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CHROMITES AND MAGNETITE IN THE LATERITE ORE OCCURRENCES OF KARYDIA, EDESSA REGION (NORTHERN GREECE)

By

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Abstract: *The chromites and magnetite from the laterite ores of Karydia, Edessa region, are optically and chemically studied. The lateritic occurrences are redeposited formations found either on serpentinites or on sedimentary rocks and they are conformably covered by the Middle-Upper Cretaceous transgressive sediments. The studied chromites are of clastic origin, highly cataclastic and some grains are partly altered to ferritchromite. An overgrowth rimming of magnetite is always present. Unaltered chromites fall in the «aluminian chromite» field in the* $Cr_{16}Al_{16}Fe_{16}$ *triangular classification of Stevens. Their chemical variation reveals an origin from alpine-type ophiolites or podiform chromite deposits. Magnetite exhibits always in varying extent a martitization and / or maghemitization as a result of oxidation. It constitutes one of the main Ni-bearing minerals of the laterite ore with NiO content from 0.59 to 1.47 wt.-%.*

All the features of the studied chromites and magnetite seem to be similar to those of the same minerals from the laterite ore deposits of the broader area of Edessa.

INTRODUCTION

The studied chromites and magnetite are hosted within the laterite ores of Karydia, Edessa region (Fig. 1). The lateritic ore occurrences in the form of small lenses or thin beds, lie either on serpentinites or on sedimentary rocks and they are conformably covered by the Middle-Upper Cretaceous transgressive sediments. It is about secondary (allochthonous) redeposited iron-nickel laterites formed before or during the Middle-Upper Cretaceous transgression, by weathering process on preexisting primary lateritic profiles. An obvious bedding of the mineral constituents reveals the sedimentary origin of the laterites.

The area of Karydia belongs geotectonically to the Almopia zone and especially to the «unit of Kerasia», overthrusting to the west the pelagonian flysch (MERCIER 1966).

The main mineralogical assemblages found in the Fe-Ni-laterites of Karydia are: magnetite, chromite, hematite, maghemite, goethite, traces of millerite, chlorite, stilpnomelane, quartz.

The ore reserves of the lateritic occurrences are of small quantity and thus their economic importance is very limited.

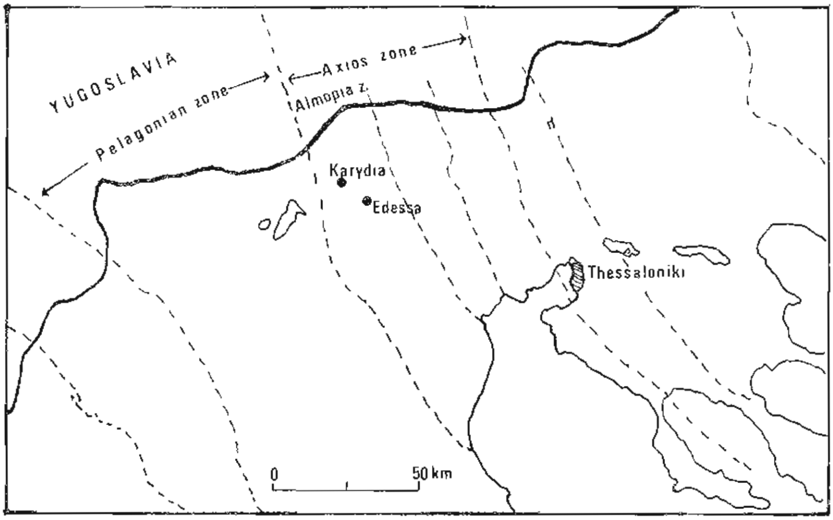

Fig. 1. Location map of the area studied with simplified isopic zones of N. Greece

MINERALOGY

Detailed study of laterite ore samples under the reflecting light microscope showed the following assemblage of opaque minerals: Chromite-ferritchromite, magnetite, hematite, maghemite, goethite and traces of millerite.

Chromite:

The grain size of chromite ranges from 0.001mm to 1mm averaging at 0.2mm. They vary from euhedral to highly irregular anhedral and show a large variation in the rank of cataclasis. The large chromite crystals are highly cataclastic into angular grains of varying size cemented by magnetite and so a «mosaic» texture is formed (Fig.

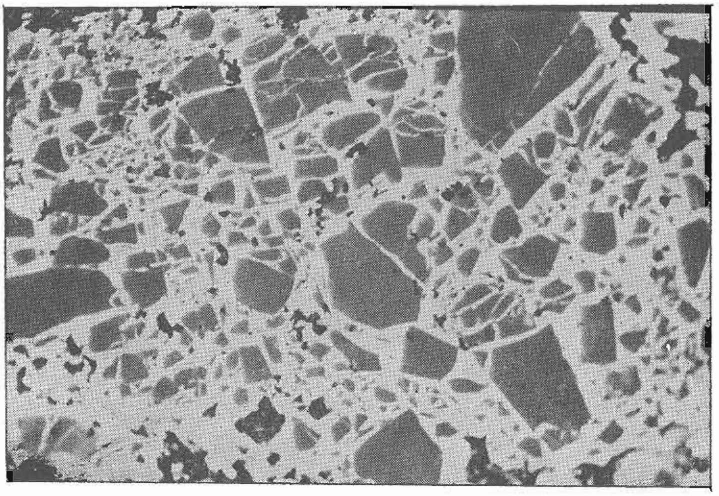

Fig. 2. Cataclastic chromite (grey) with «mosaic» texture in magnetite (white) Polished section, -N, oil immersion, × 300.

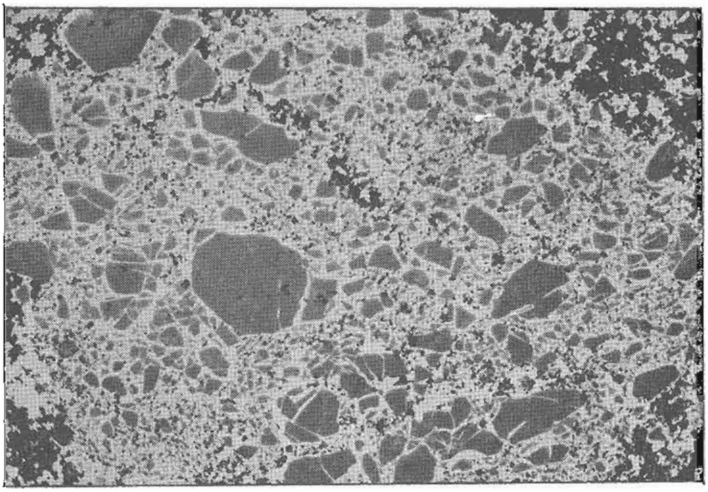

Fig. 3. Cataclastic chromite (grey) with «dust»-like texture in magnetite (white). Polished section, -N, oil immersion × 300.

2). Sometimes they form a «dust» - like texture of minute grains (Fig. 3). Many chromite grains are traversed by an intersecting net of cracks healed with magnetite or hematite, (Fig. 4).

Chromite shows differences in color shades (in the range of grey) and reflectance with varying chemical composition or alteration. A distinct difference in the reflectance between Cr-rich and relatively Al-rich chromite grains is optically discernible, (Fig. 5).

Chromite grains are always rimmed by magnetite. In most cases the contact between the chromite core and the magnetite rim is sharp.

Some chromite grains contain roughly spherical silicate inclusions.

Two modes of chromite alteration are usually observed:

1. Decolorized margins, or patches, or irregular zones along cracks, fractures and cavities of the individual grains, (Fig. 6). More sparsely wholly decolorized chromite grains are found. These decolorized areas with higher than chromite reflectance represent an Fe-rich chrome-spinel known as «ferritchromite» (SPANGENBERG 1943). This is not a mineral phase name but an intermediate product in composition and reflectance between chromite and magnetite.

2. Some chromite grains exhibit parts, in the form of veinlets or ovoid shapes, spotty and heterogeneous with respect to color, reflectance and internal reflections. This alteration is usually fracture controlled.

The Al-rich chromite grains seem to be more susceptible to the alteration process.

Partial replacement of chromite grains by magnetite is also observed in both modes of chromite alteration.

An extensive analysis of the chromite alteration and the ferritchromite formation has been made by MICHAILIDIS (1982).

Magnetite:

Magnetite forms small euhedral individual crystals and aggregates of rather variable crystal size including or not a chromite nucleus. This close intergrowth of chromite and magnetite, with the first being a nucleus in the latter, is a characteristic feature found in all studied chromiferous laterites of Greece (ALBANTAKIS 1974, MICHAILIDIS 1982) and Yugoslavia (IVANOV 1960). The magnetite rim results from an «epitaxial neomineralization» on chromite which has the same crystal structure and serves as a nucleus for growth of the magnetite metacryst. According to MICHAILIDIS (1982) the chromites from la-

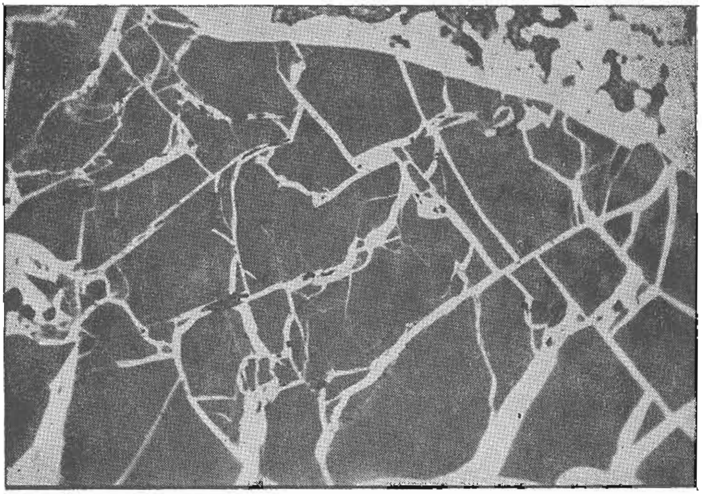

Fig. 4. Chromite grain (grey) with intersecting cracks healed with magnetite (white). Polished section, -N, oil immersion, × 400.

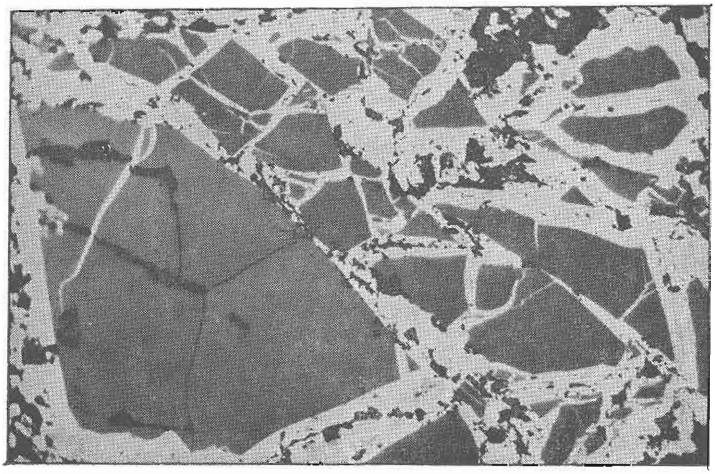

Fig. 5. Angular chromite grains with different reflectance in magnetite (white). Polished section, -N, oil immersion, × 400.

terite ores have a complicated history and the formation of the magnetite rim is attributed to several processes: serpentinization, metasomatic alteration of chromite to magnetite through ferritchromite, diagenesis and metamorphism of the iron rich lateritic components.

There are also observed larger metacrysts of magnetite without chromite nucleus. These magnetite metacrysts are recrystalization products formed during a low grade metamorphism due to Alpine orogeny. Magnetite has a marked power of crystallization and tends to develop well formed crystals. In the studied assemblage of minerals it is grey-white with clear brownish tint and always isotropic.

Magnetite (Fe_3O_4) exhibits always in varying extent an alteration to hematite: a-Fe_2O_3 (martizitation) and/or to maghemite: α-Fe_2O_3 (maghemitization) even in the same crystals as a result of oxidation or weathering.

Martitization is expressed by very thin lamellae of hematite arranged along the octahedral cleavage planes (111) of the magnetite. The exsolution texture of hematite to magnetite, produced by heating (RAMDOHR 1969), is practically identical with the texture resulting from martitization. The distinction is possible because in the first case (exsolution intergrowths) the hematite lamellae are broad, of uniform width and evenly distributed through the magnetite, (RAMDOHR 1969) whereas in the second (martitization) the hematite lamellae produced vary in width in different parts being concentrated at the margins of the magnetite crystals (Fig. 7), or along cracks (Fig. 8). In some cases zones within magnetite are selectively altered.

The alteration of magnetite to maghemite is generally independed of the crystallographic directions. The transformation takes place quite irregularly but usually it is definitely connected with grain boundaries and fissures. Individual zones in magnetite occasionally appear to be resistant to this transformation. The aggregates of small magnetite crystals seem to be more susceptible to this alteration.

The conditions governing whether magnetite will be oxidized to hematite or to maghemite are not well known (BASTA 1959). Since Fe_3O_4 and a-Fe_2O_3 have similar type of structure, HAEGG (1935) showed that the change from the former to the latter is a continuous process and all stages in this oxidation can be found in nature. BASTA (1959) found experimentally substances intermediate in composition between magnetite and maghemite with different color shades.

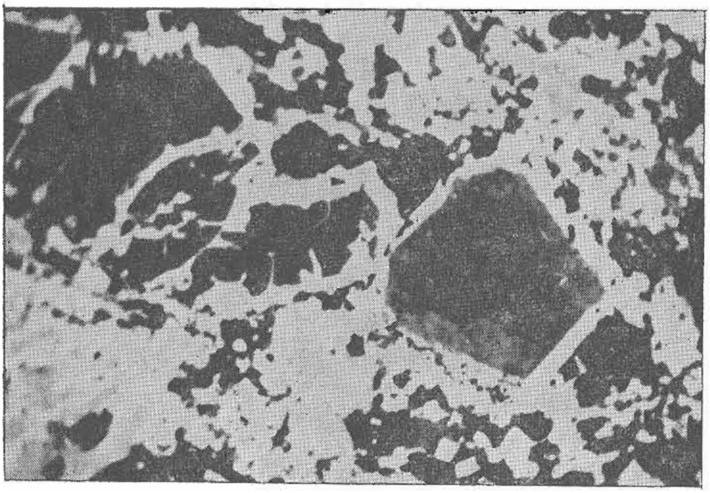

Fig. 6. Idiomorphic chromite crystal (dark grey) exhibiting alteration margins (light grey) of ferritchromite both surrounded by magnetite (white). Polished section, -N, oil immersion, × 300.

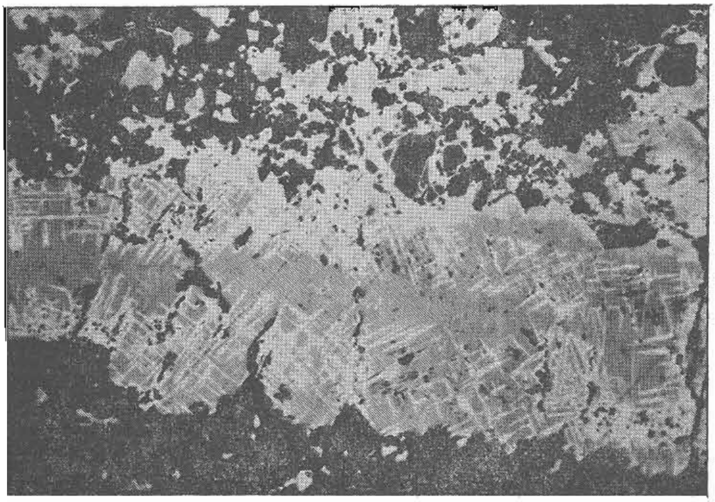

Fig. 7. Martitization of magnetite metacrysts (light grey) along the margins. Very thin hematite lamellae (white) arranged along the (111) planes. Polished section, -N, oil immersion, × 300.

As we have seen maghemite forms in extent immediately adjacent to the surface, associated with goethite. Thus, we believe that maghemite and associated goethite have been formed under surface conditions from magnetite as a result of weathering and oxidation.

Maghemite in most cases serves as an intermediate phase in the oxidation of magnetite to hematite (COLOMBO et al 1968, RAMDOHR 1969) and alters gradually to hematite.

Hematite:

Hematite is found only as the result of martitization of magnetite crystals. It forms very thin lamellae arranged to the (111) cleavage planes of magnetite crystals (Fig. 7, 8, 9).

Hematite is white, in comparison with the other associated minerals, with moderate bireflectance and very distinct anisotropy.

Maghemite:

Maghemite appears as fine networks or cloud-like masses covering the magnetite crystals. It is white to bluish-grey, isotropic, darker than hematite.

Goethite:

Goethite is found as a weathering product of magnetite. It forms very fine grained aggregates cloud-like or powdery-porous masses between the other opaque minerals. In some cases it forms veins of varying width penetrating chromite and / or magnetite crystals (Fig. 9) which reveals the epigenetic origin of the mineral. Goethite is mostly cryptocrystalline, as results from the diffraction patterns, with bluish grey color. It's bireflectance and anisotropy are masked by the internal reflections.

Millerite:

Millerite has been observed in the form of minute drop-like inclusions in magnetite crystals. It is light-yellow in color, with very high reflectance, distinct reflection pleochroism and very lively anisotropy in colors of yellow and iris blue.

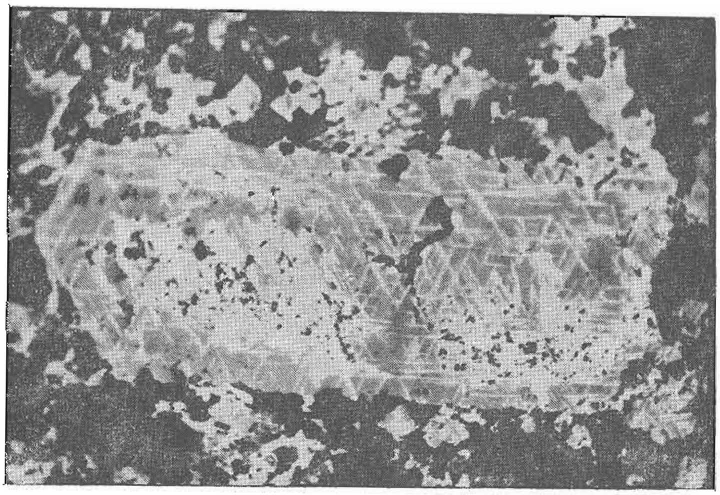

Fig. 8. Advanced martitization of a magnetite metacryst (light grey). Hematite (white) is concentrated mainly along the cracks. Polished section, -N, oil immersion, × 300.

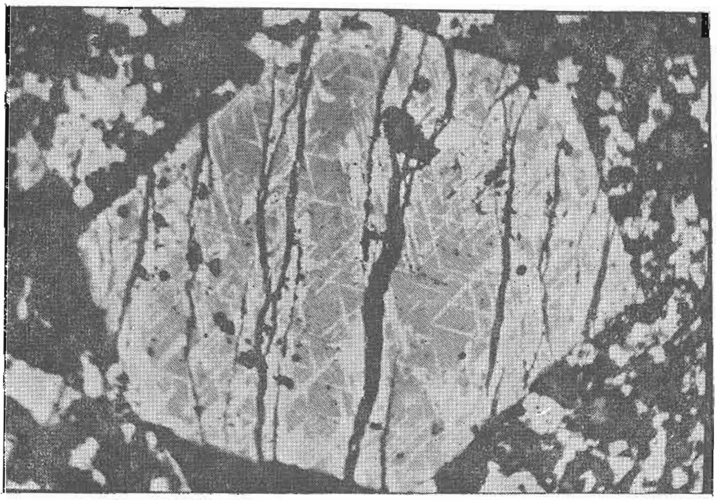

Fig. 9. Veinlets of goethite (grey) penetrating a martitized magnetite metacryst (light grey). Polished section, -N, oil immersion, × 400.

Table 1 lists 41 representative electron microprobe analyses* of chromite, ferritchromite and magnetite from the laterite ores of Karydia area. The FeO and Fe_2O_3 were calculated from total iron by assuming spinel stoichiometry (RO: R_2O_3=1).

Two different groups of chromites were found as regards the Al_2O_3 and Cr_2O_3 compositional variation: one group with higher Cr-content (Cr_2O_3=55.3-59.1% and Al_2O_3=9.5-14.1%) and the other with relative higher Al-content (Cr_2O_3=43·5-46·4% and Al_2O_3=20.3-23.5%). The studied chromites have roughly comparable chemical composition to those from other laterite ore deposits of the broader area of Edessa. The most significant difference is the very high Mn content of the latter (0.3-17.1wt% MnO) (MICHAILIDIS 1982), while the former have Mn content below the limit of detection of the microanalyser used.

The TiO_2 content is also below the limit of detection. DICKEY (1975) indicated that the TiO_2 content in podiform chromites is generally less than 0.3wt %.

The different chemical composition, even in very close being chromites, which is also shown by a difference in the reflectance of the chromite grains, reveals the clastic origin of the chromites in the laterite ores.

Compositional variations of chromites are best illustrated by projections within the spinel prism, (Fig. 10) according to the IRVINE's (1965) method.

Fig. 11, a projection parallel to the triangular cross-section of the prism, shows that the studied unaltered chromites fall in the «aluminian chromite» field of the Cr_{16}-Al_{16}-Fe_{16} triangular classification of

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* Anelytical procedures:

Microprobe analyses were made by one of the authors (K.M.) using a Link System Model 290-2KX Energy dispersive spectometer, attached to a Cambridge Instruments Geoscan. The analyses were perfomed nsing 15 CV accelerating potential and 3nA specimen current on cobalt metal. Mesurements were made using a livetime of 100secs. The spectra were processed using a commercial version of the program developed by Stathan in Dr J.V.P. Long's Laboratory in Cambridge. Pure metal standards were used for Cr, Ti, Fe, Mn, Ni, corundum for Al, periclase for Mg and wollastonite for Ca and Si.

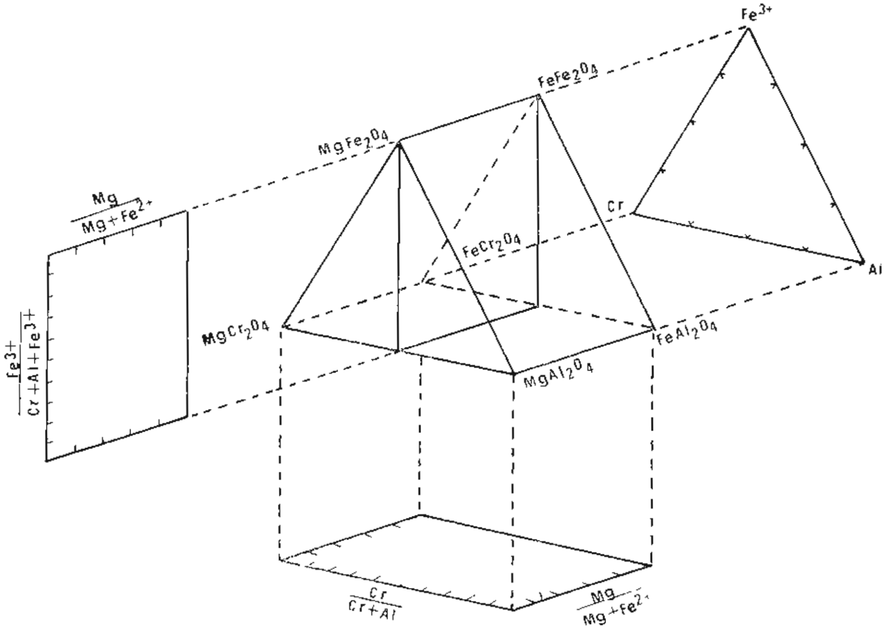


Fig. 10. The compositional prism of chromites. The derivation of the three projections used for plotting the analyses in this paper are indicated.

STEVENS (1944), while ferritchromite falls within the field of «ferrian chromite», as it was expected.

In Fig. 12 the plots of the analyses on the two planes expressing $Cr/Cr+Al$ vs. $Mg/Mg+Fe^{2+}$ and $Fe^{3+}/Cr+Al+Fe^{3+}$ vs. $Mg/Mg+Fe^{2+}$ show that the studied chromites fall in the field of podiform chromites. Besides, the ratio $Fe^{3+}/Cr+Al+Fe^{3+}$ is always lower than 0.10 and this is also a characteristic feature of podiform chromites (THAYER 1964, 1970; IRVINE 1967).

The pattern of variation of Cr_2O_3 vs. Al_2O_3 and Cr_2O_3 vs. FeO (total iron as FeO) contents in the investigated chromites (Fig. 13) is also characteristic for podiform chromites. As THAYER (1970) states, in podiform chromites an increase of Cr_2O_3 content is compensated by a decrease of Al_2O_3, while in constrast there is a relative constancy of total iron.

Triangular plot of Al, Cr, Mg and Fe oxides for the studied chromites based on analyses of Table 1 are illustrated in Fig. 14.

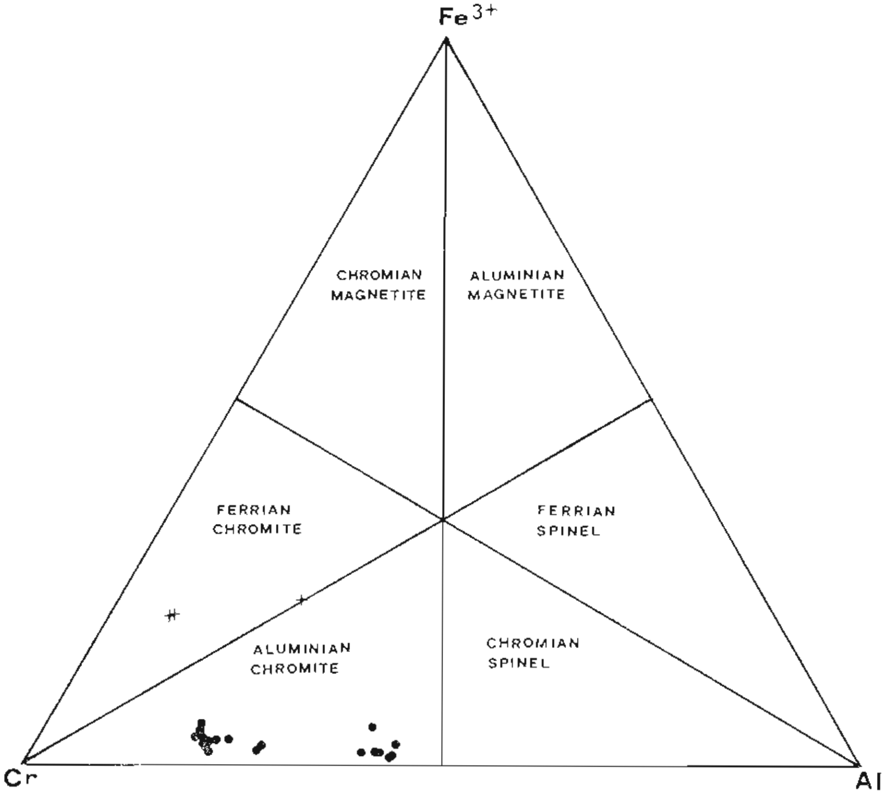


Fig. 11. Distribution of chromites-ferritchromites from the Karydia laterite ores in the Cr_{16}-Al_{16}-Fe_{16} triangular classification of STEVENS (1944). ● *unaltered chromite,* + *ferritchromite.*

From these diagrams the two groups of chromites (Cr-rich and Al-rich) are discernible.

From Table 1 results (analyses 10, 21, 28) that relative to the parent chromite grain, ferritchromite is enriched in Fe^{3+}, Fe^{2+}, Ni, Si and is impoverished mainly in Mg, Al and to a lesser extent in Cr. Similar modes of chromite alteration have been observed by many scientists (VAASJOKI and HEIKKINEN 1962, WEISER 1967, MIHÁLIK and SAAGER 1968, BEESON and JACKSON 1969, FRISCH 1971, HEDLUND et al 1974, BLISS and MacLEAN 1975, PARASKEVOPOULOS and ECONOMOU 1980, MICHAILIDIS 1982) in their study of chromites in different geological environments.

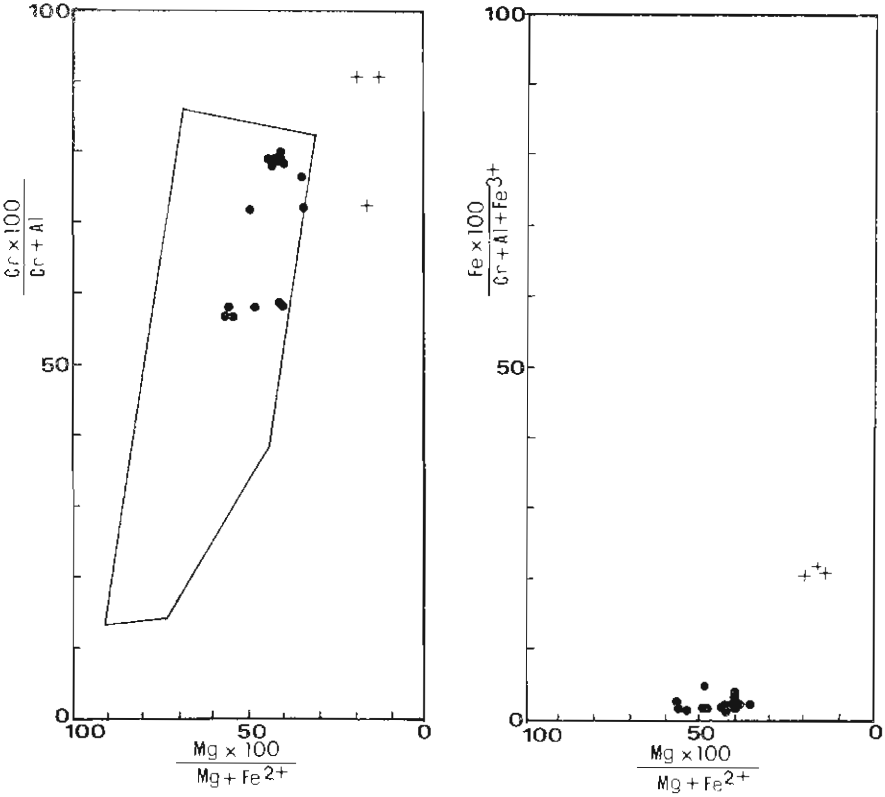


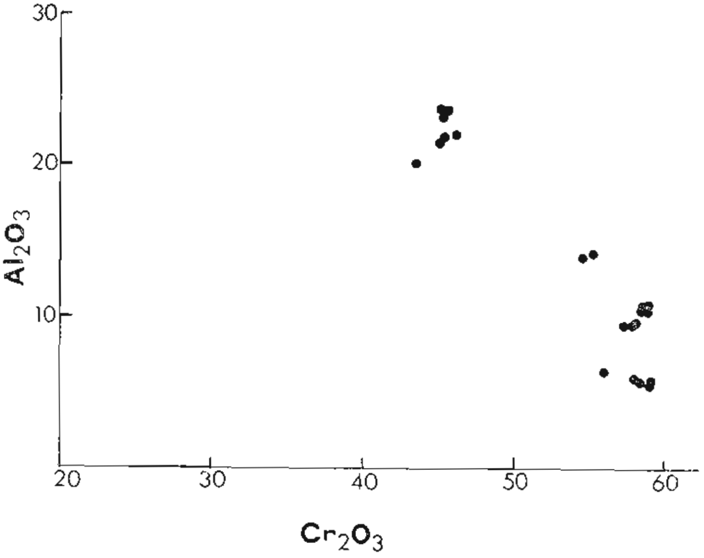
Fig. 12. Plot of the chromite-ferritchromite analyses in the spinel prism (after IRVINE 1965).

● unaltered chromite, + ferritchromite.

(the field of podiform chromites is also illustrated, after IRVINE and FINDLAY 1972).

Magnetite has high NiO and Cr_2O_3 contents ranging between 0.59-1.47wt% and 0.28-2.74wt% respectively. Comparable NiO and Cr_2O_3 contents are refered by MICHAILIDIS (1982) for magnetites from laterite ore deposits of the broader area of Edessa.

Magnetite constitutes one of the main Ni-bearing minerals of the laterite ore.



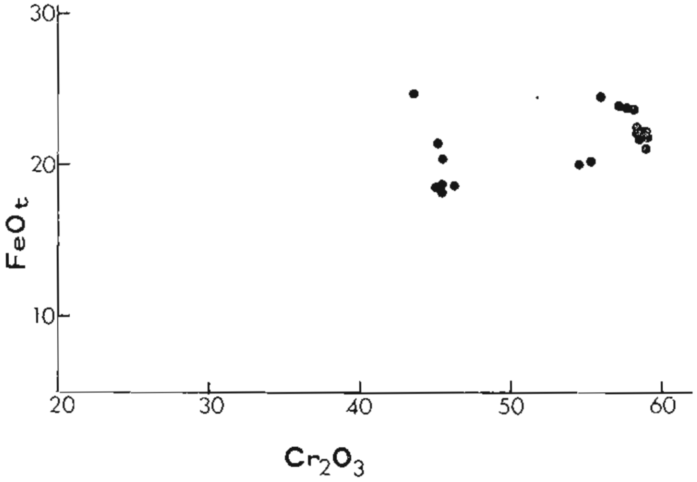


Fig. 13. Variation of Al_2O_3 (top) and FeO (bottom, total iron as FeO) contents (in wt%) of the studied chromites in relation to their Cr_2O_3 content.

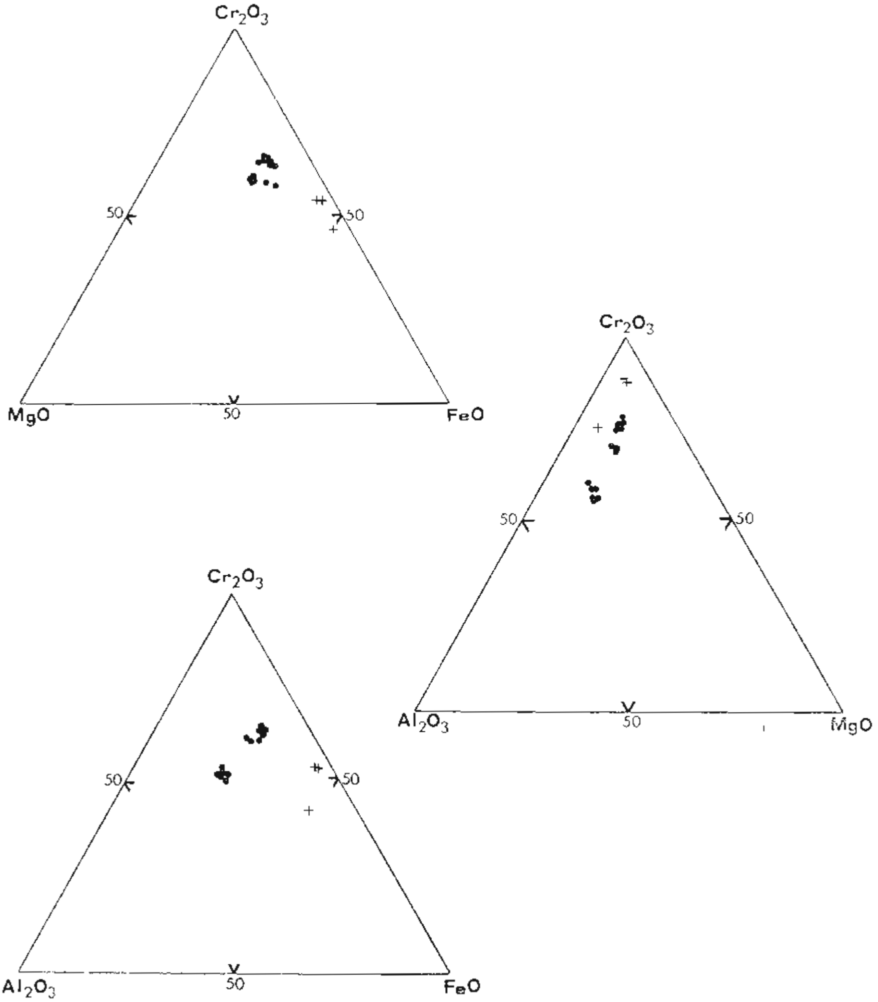


Fig. 14. Triangular plot of Al, Cr, Mg and Fe_t *oxides for the studied chromites-ferritchromites.*

● *unaltered chromite,* + *ferricthromite.*

CONCLUSIONS

From the optical study and the chemical characteristics of the chromites and magnetite from the Karydia laterite ores, the following conclusions result:

1. Chromites are of clastic origin, usually highly cataclastic and in some cases partly altered to ferritchromite.

2. They must derive from alpine-type ophiolite rocks or podiform chromite deposits, as results from the relative compositional diagrams the very low $Fe^{3+}/Cr + Al + Fe^{3+}$ ratio and nearly the absence of titanium.

3. The studied unaltered chromites fall in the «aluminian chromite» field, while ferritchromite within the «ferrian chromite» field in the Cr_{16}-Al_{16}-Fe_{16} triangular classification of Stevens.

4. *Ferritchromite is enriched in* Fe^{3+}, Fe^{2+}, *Ni, Si and impoverished mainly in Mg, Al and to a lesser extent in Cr.*

5. *Magnetite exhibits always in varying extent martitization and /or maghemitization as a result of oxidation or weathering.*

6. *Magnetite has a relatively high NiO content and constitutes one of the main Ni-bearing minerals of the laterite ore.*

Acknowledgements: The authors would like to thank Professor J. ZUSSMAN who very kindly made available the necessary facilities for electron microprobe analyses at the University of Manchester (Dept. of Geology).

TABLE 1.

Representative electron microprobe analyses of chromite-ferritchromite and magnetite studied.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SiO_2	—	0.20	—	0.41	—	—	0.21	—	0.22	0.48	0.46	0.51	—	—
TiO_2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Al_2O_3	10.40	10.81	10.77	11.41	10.96	23.32	20.32	23.54	23.23	10.32	—	21.53	22.16	22.27
Cr_2O_3	58.98	59.13	58.30	55.92	58.07	45.38	43.54	45.41	45.14	40.75	2.31	45.02	46.84	46.23
Fe_2O_3	2.07	0.94	1.57	2.05	2.25	1.61	4.90	2.60	1.35	16.61	65.55	1.61	1.72	1.67
FeO	20.40	21.26	20.80	22.60	21.73	16.55	20.53	16.40	17.22	28.33	30.90	22.46	17.40	19.38
MnO	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MgO	8.83	8.52	8.45	7.70	8.11	12.38	9.18	12.81	12.14	3.27	—	8.94	11.86	10.62
NiO	—	—	—	—	—	—	0.49	—	—	0.45	0.81	—	—	—
Total	100.68	100.86	99.89	100.09	101.12	99.24	99.17	100.76	99.30	100.21	100.03	100.07	99.98	100.17
Number of cations on the basis of 32 oxygens														
Si	—	0.050	—	0.109	—	—	0.053	—	0.055	0.133	0.141	0.128	—	—
Ti	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Al	3.246	3.366	3.404	3.586	3.415	6.811	6.146	6.767	6.793	3.381	—	6.427	6.487	6.558
Cr	12.342	12.348	12.252	11.789	12.138	8.888	8.829	8.756	8.852	8.948	0.561	9.011	9.192	9.127
Fe^{3+}	0.412	0.186	0.316	0.413	0.447	0.301	0.946	0.477	0.242	3.471	15.156	0.306	0.321	0.315
Fe^{2+}	4.516	4.695	4.665	5.041	4.805	3.430	4.403	3.345	3.572	6.580	7.941	4.756	3.614	4.047
Mn	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mg	3.484	3.354	3.375	3.059	3.195	4.570	3.510	4.655	4.487	1.353	—	3.372	4.386	3.953
Ni	—	—	—	—	—	—	0.100	—	—	0.101	0.200	—	—	—
Total	24.000	23.999	24.012	23.997	24.000	24.000	23.987	24.000	24.001	23.967	23.999	24.000	24.000	24.000

1 - 7 chromites, 8-11 chromite-ferritchromite and magnetite rim, 12-14 chromites.

TABLE 1. (Continued).

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
SiO_2	0.81	0.53	0.61	0.97	—	—	0.27	1.12	1.10	—	—	—	—	0.45
TiO_2	—	—	—	—	—	0.19	—	—	—	—	—	—	—	—
Al_2O_3	—	—	—	—	14.09	13.94	3.41	—	0.34	10.82	10.54	10.35	10.38	3.37
Cr_2O_3	1.20	1.05	0.46	2.74	55.28	54.55	50.76	1.71	2.70	58.99	58.50	58.67	58.38	49.97
Fe_2O_3	66.71	67.54	67.99	65.32	2.20	1.74	14.99	65.90	64.83	1.11	1.80	1.61	2.16	15.03
FeO	30.70	30.56	30.85	30.42	18.41	18.54	26.77	30.71	29.17	20.07	20.68	20.95	19.80	27.65
MnO	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MgO	—	—	—	0.24	10.46	10.21	3.75	—	0.80	8.95	8.53	8.30	8.98	2.71
NiO	0.89	0.99	0.71	1.06	—	—	—	1.13	1.47	—	—	—	—	0.86
Total	100.31	100.67	100.62	100.75	100.44	99.17	99.95	100.57	100.41	99.94	100.05	99.88	99.70	100.04
					Number of cations on the basis of 32 oxygen									
Si	0.247	0.161	0.186	0.295	—	—	0.077	0.341	0.333	—	—	—	—	0.129
Ti	—	—	—	—	—	0.038	—	—	—	—	—	—	—	—
Al	—	—	—	—	4.289	4.300	1.151	—	0.122	3.388	3.313	3.264	3.264	1.146
Cr	0.290	0.247	0.110	0.657	11.284	11.282	11.503	0.412	0.644	12.390	12.326	12.411	12.411	11.396
Fe^{3+}	15.340	15.510	15.648	14.900	0.427	0.342	3.232	15.077	14.734	0.222	0.361	0.325	0.433	3.263
Fe^{3+}	7.844	7.800	7.891	7.710	3.975	4.056	6.417	7.809	7.368	4.459	4.610	4.689	4.418	6.671
Mn	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mg	—	—	—	0.107	4.025	3.982	1.600	—	0.358	3.541	3.390	3.311	3.569	1.163
Ni	0.218	0.242	0.174	0.257	—	—	—	0.276	0.357	—	—	—	—	0.199
Total	23.939	23.960	24.009	23.926	24.000	24.000	23.980	24.005	23.916	24.000	24.000	24.000	23.995	23.967

15 - 18 magnetites, 19 - 23 chromite-ferritchromite and magnetite rim, 24 - 25 chromite, 26 - 30 chromite - ferritchromite and magnetite rim.

TABLE 1. (Condinued).

	29	30	31	32	33	34	35	36	37	38	39	40	41
SiO_2	0.51	0.54	—	—	—	0.67	0.87	1.12	1.11	0.66	0.63	0.54	1.02
TiO_2	—	—	—	—	—	—	—	—	—	—	—	—	—
Al_2O_3	—	—	9.69	9.54	9.59	—	—	—	0.67	—	—	—	—
Cr_2O_3	1.56	1.37	58.82	57.86	57.37	0.28	0.66	0.61	0.89	2.05	0.94	1.55	0.36
Fe_2O_3	66.61	67.14	2.05	3.13	3.42	68.02	67.27	66.67	65.93	66.25	67.44	66.08	67.70
FeO	30.27	30.22	20.86	20.92	20.84	30.97	30.97	31.62	31.15	30.63	30.65	30.36	30.70
MnO	—	—	—	—	—	—	—	—	—	—	—	—	—
MgO	—	—	8.24	8.17	8.18	—	—	—	—	—	—	—	0.25
NiO	1.10	1.34	—	—	—	0.59	0.67	—	0.76	0.97	0.92	1.25	0.73
Total	100.05	100.61	99.66	99.62	99.40	100.53	100.44	100.02	100.51	100.56	100.58	100.78	100.76
	Number of cations ou the basis of 32 oxygens												
Si	0.157	0.166	—	—	—	0.205	0.264	0.341	0.339	0.202	0.193	0.165	0.309
Ti	—	—	—	—	—	—	—	—	—	—	—	—	—
Al	—	—	3.072	3.032	3.054	—	—	—	0.239	—	—	—	—
Cr	0.378	0.330	12.514	12.333	12.251	0.067	0.160	0.148	0.213	0.495	0.227	0.373	0.085
Fe^{3+}	15.386	15.421	0.414	0.635	0.695	15.626	15.444	15.341	15.131	15.203	15.484	15.379	15.451
Fe^{2+}	7.769	7.713	4.695	4.718	4.707	7.906	7.901	8.085	7.945	7.812	7.822	7.735	7.786
Mn	—	—	—	—	—	—	—	—	—	—	—	—	—
Mg	—	—	3.305	3.282	3.293	—	—	—	—	—	—	—	0.114
Ni	0.270	0.328	—	—	—	0.145	0.164	—	0.186	0.239	0.226	0.306	0.177
Total	23.958	23.960	24.000	24.000	24.000	23.949	23.933	23.915	24.053	23.951	23.952	23.958	23.922

26 - 30 chromite-ferritchromite and magnetite rim, 31 - 35 chromite nuclens and magnetite rim, 36-41 magnetite metacrysts Fe_2O_3 and FeO calculated from total Fe assuming spinel stoichiometry (R_2O_3:RO=1)

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ΠΕΡΙΛΗΨΗ

ΧΡΩΜΙΤΕΣ ΚΑΙ ΜΑΓΝΗΤΙΤΗΣ ΑΠΟ ΤΙΣ ΛΑΤΕΡΙΤΙΚΕΣ ΕΜΦΑΝΙΣΕΙΣ ΚΑΡΥΔΙΑΣ, ΠΕΡΙΟΧΗΣ ΕΔΕΣΣΑΣ (Β. ΕΛΛΑΔΑ)

από

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(Εργαστήριο Ορυκτολογίας-Πετρολογίας του Πανεπιστημίου Θεσσαλονίκης)

Μελετούνται τα οπτικά χαρακτηριστικά και η χημική σύσταση του χρωμίτη και μαγνητίτη από λατεριτικές εμφανίσεις της περιοχής Καρυδιάς, Έδεσσας (Β. Ελλάδα). Οι εμφανίσεις αυτές έχουν επανατοποθετηθεί είτε πάνω σε σερπεντινίτες είτε σε ιζηματογενή πετρώματα και είναι σύμφωνα καλυμμένες από ιζήματα της Μεσο-Ανω-Κρητιδικής επίκλυσης.

Οι χρωμίτες που μελετήθηκαν είναι κλαστικού χαρακτήρα, παρουσιάζονται έντονα κατακλασμένοι και μερικοί κόκκοι έχουν μετατραπεί σε σιδηροχρωμίτη. Παρατηρείται πάντοτε σ' αυτούς ένα περίβλημα από μαγνητίτη. Οι αναλλοίωτοι χρωμίτες προβάλλονται στο πεδίο των «αργιλιούχων χρωμιτών» στο $\mathrm{Cr_{16}}$-Al-$_{16}$-$\mathrm{Fe_{16}}$ τριγωνικό διάγραμμα κατατάξεως του Stevens. Η χημική τους σύσταση δείχνει να προέρχονται από αλπικού τύπου οφειόλιθους ή λοβόμορφου τύπου κοιτάσματα χρωμιτών.

Ο μαγνητίτης παρουσιάζει πάντοτε διαφορετικού βαθμού μετατροπή σε αιματίτη (μαρτιτίωση) ή /και μαγκεμίτη ως αποτέλεσμα οξείδωσης. Αποτελεί ένα από τα κυριώτερα ορυκτά φορείς του Ni του μεταλλεύματος με περιεκτικότητα 0.59-1.47% NiO.

Όλα τα χαρακτηριστικά των χρωμιτών και μαγνητιτών που μελετήθηκαν φαίνονται να είναι παρόμοια μ' εκείνα των ίδιων ορυκτών από λατεριτικά κοιτάσματα της ευρύτερης περιοχής της Έδεσσας.