*K*	2.83E+02	0.001709
				Hg	*L*	3.06E+04	0.001777
				Ca, Ti, Cr, Fe, Ni, Cu, Rb, Mo, Rh, In, Sn			m.e.
149	Ash green	W	Fontana	S	*K*	7.79E+07	0.00047
				Ca	*K*	1.02E+09	0.0001829
				Ti	*K*	6.17E+08	3,97E-02
				Fe	*K*	9.13E+07	1,42E-03
				Ni	*K*	2.76E+07	5.51e-07
				Cu	*K*	4.07E+07	9.72e-07
				Zn	*K*	1.24E+09	2,80E-02
				Sr	*K*	8.74E+08	2,54E-02
				Pb	*L*	8.76E+09	0.0004731
				V, Cr, Mn, Ni, Au, Zr, Mo, Rh, Sn			m.e.
150	Yellow ochre	W	Winsor &Newton	Fe	*K*	1.18E+10	0.0001835
151	Burnt sienna	W	Winsor &Newton	Ca	*K*	4.64E+08	8.28e-05
				Mn	*K*	1.84E+09	3.84e-05
				Fe	*K*	1.68E+10	0.0002601
				Cu	*K*	2.42E+08	5,77E-03
				Sr	*K*	2.80E+08	8,12E-03
				Pb	*L*	1.22E+09	6,57E-02
				Ba, V, Cr, Ni, Cu, As, Rb, Mo, Rh,			m.e.

N.	Labels			Elements	Lines	Peaks area	Mass fraction
152	Yellow ochre	W	Talens	Ca	*K*	3.33E+08	5,94E-02
				Fe	*K*	8.61E+09	0.0001335
				Sr	*K*	5.22E+08	1,51E-02
				Pb	*L*	7.90E+09	0.0004265
				Ti, V, Cr, Mn, Ni, Rb, Mo, Rh, In, Sn			m.e.
T=tempera; O=oil; W=watercolor; /= unidentifiable; m.e: minority elements							

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