



Fig. II - 1-5 Distribution Map of Alteration Index of the Tunca Area

(i) Tunca Deposit

This deposit lies south of Tunca village. A silicified zone with dissemination to network of sulphide distributed in a range of about 500m along the riverbed of the Tunca River, and massive sulphide deposit lies in the center of the zone.

i) Massive Sulphide Deposit

The massive sulphide deposit is exposed only on the northern bank of the Tunca River and large massive boulders are scattered on its slope with its width of about 30 meters and its height of about 20 meters. A large block is several meters in diameter and each boulder contains an aggregation of rubble ores showing their subangular to subrounded fragment shapes with their diameter of several centimeters to tens of centimeters.

The ores are massive, a part of them consists of crystalline pyrites, being accompanied with a minor quantity of chalcopyrite. Barite and quartz fill the pores of ores. There is rarely a milky quartz vein with barites that cuts massive sulphide ores and has coarse grain sphalerite as its main ore. Under microscopic observation, minor amount of chalcopyrite, sphalerite, and marcasite besides pyrite are seen from the massive sulphide specimen.

The assay results of the massive sulphide ores (F024, F025) is 0.27 - 0.42g/t Au, 4.65 - 5.00g/t Ag, 0.02 - 0.10% Cu, < 0.01 - 0.03% Pb, 0.02 - 0.08% Zn, < 0.01% Ba, 32.90 - 47.80% S, 5 - 10 ppm Ga, 1 - 2 ppm Ge, < 1 ppm In, and 79 - 729 ppm As. All the elements besides S are low grades.

MTA carried out a geological survey in the Tunca area from 1970 to 1975, conducted 8 drillings (1,319.2m) targeting this deposit. As a result, MTA obtained massive pyrite with its intersection length of 7.65m at T-4 hole. Its grade is 1.43% Cu and 1.26% Zn. MTA estimates ore reserves of one million ton.

Since the Tunca Deposit exists at the end of landslide zone, it is presumed that the massive sulphide blocks were parts of a main ore deposit, which might have existed in the north, separated and moved by a landslide.

ii) Silicified Zone

The silicified zone is composed of the Alemağaç Formation's dacite lava (Adcl) and the dacitic pyroclastic rocks (Atf). In many cases, however, its original rock structures are not clear because they are intensely silicified. The northeast to southwest, north to south, and northwest to southeast cracks with their steep angle can be seen in the zone. Sulphide minerals, consisting of pyrite and minor amounts of chalcopyrite, exist as dissemination and veinlet.

(ii) Tunca South Occurrence

This occurrence is situated in the mountains with their altitude of about 440m lying about 200m southwest of the Tunca Deposit. The green dacitic pyroclastic rocks (Attf) have undergone silicification and sericitization, being accompanied with dissemination of coarse grained sphalerite, chalcopyrite, galena, barites and fine grained pyrite. Under microscopic observation, sphalerite, chalcopyrite, galena, and pyrite are seen. The assay results of sulphide dissemination ores (G033, G034) is 0.11 - 0.72g/t Au, 8.55 - 19.60g/t Ag, 0.26 - 0.29% Cu, < 0.02 - 0.03% Pb, 2.32 - 2.89% Zn, 5.91 - 7.44% Ba, 2.70 - 4.85% S, 6 - 12 ppm Ga, 11 - 13 ppm Ge, < 1 ppm In, 1,300 - 2,080 ppm As. The assay results reveal high grades of heavy metals and As, compared with the massive sulphide ores in the Tunca Deposit.

This occurrence is presumed to have formed in the late stage of volcanogenic massive sulphide mineralization.

(iii) Tunca West Occurrence

This occurrence is about 400 meters west of the Tunca Deposit and lies in riverbed of the Tunca River. The Alemağaç dacite lava (Adcl) has undergone intense silicification, being accompanied with pyrite dissemination. The northwest to southeast and northeast to southwest fracture systems are dominant and there exist two veinlets, consisting of coarse-grained pyrite (30 cm in width and N30° E/vertical, 10 cm in width and N10° E/80° W). The host rock has undergone silicification and chloritization. Under microscopic observation, only pyrite is seen. The assay results of pyrite vein (E014) is 0.08g/t Au, 4.35g/t Ag, 0.01% Cu, 0.01% Pb, 0.01% Zn, <0.01% Ba, 50.71% S. All the elements besides S and Ag are low grades. And the assay results of silicified rock around the pyrite vein (E016) is 0.01g/t Au, 1.00g/t Ag, <0.01% Cu, 0.01% Pb, <0.01% Zn, <0.03% Ba, 2.15% S, which is also low grade like pyrite vein.

(iv) Şenyuva Occurrence

This occurrence is the southwest of the Şenyuva and distributes in a range of about 300 m along the riverbed of the Şenyuva River. The green dacitic pyroclastics rocks (Attf) have undergone silicification, sericitization, and chloritization, being accompanied with sulphide minerals. Under microscopic observation, chalcopyrite, galena, sphalerite, tetrahedrite and pyrite are seen. The assay result (E019) is 0.26g/t Au, 26.50g/t Ag, 1.24% Cu, 0.02% Pb, 3.69% Zn, 5.60% Ba, 13.70% S, indicating a relatively high grade of Ag.

There is oxide manganese ore, being concentrated in the reddish calcareous mudstone (Cms) that is the lowermost layer of the Çağlayan Formation around the Şenyuva Occurrence.

In the vicinities of modern sea-floor hydrothermal deposits, there exist manganese oxide, which is formed as the results of hydrothermal activities. There are oxide manganese deposits near the Kuroko deposits in Japan. Therefore, it is presumed that the manganese ore is related to the hydrothermal activity.

A local people said this ore was mined for a short period in the 1950's.

(v) Şenyuva North Occurrence

This occurrence is the north of the Şenyuva Occurrence. There is a fine-grained pyrite dissemination zone in the green dacitic pyroclastic rocks (Attf) of the Alemağaç Formation. This zone reaches 40 cm in thickness and underlies the reddish calcareous mudstone (Cms) layer of the lowermost of the Çağlayan Formation. The host rock has undergone hydrothermal alteration, producing sericite/smectite mixed layer mineral, and calcite. The assay results (G008) is <0.01g/t Au, 1.20g/t Ag, <0.01% Cu, 0.02% Pb, 0.01% Zn, 0.94% Ba, 0.08% S, 172 ppm As, indicating a rather high grade of As.

1-3-2 Murgul Area

The Murgul area is situated in the east of the Hopa area. The area consists of three areas, namely the Kokolet area, Ardiç area, and Kabaca area that surround the Murgul Deposit swarm. The area is from 500 meters to 2,000 meters high above sea level along the Murgul River basin, covering 25 km². The Murgul River runs from the Eastern Black Sea Mountains to the south of the area and flows down to meet the Çorh River at Borçka.

The Kokolet area is in the Kokolet River basin, a branch of the Murgul River. Steep mountains from 1,400 to 1,600 meters in altitudes run in the north-south and border the Kokolet area and the Ardiç area.

Virgin forest covers the slopes. The southern part of the Kokolet area is rocky mountains, which ranges with the Eastern Black Sea Mountains, and their slopes are steep.

The Ardiç area is in mountains to the east of the Murgul town. The area is in the forests, from 900 meters to 1,300 meters in altitude.

The Kabaca area is situated in the western to southern parts of the Murgul Deposit swarm. It is in the basin between the Kabaca River and the Lepüşkür River, both of which are branches of the Murgul River. The eastern Kabaca area has forests, while the western part along the Kabaca River has naked rock zone with few trees.

There are settlements around this area, such as Kabaca, Iskale, Ardiç, and Ozmal. The main settlement is Murgul, which is situated to the northeast of this area.

(1) Geology

The Murgul area is underlain by the Kabaca Formation of the lower Cretaceous, the Murgul Formation, Ardiç Formation, and Küre Formation of the upper Cretaceous, and several rocks have intruded into these formations. Fig. II-1-7 shows a geological cross section. Fig. II-1-8 shows a schematic stratigraphic column.

(a) Kabaca Formation (Kv)

The Kabaca Formation is the lowermost formation in the area and is characterized by basic volcanic activities. This formation is composed of andesite and andesitic sedimentary rocks. The formation exposes along the Kabaca River around