Appendix Tables

App. Fig. 6-1 Results of Microscopic Observation of Thin Section (1/4)

Küre

Sample No.	Rock Name	Texture	Phenocryst									Groundmass								
			Qz	Kf	Pl	Bi	Ho	Au	Hy	Mf	Op	Qz	Pl	Bi	Ho	Au	Hy	Mf	Op	G
A001	Altered basalt	porphyritic			◉			□					○			□				
A008	Pyroxinite	holocrystalline			□			◉			△									
N015	Serpentinite	holocrystalline		◉					◉		△									
M049	Gabbro	holocrystalline	△		◉			○			△									
H019	Gabbro	holocrystalline			○		○	◉			□									
S004	Gabbro	holocrystalline			○			◉			△									
M014	Gabbro	holocrystalline			○		○	○			□									
A007	Gabbro	holocrystalline			○		□	○			△									
M026	Silicified diorite	holocrystalline			○			○			△									
Y009	Diorite	holocrystalline			◉		◉			□	□									
Y096	Dacite	porphyritic	○		◉															
Y-97	Dacite	porphyritic	◉		○	□														
N002	Dacite	porphyritic	◉		○	□	□					◉	○						□	
N012	Dacite	felsitic	◉		□		□					◉	□						△	
S033	Dacite	porphyritic	◉		□							◉	□						△	□
Y004	Dacite	intergranular			◉							○	○			○			□	
A002	Massive basalt	ophitic			◉			○			△		□			□				
N014	Massive basalt	porphyritic			◉			○				△				○			□	
N016	Massive basalt	intersertal			◉			○					○			○			△	
K010	Massive basalt	intergranular			○			○				△	○			□			△	
K014	Massive basalt	ophitic			○			○				◉							□	
L023	Massive basalt	sub-ophitic			◉			□											□	
M044	Massive basalt	intergranular			○								◉			○			□	
M055	Massive basalt	intergranular			◉			□			□		○			○			△	
N025	Massive basalt	lepidoblastic	□		◉						□									
Y036	Massive basalt	intergranular			◉			○					○			○			△	
Y027	Massive basalt	cataclastic			◉					□	□									
Y034	Massive basalt	ophitic			◉			○			□									
Y045	Massive basalt	intersertal			◉			○					○			○			□	
Y046	Massive basalt	micro-porphyritic			◉			○					◉			◉			□	
M036	Massive basalt	sub-ophitic			○			□				△	○			□			△	
Y007	Massive basalt	ophitic			◉			□					○			△			□	
Y025	Massive basalt	sub-ophitic			◉			□					□			□			△	
M108	Massive basalt	felsitic	◉		○								○			△			○	
Y102	Massive basalt	ophitic			○			○				△	○			□				
A013	Hyaloclastite	porphyritic			○			□					○			○			○	
A010	Hyaloclastite	porphyritic			◉							○							□	□
A028	Altered basalt	intergranular			○			○					◉			□				
A036	Altered tuff											○	○						□	
A038	Hyaloclastite	intergranular			○			△					◉			○				
A030	Altered basalt	porphyritic			○			○				◉							□	
A037	Altered basalt	poikilitic			◉			○					○			□			□	
A039	Altered basalt	porphyritic	○		○							◉							◉	
M039	Altered basalt	porphyritic			◉								○			□			□	
S050	Pillow lava	intersertal			◉			○					○			○			○	
S057	Altered pillow lava	intergranular			◉			□					○			□			○	
L021	Pillow lava	intergranular			○			□					○			□		○	○	
S047	Pillow lava	sub-ophitic			○			□					○			□		○	□	
Y005	Pillow lava	sub-ophitic			◉			□					○			□		◉	□	
Y098	Pillow lava	intergranular		□	◉			□					○			□			□	
Y023	Pillow lava	hyalo-ophitic			◉			○					◉			○			□	
Y014	Hyaloclastite	porphyritic			◉			◉					○			○			○	
Y030	Hyaloclastite	porphyritic			◉			○					○			○			○	
Y039	Hyaloclastite	intergranular			◉			○			□		○			○			△	
Y020	Hyaloclastite	intergranular			◉			□					○			□			□	
Y099	Hyaloclastite	sub-ophitic			○			□					○			□			△	
Y100	Hyaloclastite	ophitic			○			□					○			□			△	
A047	Hyaloclastite	ophitic			○			□					○			□			△	
Y042	Hyaloclastite	porphyritic			◉			○					○			○			△	
Y044	Hyaloclastite	porphyritic			◉			○					○			○			□	
A003	Massive limestone	cryptocrystalline										△								
K019	Silicified sandstone	granular										◉								
Y003	Silicified sandstone	granular										○	○							
A040	Sandstone	granular										○	○						△	
Y002	Sandstone	granular										◉	○							
Y026	Sandstone	granular										◉	○							
Y041	Black shale	granular										○	○							

Abbreviations: Qz:Quartz Kf:Potash feldspar Pl:Plagioclase Bi:Biotite
Ho:Hornblende Au:Augite Hy:Hyperthene Mf:Mafic mineral
Op:Opaque mineral G :Glass
◉:Abundant ○:Common □:Few △:Rare

App. Fig. 6-1 Results of Microscopic Observation of Thin Section (2/4)

Taşköprü

Sample No.	Rock Name	Texture	Phenocryst									Groundmass								
			Qz	Kf	Pl	Bi	Ho	Au	Hy	Mf	Op	Qz	Pl	Bi	Ho	Au	Hy	Mf	Op	G
H043	Green schist												○			△			○	
M202	Green schist											○	○			□				
M261	Green schist	felsitic										●	○							
M289	Green schist	porphyritic			○							●							□	
M200	Metabasalt											□	□					□		
M205	Metabasalt	porphyritic			○							○				○		○		
M230	Metabasalt	sub-ophitic			○			○				□	□			□			△	
M277	Metabasalt	ophitic			●			□					○			□			□	
M287	Green schist	lepidoblastic										●	○			□			□	
M288	Green schist	lepidoblastic										△	●			□				
M286	Diorite	porphyritic			○		□						○		□				□	
Y075	Biotite granite	holocrystalline	△		○		○				△									
A101	Diorite	porphyritic	△		○								□			△			△	
A312	Diorite	porphyritic	□		○			□			△									
H040	Diorite	holocrystalline	□		○		○				△									
H044	Diorite	holocrystalline	△		●					□	△									
H047	Diorite	holocrystalline	□		●	□	○													
M276	Metabasalt	hyaloclastic			●			□	□				○			□			△	
A102	Dacite	porphyritic			○						△	●	○						△	
K248	Andesite	porphyritic	△		○			△					○			□			△	
F091	Dacite	porphyritic	●		○							●	○						△	
Y089	Dacite	porphyritic	○		○	□						●	○						△	
Y091	Granite	holocrystalline	△		●															
Y086	Granite	holocrystalline		□	○	□		□												
K200	Green schist											□							△	
M211	Gneiss	holocrystalline	□	□	○	□	□													
A108	Metabasalt											●	□							
H033	Metabasalt											○								
K206	Metabasalt	hyaloophitic			●		○						○			○				□
K252	Metabasalt	porphyritic			○							●								
L-45	Metabasalt												●			○			○	
K227	Metabasalt												●			○			○	
L048	Metabasalt	intergranular			●			○			□		○			○				
L058	Metabasalt	intergranular			●			○			□		○			○				
L082	Metabasalt	porphyritic	○									●	○						△	
M216	Metabasalt	intergranular	□		○			○					○			○				
N055	Metabasalt											○			□	□			△	
M256	Metabasalt	lepidoblastic			○			□				△	○			□				
N060	Metabasalt	lepidoblastic	○		○														□	
N064	Metabasalt	lepidoblastic			●								●						△	
Y057	Metabasalt	intergranular			●			○			□		□			○				
Y060	Metabasalt	lepidoblastic	△		●			□					○						△	
Y065	Metabasalt	sub-ophitic			●			□					○			□			△	
Y077	Metabasalt	ophitic			●							△								
Y082	Metabasalt	granoblastic	○										○						△	
Y087	Metabasalt	ophitic			○			□											□	
L050	Altered metabasalt	porphyritic			○			□				●				□			△	
L058	Silicified metabasalt	porphyritic	○		●	□		□					○			□			□	
A104	Green schist	nematoblastic										●								
A121	Green schist	nematoblastic										○								
K222	Green schist	nematoblastic										●				○				
H035	Pelitic schist	nematoblastic										●	●							
L046	Pelitic schist	nematoblastic											○						□	
H041	Silicified rock	porphyritic			●		□						○		□				△	
L062	Silicified rock											●							△	
M252	Silicified rock	porphyritic			●							●	○							
M231	Gossan(schist)											●								
Y079	Serpentinite																		△	
A103	Massive limestone	granular										△								

Abbreviations: Qz:Quartz Kf:Potash feldspar Pl:Plagioclase Bi:Biotite
Ho:Hornblende Au:Augite Hy:Hyperthene Mf:Mafic mineral
Op:Opaque mineral G :Glass
●:Abundant ○:Common □:Few △:Rare

App. Fig. 6-1 Results of Microscopic Observation of Thin Section (3/4)

Dikmendağ

Sample No.	Rock Name	Texture	Phenocryst									Groundmass								
			Qz	Kf	Pl	Bi	Ho	Au	Hy	Mf	Op	Qz	Pl	Bi	Ho	Au	Hy	Mf	Op	G
H049	Altered basalt	intergranular			◎			○					○			○			△	
K114	Dacite	porphyritic	○		◎							◎						○	○	
M106	Gabbro	holocrystalline			◎		△	○			△									
L042	Porphyritic rock	porphyritic			○	□							○						□	
H051	Brecciated basalt	intergranular			○			△					◎			○				
K116	Massive basalt	porphyritic			○			□					□			□			□	
K101	Massive basalt	porphyritic			○			□					□			□			□	
K102	Massive basalt	porphyritic	△		◎	□		△					□			△			△	
S110	Massive basalt	porphyritic	△		◎	□		□					□			△			△	
Y093	Massive basalt	porphyritic	△		○	□							□			△			△	
Y094	Massive basalt	porphyritic			○		□						□		□	△			△	

Abbreviations:

Qz:Quartz Kf:Potash feldspar Pl:Plagioclase Bi:Biotite
Ho:Hornblende Au:Augite Hy:Hyperthene Mf:Mafic mineral
Op:Opaque mineral G :Glass
◎:Abundant ○:Common □:Few △:Rare

App. Fig. 6-1 Results of Microscopic Observation of Thin Section (4/4)

Drill Hole	Depth (m)	Rock Name	Mineral/Rock Fragment: Qz	Fd	Mm	Sh	Ct	Br	Op	Matrix: Cc	Se	Ch	Bi	Cm	Bm	Remark
MJTK-1	28.2	Black Shale	△	△					△		△	△		△	△	Schistosity
MJTK-1	87.1	Graywacke	◎	◎				△			△	△		△		
MJTK-1	133.7	Graywacke	◎	△				△	△	△	△	△		△		
MJTK-1	172.0	Graywacke	◎	◎				△		△	△	△		△		
MJTK-1	199.4	Black Shale	·	·					·	△	△	△		△	△	Schistosity
MJTK-1	220.5	Graywacke	△	△	△			△	△		△	△	△	△		Banded
MJTK-1	247.0	Shale	△	△					△		△	△		△		Schistosity
MJTK-1	329.5	Black Shale	·	·					·		△	·		△		Schistosity
MJTK-1	345.1	Black Shale	·	·					·		△	·		△		Schistosity
MJTK-1	370.0	Black Shale	·	·							△	·		△	·	Schistosity
MJTK-4	30.5	Graywacke	◎	△	△	△	△	△	·		△	△	△	△		Fd -> Se,Ch
MJTK-4	68.2	Graywacke	◎	◎			·		·	△	△	△	△	△		Fd -> Cc,Se,Ch
MJTK-4	124.2	Black Shale	△								△	△		△	△	Schistosity, Cataclastics
MJTK-4	139.7	Black Shale	△	△						△	△			△	△	Schistosity
MJTK-4	182.9	Black Shale	△	·						·	△	·		△	·	Schistosity
MJTK-4	187.9	Black Shale	△	△						△	△	△		△	△	Schistosity, Cataclastics
MJTK-7	29.6	Graywacke	△	△			△	△	△	△	△	△		△		
MJTK-7	49.0	Chert-Black Shale	·	·					·		△	·		△		Schistosity,Folding
MJTK-7	120.7	Black Shale	·	·					△		△	△		△		Schistosity
MJTK-7	140.5	Chert-Black Shale	·	·					△		△	△		△		Schistosity,Folding

Drill Hole	Depth (m)	Rock Name	Phenocryst: Qz	Fd	Mm	Op				Groundmass: Cc	Se	Ch	Py	Mc	Qz	Remark
MJTK-1	57.9	Altered Basalt								△	△	△			△	Ophitic
MJTK-4	181.6	Altered Basalt		◎						△	△	·	△	·		Ophitic
MJTK-4	198.0	Altered Basalt		◎						△	△	△				Porphyritic
MJTK-6	102.0	Altered Basalt								△	△	△			△	Ophitic, Cataclastic
MJTK-6	110.1	Pillow Lava								△	△				△	Ophitic
MJTK-6	130.1	Altered Basalt		◎						△	△	△			△	
MJTK-6	142.0	Altered Basalt		◎						△	△	△			△	Microspherulitic
MJTK-6	146.7	Hyaloclastite		◎						△	△				△	

Abbreviation

Qz:Quartz
Fd:Feldspar
Mm:Mafic mineral
Sh:Shale
Ct:Chert

Br:Basic rock
Op:Opaque mineral
Cc:Carbonate
Se:Sericite
Ch:Chlorite

Bi:Biotite
Cm:Clay mineral
Bm:Bituminous material
Py:Pyrite
Mc:Marcasite

◎:Abundant - Common
△:Few
·:Rare

Drill Hole	Depth (m)	Rock Name	Phenocryst: Qz	Pl	Mm	Op			Groundmass: Cc	Se	Ch	Py	Cl	Ep	Qz	Remark
MJTK-3	56.4	Pillow Lava		◎	△				△		△		·	·	△	
MJTK-3	64.0	Basalt		◎	△				△		△				△	Ophitic
MJTK-3	73.5	Hyaloclastite		◎	△				△		△				△	Ophitic
MJTK-3	97.1	Pillow Lava		◎	△				△	△	△			·	△	Ophitic
MJTK-3	114.6	Massive Basalt		◎	△						△		·	·		Ophitic, Amygdaloidal
MJTK-3	142.3	Siderite vein							◎							Ophitic
MJTK-3	208.3	Basalt		◎	·						△			△		
MJTK-3	238.7	Altered Basalt		◎	·						△		·	·		Ophitic
MJTK-3	249.0	Altered Basalt		◎	·						△			△		Ophitic
MJTK-5	19.3	Massive Basalt		◎		△					△					Ophitic
MJTK-5	35.0	Hyaloclastite							△		△				△	Ophitic
MJTK-5	79.4	Altered Basalt									◎				◎	
MJTK-5	97.3	Hyaloclastite		◎		·					△				△	
MJTK-8	49.1	Massive Basalt		◎	△						△					Ophitic
MJTK-8	64.0	Hyaloclastite		◎	△						△			△	△	Ophitic

Abbreviation

Qz:Quartz
Fd:Feldspar
Mm:Mafic mineral
Op:Opaque mineral

Cc:Carbonate
Se:Sericite
Ch:Chlorite
Py:Pyrite

Cl:Clinozoisite
Ep:Epidote
Qz:Quartz

◎:Abundant - Common
△:Few
·:Rare

App. Fig. 6-2 Results of Microscopic Observation of Polished Section (1/2)

Sample No.	Ore Name	Ore Minerals												Gangue Minerals					Texture	
		Py	Cp	Sp	Bo	Co	Te	Mr	Pr	Mg	He	Lu	Ru	Qz	Ch	Se	Ca	Cr	CC	CF
A023	Massive cp-py ore	◉	○	□				□				△		◉					◇	◆
L100	Massive cp-py ore	◉	○	□		△	△							○	○	○	○			
A028	Basalt with hematite		□							△	△	△		○				○	◆	◇
A032	Massive cp-py ore	◉	○	□				△						□					◆	◇
A025	Massive py ore	◉	□	□										□					◆	◇
A057	Brecciated pyrite ore	◉	□	○				○						□					◇	
A058	Basalt with net py-cp	◉	○	□							△		△	◉	○			○	◆	◆
A059	Massive cp-py ore	◉	○	□										□					◇	◆
L095	Massive py ore	◉	○	□				□						□					◇	◆
L101	Massive cp-py ore	◉	○	△									△	◉	○	△		□	◇	◆
A027	Massive py ore	◉	□	□									△	□					◇	◆
L097	Massive py ore	◉	□	△										□						◇
M058	Massive py ore	◉	□	□									△	□					◇	
M059	Massive ore	◉	□	□				○					△	□					◇	◆
Y031	Massive ore	◉	□						△		△			□					◇	
Y032	Massive py ore	◉	□	□		△								□	□			□	◇	
Y033	Massive py ore	◉	□	□									△	□					◇	
Y040	Massive py ore	◉	□	□										□	○	□		○	◇	◇
L106	Diss py sil ore	◉	□	□				□						◉					◇	◆
Y038	Brecciated ore	◉	○											◉					◇	
A026	Basalt with py-cp ore	□	△	△								△		◉	○	□		□	◇	
A029	Pyrite ore	◉	□	△										◉	○	○		○	◆	
A068	Massive cp-py ore(core)	◉	○										△	◉	○				◆	
A069	Massive cp-py ore(core)	◉	○	□				□					△	◉	□				◇	◆
A070	Massive cp ore(core)	◉	□	□	○		□							□					◇	◆
A071	Massive cp-py ore(core)	◉	○	□				□					△	□	○				◇	◆
A072	Basalt with py-cp(core)	○	□	□							△	△	△		○			○	◆	
A073	Basalt with py(core)	○	□	□				□				△	△		○	□		□		
A074	Basalt with py(core)	○	□	□				□				△	△		○	○		○	◆	
A034	Sil cp-py ore	○	○	□							△		△	□					◇	◆
A035	Massive cp ore	◉	○	□									△	○					◇	◆
M060	Massive cp ore(920ML)	◉	○											◉					◆	
M061	Massive py-cp ore(1010ML)	◉	○	□		□								○					◆	
M062	Massive py ore(1010ML)	◉	○	△		△			△					△						
M063	Brecciated cp-py ore	◉	○											□	○	○			◆	◆
M064	Massive py-cp ore	◉	○	△										○						
K064	Basalt with limonite	△										△	△	○						
A017	Slag		△		△	△			△	△	△									
H025	Slag		△		△	△			△	△	△									
N091	Slag		△		△															
N094	Slag		△		△				△											
N097	Slag		△		△				△											
A041	Massive cp-py ore(core)	◉	○	□										○					◇	◆
A044	Massive cp-py ore(core)	○	□	□				□	□					□						
A046	Massive cp-py ore(core)	◉	□			□		□						○					◇	
A060	Massive cp-py ore(core)	◉	○	□								△		○	□	○		□	◇	
A061	Brecciated cp-py(core)	◉	○									△	△	○	○	○			◇	◆
A062	Massive cp-py ore(core)	◉	□		□	□	△							□					◆	◇
A063	Massive cp-py ore(core)	◉	□	△									△	○					◇	
A064	Basalt with cp-py(core)	○	□									△	△	○	○	○		○	◆	
A065	Basalt with cp-py(core)	□	○									△	△							
A066	Basalt with cp-py(core)	○	□								△			◉	○	○			◆	
A067	Basalt with cp-py(core)	○	□	△			△	△					△	○					◆	◆
A056	Massive cp-py ore(core)	◉	□				□							○					◇	
L013	Gossan	□											△	□		□				◆
Y012	Pyrite veinlet	□						△												
A122	Slag		□		△				□	○	□									
N057	Pyrite ore	◉	□	□										○		○		○		
H036	Pyrite ore	◉	□	□		△							△	○	○					
N066	Gossan with py	○	□			△					△		△	◉	○	○		○		

Abbreviations:

Py:Pyrite Cp:Chalcopyrite Sp:Sphalerite Bo:Bornite
Co:Covelline Te:Tetrahedrite Mr:Marcasite Pr:Pyrrohtite
Mg:Magnetite He:Hematite Lu:Leucoxene Ru:Rutile-Anatase
Qz:Quartz Ch:Chlorite Se:sericite Ca:Calcite
Cr:Carbonate CC:Cataclastic CF:Colloform
◉:Abundant ○:Common □:Few △:Rare
◇:Major ◆:Minor

App. Fig. 6-2 Results of Microscopic Observation of Polished Section (2/2)

Drill Hole	Depth (m)	Description	Ore Mineral							Gangue Mineral						Remark
			Py	Cp	Ct	Bo	Sp	He	Mc	Qz	Ch	Cc				
MJTK-4	155.0	Pyrite Lens	◎							△						Py:Spherical
MJTK-4	166.2	Pyrite Aggregate	△						△							Py:Spherical, Colloform
MJTK-4	181.6	Pyrite Vein/Dissem	◎						·							
MJTK-4	182.0	Pyrite Film/Lens	△	·			·		◎							Py:Spherical, Colloform
MJTK-4	187.5	Pyrite Vein	△						△	△		◎				
MJTK-4	198.0	Pyrite Vein	△						△			◎				
MJTK-6	84.0	Cal-Py Veinlet	△						△			◎				
MJTK-6	145.0	Cal Veinlet			·	·		◎				◎				
MJTK-6	146.7	Qz Vein		·		·		·		◎	△	◎				

Abbreviation

Py:Pyrite
Cp:Chalcopyrite
Ct:Chalcocite
Bo:Bornite
Sp:Sphalerite
He:hematite
Mc:Marcasite
Qz:Quartz
Ch:Chlorite
Cc:Calcite
◎:Abundant - Common
△:Few
·:Rare

Drill Hole	Depth (m)	Description	Ore Mineral									Gangue Mineral				Remark
			Py	Mo	Cp	Ct	Bo	Sp	Br	He	Li	Qz	Ch	Co	Sn	
MJTK-3	16.0	Py-Qtz Vein	◎		·					△	△	△	·			Py:Cataclastic
MJTK-3	179.5	Py Vein	◎		·				·			△	·		·	Py:Cataclastic
MJTK-3	193.5	Py Vein	◎		△	·	·					△	·	·		
MJTK-5	20.1	Py Vein	◎		·			·		◎		△	△			Py:Cataclastic
MJTK-5	27.8	Hematite Vein	△		·					◎		△	△			
MJTK-5	59.7	Py-Cp Vein	◎		◎			△		·		△	△	△		Py:Cataclastic
MJTK-5	123.2	Py Network/Dissem	◎		△			·		△		△	◎	△		Py:Cataclastic
MJTK-5	131.9	Py Veinlet	◎							△		△	◎	△		Py:Cataclastic
MJTK-5	133.9	Py-Cp network	◎		△			·		·		△	◎	△		Py:Cataclastic
MJTK-5	134.9	Py Veinlet	◎									△	◎			
MJTK-5	159.0	Py Network	◎		·					·		△	◎	·		Py:Cataclastic
MJTK-5	167.9	Py Veinlet	◎		△					·		△	△	△		Py:Cataclastic
MJTK-5	190.5	Py Veinlet	◎							△		△	◎			Py:Cataclastic
MJTK-5	198.4	Py Veinlet	◎		·					△		△	◎			
MJTK-5	200.0	Py Veinlet	◎		·					△		△	◎			Py:Cataclastic
MJTK-8	95.6	Massive Sulfide Ore	◎	△	◎			△				△	△	◎		Py:Cataclastic

Abbreviation

Py:Pyrite
Mc:Marcasite
Cp:Chalcopyrite
Ct:Chalcocite
Bo:Bornite
Sp:Sphalerite
Br:Bravoite
He:hematite
Li:Limonite
Qz:Quartz
Ch:Chlorite
Cc:Calcite
Sn:Sphene
◎:Abundant - Common
△:Few
·:Rare

App. Fig. 6-3 Results of X-ray Diffraction Analysis

Area	Number	Rock Name	Mineral								
			Qz	Ch	Se	Ca	Pl	Aa	He	Py	Al
Küre	A009	Altered basalt	◎		△		△				
Küre	A024	Altered basalt	◎	•	○			△		△	
Küre	A030	Altered basalt	◎								
Küre	M034	Altered basalt	◎	△	○						
Küre	S057	Altered basalt	◎	△			○				
Küre	Y010	Altered basalt	◎				◎			•	
Küre	Y037	Altered basalt	◎		•				•		
Küre	Y043	Altered basalt	○	○		◎	◎				
Küre	Y048	Altered basalt	◎							○	
Taşköprü	K218	Gossan with Py	◎		◎					○	
Taşköprü	S078	Altered rock	◎	△	○						○
Taşköprü	Y059	Altered basalt	◎	△	△						

Abbreviations

Qz:Quartz
Ch:Chlorite
Se:Sericite
Ca:Calcite
Pl:Plagioclase

Aa:Anatase
He:Hematite
Py:Pyrite
Al:Analcime

◎:Abundant
○:Common
△:Few
• :Rare

Drill Hole	Depth (m)	Rock Name	Mineral					
			Qz	Il	Ch	Pl	Cc	Py
MJTK-1	93.0	Clay	○	△	○			
MJTK-1	126.8	Clay	○	△	○			
MJTK-1	129.7	Clay	○	△	○	•		
MJTK-1	131.0	Clay	○	△	○	•		
MJTK-1	133.4	Clay	○	△	○	•		
MJTK-1	281.5	Clay	○	△	○			•
MJTK-4	181.4	Hyaloclastite	○	•	•	△	△	△
MJTK-4	198.0	Massive Basalt	△	•	△	○	△	•
MJTK-6	121.5	Black Shale	◎	△	○	•		
MJTK-6	142.0	Massive Basalt	△		•	◎	○	△
MJTK-6	146.7	Hyaloclastite	○	△	○		○	
MJTK-7	161.0	Black Shale	◎	△	△	•		

Abbreviations

Qz:Quartz
Il:Illite
Ch:Chlorite

Pl:Plagioclase
Cc:Calcite
Py:Pyrite

◎:Abundant
○:Common
△:Few
• :Rare

Drill Hole	Depth (m)	Rock Name	Mineral							
			Qz	Ch	Si	La	Pl	Ep	He	Py
MJTK-3	142.3	Silicified	○		◎					
MJTK-3	145.0	Argillized basalt	△	○	○		△			
MJTK-3	238.7	Altered basalt		○		◎				
MJTK-3	268.0	Altered basalt	◎	△				○		
MJTK-5	27.8	Hematite vein	△		△				◎	
MJTK-5	179.5	Altered basalt	○	◎						•
MJTK-8	35.8	Clay		△			◎			
MJTK-8	77.6	Clay	○	◎						
MJTK-8	96.0	Altered basalt	◎	○	○					

Abbreviations

Qz:Quartz
Ch:Chlorite
Si:Siderite
La:Laumontite

Ep:Epidote
Pl:Plagioclase
He:Hematite
Py:Pyrite

◎:Abundant
○:Common
△:Few
• :Rare

App. Fig. 6-4 Assay Results of Ore Samples (1/5)

Copper Ore Samples collected from Open Pit of Aşıköy Orebody

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A023	0.3	15	8.38	0.06	1.56	0.1	46.21	EPMA S-isotope
A025	<0.1	5	2.66	0.04	0.05	0.24	44.01	EPMA
A026	0.2	<.5	1.65	0.06	0.17	0.07	13.09	S-isotope
A027	1.6	5	1.30	0.06	0.05	0.04	45.55	EPMA S-isotope
A032	<0.1	5	1.45	0.06	0.12	0.11	44.93	EPMA
L095	<0.1	<.5	1.69	0.02	0.05	0.04	46.51	
L096	8.1	5	1.9	0.19	0.08	0.03	45.91	
L100	1.9	5	7.38	0.12	0.13	0.08	43.29	
L101	0.9	5	1.55	0.09	0.05	0.04	43.26	
L102	0.8	5	3.78	0.07	0.87	0.08	42.56	
L105	<0.1	5	1.48	0.07	0.21	0.05	49.81	
L108	<0.1	<.5	3.22	0.04	0.07	<0.01	49.56	
L112	0.3	<.5	1.73	0.02	0.03	0.13	43.59	
Y031	1.5	5	2.88	0.04	0.05	0.03	42.60	
Y032	3.4	5	1.49	0.06	0.11	0.02	47.71	
Y033	1.8	5	1.6	0.02	0.05	0.31	40.60	
Y040	8.5	15	2.38	0.12	0.11	0.11	45.40	

Pyrite Ore Samples collected from Open Pit of Aşıköy Orebody

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A029	<0.1	5	0.07	0.19	0.10	0.04	47.11	S-isotope
L097	1.4	5	0.31	0.07	0.07	0.05	48.95	
L098	<0.1	5	0.54	0.20	0.05	0.04	48.04	
L099	0.6	5	0.81	0.19	0.08	0.06	43.69	
L103	<0.1	<.5	0.04	0.12	0.11	0.08	20.49	
L104	0.5	<.5	0.28	0.15	0.12	0.06	30.63	
L106	0.8	<.5	0.12	0.01	0.05	0.01	40.51	
L107	3.0	5	0.20	<0.01	0.11	0.01	46.57	
L109	<0.1	5	0.04	0.01	0.11	0.03	48.68	
L110	<0.1	<.5	0.03	0.01	0.12	0.05	39.81	
L111	0.6	<.5	0.02	0.04	0.54	0.11	46.99	
Y038	0.8	5	0.40	0.02	0.06	0.03	44.14	

Copper Ore collected from 920ML of Aşıköy Orebody

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
M058	3.2	5	4.0	0.02	0.28	0.63	48.19	
M059	3.6	15	3.0	0.05	0.04	0.44	48.74	

Drilled Cores of Toykondu Ore Zones

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A041	1.8	< 5	4.31	0.11	0.05	0.02	44.20	No.163 22-24m
A042	2.2	<.5	4.38	0.11	0.04	<0.01	45.19	No.163 24-25.7m
A043	4.1	25	9.88	0.15	0.07	<0.01	41.86	No.164 39.2-40.5m
A044	0.2	5	5.13	0.11	0.03	0.03	44.74	No.164 40.5-43m
A045	0.2	10	7.38	0.08	0.04	<0.01	46.99	No.164 43-45.2m
A046	2.2	< 5	6.75	0.10	0.03	0.03	46.44	No.164 45.2-47.5m

App. Fig. 6-4 Assay Results of Ore Samples (2/5)

Ore Samples from Bakibaba Orebody

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A013	<0.1	< 5	<0.01	0.06	0.06	0.01	0.42	
A034	5.6	5	4.63	0.06	0.18	0.20	29.45	EPMA
A035	7.6	10	9.25	0.10	2.48	0.06	44.60	EPMA S-isotope
K064	0.4	< 5	0.05	0.02	0.08	<0.01	<0.01	
M060	0.3	< 5	0.15	0.01	0.05	0.04	27.27	
M061	2.5	5	15.25	<0.01	3.75	0.02	44.47	1,014ML
M062	0.2	< 5	5.38	<0.01	0.09	0.16	49.04	1,014ML
M063	2.6	30	6.13	<0.01	0.03	0.21	43.50	1,080ML
M064	0.9	10	4.69	<0.01	0.10	0.44	46.37	1,080ML

Gossan in the Surface of Bakibaba Mineralized Zone

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
N083	0.4	< 5	0.03	0.01	0.05	<0.01	<0.01	
N084	<0.1	< 5	0.04	<0.01	0.05	0.01	<0.01	
N085	<0.1	< 5	0.03	<0.01	0.06	0.07	0.23	
N086	<0.1	< 5	0.26	0.01	0.08	0.04	<0.01	
N087	<0.1	< 5	0.04	<0.01	0.03	<0.01	<0.01	
N088	<0.1	< 5	0.09	<0.01	0.05	0.04	<0.01	
N089	<0.1	< 5	0.12	<0.01	0.09	<0.01	<0.01	
N090	<0.1	10	0.44	<0.01	0.09	0.12	15.30	

Slag of Bakibaba

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A017	<0.1	< 5	2.19	0.02	0.08	0.19	2.16	
H025	<0.1	< 5	0.60	0.12	0.17	0.43	1.16	
N091	<0.1	< 5	0.69	<0.01	0.12	0.29	1.07	
N092	3.6	10	4.06	0.02	0.25	0.46	1.21	
N093	<0.1	< 5	0.48	0.04	0.31	0.29	0.74	
N094	<0.1	5	1.76	0.01	0.17	0.37	1.33	
N095	<0.1	< 5	0.54	0.01	0.21	0.41	1.14	
N096	0.1	5	1.50	0.15	0.17	0.46	1.04	
N097	0.5	5	2.50	0.04	0.32	3.31	0.71	

Core, Gossan and Slag of Kızılsu Mineralized Zone

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A050	0.2	< 5	0.51	0.04	0.02	0.01	1.75	gossan
A051	<0.1	< 5	0.44	<0.01	0.02	0.02	0.24	gossan
A052	<0.1	< 5	0.63	<0.01	0.15	0.33	1.26	slag
A053	<0.1	< 5	0.04	0.09	0.01	<0.01	<0.01	gossan
A054	1.7	< 5	0.12	0.01	0.03	<0.01	<0.01	gossan
A055	<0.1	< 5	0.03	0.05	0.02	0.04	<0.01	gossan
A056	0.9	5	3.81	0.05	0.02	0.33	40.41	core

App. Fig. 6-4 Assay Results of Ore Samples (3/5)

Concentrates of Copper and Pyrite

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A076	2.0	5	1.13	0.03	0.42	0.14	43.5	
A077	0.1	< 5	0.63	0.02	0.30	0.16	45.8	Cu concentrates
A078	1.8	< 5	1.09	0.06	0.42	0.15	42.46	
A079	5.2	25	12.88	0.06	1.31	0.20	42.58	
A080	4.1	25	13.88	0.06	1.28	0.21	42.03	S concentrates
A081	4.4	25	11.75	0.06	1.08	0.14	43.01	

Samples collected from the Other Mineralized Zones in the Küre Zone

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
K009	<0.1	< 5	0.01	0.02	0.02	<0.01	<0.01	Ersizler
K018	<0.1	< 5	<0.01	0.02	0.01	<0.01	17.26	İpsinler
L013	<0.1	< 5	<0.01	0.04	0.01	<0.01	0.53	North of Zemberekler
L014	<0.1	< 5	<0.01	<0.01	0.02	0.03	0.64	North of Zemberekler
L015	<0.1	< 5	<0.01	<0.01	0.03	0.01	0.06	North of Zemberekler
L019	<0.1	< 5	<0.01	<0.01	0.02	<0.01	0.24	NE of Bakibaba
L028	<0.1	< 5	0.01	<0.01	0.02	0.06	<0.01	SE of Ipsinler
M044	<0.1	< 5	<0.01	0.05	0.01	0.03	4.87	NE of Bakibaba
N029	<0.1	< 5	<0.01	<0.01	0.01	<0.01	0.82	NE of Katiructugu r
N039	<0.1	< 5	0.02	<0.01	0.01	<0.01	<0.01	S of Katiructugu Sr
Y012	<0.1	< 5	<0.01	<0.01	0.01	<0.01	3.73	Zemberekler D.
Y019	<0.1	< 5	<0.01	<0.01	0.01	<0.01	7.26	W of Katiructugu Sr
Y024	<0.1	< 5	<0.01	<0.01	0.01	<0.01	0.72	Zemberekler D.

NE:Northeast SE:Southeast SW:Southwest W:West S:South

Samples collected from Taşköprü Zone

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
A122	<0.1	< 5	1.19	0.07	0.19	0.17	0.35	Cozoglu
A123	<0.1	< 5	0.78	0.01	0.04	<0.01	1.81	Cozoglu
Y200	<0.1	5	2.5	<0.01	0.75	0.01	0.18	Cozoglu
Y203	<0.1	5	0.91	<0.01	0.16	0.01	1.22	Cozoglu
Y204	<0.1	5	4.81	<0.01	0.01	<0.01	0.49	Cozoglu
Y207	<0.1	5	1.05	<0.01	0.18	0.11	0.83	Cozoglu
N057	1.9	115	0.3	0.1	0.15	<0.01	40.26	Cunur
Y165	<0.1	5	4.31	<0.01	1.44	0.01	0.29	Cunur
K422	<0.1	< 5	0.02	<0.01	0.01	<0.01	4.22	Alayurek
N108	0.2	< 5	0.91	<0.01	0.03	<0.01	12.81	Alayurek
N111	1.5	100	0.17	0.39	0.03	<0.01	1.75	Alayurek
S076	<0.1	15	1.02	0.04	1.56	<0.01	1.39	Alayurek
S077	<0.1	< 5	0.04	<0.01	0.03	<0.01	<0.01	Alayurek
A075	<0.1	5	<0.01	0.02	0.01	<0.01	31.24	Southeast of Kajakuz
H032	<0.1	5	0.01	0.06	0.01	<0.01	35.01	Sey Y.
H036	<0.1	5	0.07	<0.01	0.14	<0.01	<0.01	Boyali
H037	<0.1	< 5	0.04	<0.01	0.08	<0.01	25.14	Boyali
H038	<0.1	< 5	0.03	0.02	0.05	0.01	<0.01	Boyali
K224	<0.1	< 5	0.01	0.02	0.01	0.02	0.90	North of Soku
K228	<0.1	< 5	0.08	<0.01	0.01	<0.01	0.14	North of Soku
L051	<0.1	< 5	0.01	<0.01	0.04	<0.01	1.18	Suleymankoy
L052	<0.1	< 5	0.01	0.05	0.01	<0.01	1.86	Suleymankoy
M234	<0.1	< 5	0.07	0.04	0.01	<0.01	<0.01	Southeast of Delimar
M257	<0.1	< 5	0.08	0.04	0.02	<0.01	1.25	Northeast of Gano M.
N063	<0.1	< 5	0.01	0.01	0.01	0.04	19.00	South of Dikmen
N066	<0.1	< 5	0.03	<0.01	<0.01	<0.01	7.01	Kepez
N072	<0.1	< 5	0.01	<0.01	0.02	<0.01	2.84	Northwest of Sarpin
S095	<0.1	< 5	0.01	<0.01	0.01	0.01	1.52	South of Alayurek
S097	<0.1	< 5	0.47	<0.01	0.01	0.03	16.99	South of Alayurek
Y067	<0.1	< 5	0.63	<0.01	0.44	<0.01	<0.01	North of Soku

App. Fig. 6-4 Assay Results of Ore Samples (4/5)

Samples collected from Dikmendağ Zone

Sample No.	Au(g/T)	Ag(g/T)	Cu(%)	Pb(%)	Zn(%)	Co(%)	S(%)	Remarks
K111	<0.1	< 5	<0.01	<0.01	0.01	<0.01	1.93	Southeast of Kale T.
S261	<0.1	5	<0.01	<0.01	0.01	<0.01	3.58	South of Masköy
S262	<0.1	< 5	<0.01	0.01	0.01	<0.01	4.48	South of Masköy
S111	<0.1	< 5	0.80	0.06	0.03	1.63	<0.01	Southeast of Kale T.
K405	<0.1	5	3.25	<0.01	0.02	0.21	0.50	Southwest of Kale T.

App. Fig. 6-4 Assay Results of Ore Samples (5/5)

No.	Hole No.	Depth(m)	Au(g/t)	Ag(g/t)	Cu(%)	S(%)	Co(%)
K-301	MJTK-4	156.9 - 158.9	< 0.2	1.5	0.03	0.68	<0.01
K-302	MJTK-4	158.9 - 160.9	< 0.2	< 1.0	< 0.01	0.55	<0.01
K-303	MJTK-4	160.9 - 162.9	< 0.2	< 1.0	< 0.01	0.25	<0.01
K-304	MJTK-4	162.9 - 164.9	< 0.2	< 1.0	< 0.01	0.43	<0.01
K-305	MJTK-4	164.9 - 165.9	< 0.2	3.9	0.01	1.12	<0.01
K-306	MJTK-4	166.9 - 168.9	< 0.2	1.3	< 0.01	0.45	<0.01
K-307	MJTK-4	168.9 - 170.9	< 0.2	< 1.0	0.01	0.43	<0.01
K-308	MJTK-4	170.9 - 172.9	< 0.2	< 1.0	0.08	1.54	<0.01
K-309	MJTK-4	172.9 - 174.9	< 0.2	4.2	0.02	2.05	<0.01
K-310	MJTK-4	174.9 - 176.9	< 0.2	< 1.0	0.02	4.35	<0.01
K-311	MJTK-4	176.9 - 178.9	0.7	4.2	2.63	9.14	0.02
K-312	MJTK-4	178.9 - 180.9	< 0.2	< 1.0	0.03	4.20	<0.01
K-313	MJTK-4	180.9 - 182.9	1.9	1.7	0.02	7.99	<0.01
K-314	MJTK-4	182.9 - 184.9	< 0.2	6.7	0.20	3.30	<0.01
K-315	MJTK-4	184.9 - 186.9	< 0.2	1.9	0.02	3.13	<0.01
K-316	MJTK-4	186.9 - 188.9	< 0.2	< 1.0	0.02	4.02	<0.01
K-317	MJTK-4	188.9 - 190.9	< 0.2	19.0	0.04	5.77	<0.01
K-318	MJTK-4	190.9 - 192.9	< 0.2	9.4	0.03	4.23	<0.01
K-319	MJTK-4	192.9 - 194.9	< 0.2	1.2	0.02	9.43	<0.01
K-320	MJTK-4	194.9 - 196.9	< 0.2	9.7	0.02	5.71	<0.01
K-321	MJTK-4	196.9 - 198.9	< 0.2	< 1.0	0.02	2.95	<0.01
K-322	MJTK-4	198.9 - 200.3	< 0.2	4.2	0.02	2.46	<0.01
K-401	MJTK-5	53.0 - 54.0	< 0.03	< 0.3	0.12	1.98	0.019
K-402	MJTK-5	54.0 - 55.0	< 0.03	< 0.3	0.59	1.38	0.066
K-403	MJTK-5	55.0 - 56.0	< 0.03	< 0.3	0.12	0.40	0.010
K-404	MJTK-5	56.0 - 57.0	< 0.03	< 0.3	0.06	0.20	0.010
K-405	MJTK-5	57.0 - 58.0	< 0.03	< 0.3	0.24	2.23	0.023
K-406	MJTK-5	58.0 - 59.0	< 0.03	< 0.3	0.22	4.56	0.028
K-407	MJTK-5	59.0 - 60.0	< 0.03	< 0.3	0.05	0.79	0.012
K-408	MJTK-5	60.0 - 61.0	< 0.03	< 0.3	0.12	1.75	0.013
K-409	MJTK-5	61.0 - 62.0	< 0.03	< 0.3	0.32	2.07	0.012
K-410	MJTK-5	62.0 - 63.0	< 0.03	< 0.3	0.42	3.56	0.015
K-411	MJTK-5	63.0 - 64.0	< 0.03	< 0.3	0.18	4.68	0.017
K-412	MJTK-5	64.0 - 65.0	< 0.03	< 0.3	0.10	4.41	0.018
K-413	MJTK-5	65.0 - 66.0	< 0.03	< 0.3	0.17	5.91	0.021
K-414	MJTK-5	66.0 - 67.0	< 0.03	< 0.3	0.83	14.20	0.043
K-415	MJTK-5	67.0 - 68.0	< 0.03	< 0.3	0.45	4.33	0.019
K-416	MJTK-5	68.0 - 69.0	< 0.03	< 0.3	0.15	3.71	0.017
K-417	MJTK-5	69.0 - 70.0	< 0.03	< 0.3	0.08	3.86	0.021
K-418	MJTK-5	70.0 - 71.0	< 0.03	< 0.3	0.21	1.95	0.017
K-419	MJTK-5	71.0 - 72.0	< 0.03	< 0.3	0.05	8.00	0.035
K-420	MJTK-5	72.0 - 73.0	< 0.03	< 0.3	0.04	12.30	0.048
K-421	MJTK-5	73.0 - 74.0	< 0.03	< 0.3	0.06	11.10	0.046
K-422	MJTK-5	74.0 - 75.0	< 0.03	< 0.3	0.12	5.87	0.033
K-423	MJTK-5	75.0 - 76.0	< 0.03	< 0.3	0.03	5.14	0.029
K-424	MJTK-5	76.0 - 77.0	< 0.03	< 0.3	0.02	0.73	0.021
K-425	MJTK-5	132.0 - 133.0	< 0.03	< 0.3	0.26	6.87	0.018
K-426	MJTK-5	133.0 - 134.0	0.07	0.3	2.79	13.20	0.030
K-427	MJTK-5	134.0 - 135.0	< 0.03	< 0.3	1.60	10.90	0.039
K-428	MJTK-5	135.0 - 136.0	< 0.03	< 0.3	0.56	8.16	0.053
K-429	MJTK-5	136.0 - 137.0	< 0.03	< 0.3	0.02	1.18	0.025
K-430	MJTK-5	137.0 - 138.0	< 0.03	< 0.3	0.01	5.22	0.039
K-431	MJTK-8	95.25- 96.0	1.85	8.6	4.05	39.60	0.197

App. Fig. 6-5 Chemical Analysis and CIPW Norms (1/3)

	A047	L021	M036	S047	Y005	Y007	Y025	Y098	Y099	Y100	Y102	M108
SiO_2 wt%	47.73	34.67	48.44	46.24	47.93	53.44	50.23	45.72	49.65	52.69	65.62	56.63
TiO_2	1.66	0.95	0.43	0.69	1.06	1.21	1.24	1.78	1.05	1.29	0.64	0.62
Al_2O_3	14.13	15.09	14.54	17.01	15.72	15.56	15.39	14.17	14.52	15.34	14.41	15.21
Fe_2O_3	5.59	1.57	1.22	5.54	3.09	2.59	3.59	3.72	5.02	3.04	2.05	1.29
FeO	5.19	7.32	5.82	7.19	4.80	7.07	6.07	7.48	4.53	5.95	2.21	5.59
MnO	0.19	0.65	0.15	0.12	0.13	0.14	0.16	0.17	0.14	0.13	0.10	0.16
MgO	7.32	5.21	9.62	9.57	5.77	5.56	5.51	7.57	8.72	5.63	2.00	6.35
CaO	7.76	13.72	5.66	2.38	6.95	3.01	7.51	10.67	7.46	3.57	2.92	1.61
Na_2O	4.11	2.83	4.65	3.80	4.80	5.59	4.89	2.89	3.92	5.16	6.16	6.10
K_2O	0.93	0.95	0.08	0.19	0.54	0.08	0.19	0.20	0.18	0.21	1.35	0.05
P_2O_5	0.10	0.01	0.01	0.01	0.05	0.04	0.04	0.11	0.01	0.10	0.12	0.01
LOI	3.28	15.33	7.99	5.10	8.90	4.23	3.60	3.49	3.59	5.81	3.59	4.67
Cr_2O_3	0.01	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.02
Total	98.00	98.31	98.65	97.85	99.75	98.53	98.43	97.98	98.80	98.95	101.18	98.31
FeO*	10.22	8.73	6.92	12.18	7.58	9.40	9.30	10.83	9.05	8.69	4.06	6.75
Fe/Mg	1.40	1.68	0.72	1.27	1.31	1.69	1.69	1.43	1.04	1.54	2.03	1.06
Con.P	45.26	49.28	32.53	47.31	40.56	45.57	46.76	50.39	41.38	44.12	29.89	35.07
Q	0.00		0.00	0.59	0.00	1.88	0.00	0.00	0.00	3.17	16.37	4.25
C	0.00		0.00	6.25	0.00	0.91	0.00	0.00	0.00	0.38	0.00	2.22
or	5.50		0.47	1.12	3.19	0.47	1.12	1.18	1.06	1.24	7.98	0.30
ab	34.76		39.32	32.14	39.26	47.27	41.35	24.44	33.15	43.64	52.09	51.59
an	17.37		18.58	11.74	19.76	14.67	19.49	25.11	21.50	17.06	7.70	7.92
ne	0.00		0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
di-wo	8.55		3.94	0.00	6.01	0.00	7.30	11.32	6.44	0.00	2.51	0.00
di-en	6.68		2.63	0.00	4.15	0.00	4.65	7.38	5.09	0.00	1.77	0.00
di-fs	0.93		1.02	0.00	1.37	0.00	2.18	3.15	0.63	0.00	0.53	0.00
hy-en	0.37		1.96	23.82	0.00	13.84	3.52	2.70	14.61	14.02	3.21	15.81
hy-fs	0.05		0.76	7.71	0.00	9.11	1.65	1.15	1.82	6.53	0.96	8.47
ol-fo	7.83		13.57	0.00	7.16	0.00	3.89	6.14	1.41	0.00	0.00	0.00
ol-fa	1.20		5.77	0.00	2.61	0.00	2.01	2.89	0.19	0.00	0.00	0.00
mt	8.10		1.77	8.03	4.48	3.75	5.20	5.39	7.28	4.41	2.97	1.87
hm	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
il	3.15		0.82	1.31	2.01	2.30	2.36	3.38	2.00	2.45	1.22	1.18
ap	0.24		0.02	0.02	0.12	0.10	0.10	0.26	0.02	0.24	0.28	0.02
TOTAL	94.71		90.61	92.72	90.82	94.28	94.80	94.48	95.18	93.11	97.57	93.61
Femic	37.09		32.25	40.90	27.91	29.09	32.85	43.76	39.49	27.64	13.45	27.35
S.I.	32.42	29.40	45.23	37.18	30.87	26.95	27.70	35.23	39.87	31.83	14.74	32.99

	A047	L021	M036	S047	Y005	Y007	Y025	Y098	Y099	Y100	Y102	M108
Ba ppm	240	230	10	20	60	< 20	< 20	20	< 20	20	240	20
Nb	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Rb	16	27	< 5	5	22	5	11	11	5	11	71	< 5
Sr	180	90	70	70	100	20	30	130	150	70	90	60
Y	40	20	10	20	20	30	30	50	30	30	20	10
Zr	110	50	20	30	50	50	70	120	60	80	150	50

Area	Sample No.	Rock Name	Rock Unit	Location	Coordinates
Küre	A047	Breciated basalt	Küre F.	KS-3:72m	2558370 4629068
Küre	L021	Pillow lava	Küre F.	W.Kuşça M.	2561015 4631375
Küre	M036	Massive basalt	Küre F.	W.Katıructugu T	2559000 4632140
Küre	S047	Pillow lava	Küre F.	NE.Kızana M.	2557340 4631930
Küre	Y005	Pillow lava	Küre F.	SE.Küre	2560310 4628680
Küre	Y007	Massive basalt	Küre F.	S.Küre	2559740 4629085
Küre	Y025	Massive basalt	Küre F.	N.Küre	2559160 4631975
Küre	Y098	Pillow lava	Küre F.	Asıköy	2575240 4630802
Küre	Y099	Breciated basalt	küre F.	NW.Küre	2558300 4631700
Küre	Y100	Breciated basalt	küre F.	N.Küre	2559300 4631600
Dikmendag	Y102	Massive basalt	Küre F.	E.Masköy	2548300 4632503
Dikmendag	M108	Massive basalt	Küre F.	S.Kızılelma	2542600 4631100

App. Fig. 6-5 Chemical Analysis and CIPW Norms (2/3)

	H043	M200	M202	M205	M230	M261	M277	M287	M288	M289
SiO_2 wt%	47.13	56.43	46.74	46.77	54.90	45.11	52.11	52.03	48.11	67.44
TiO_2	1.05	0.86	0.24	0.83	1.18	1.27	1.14	0.86	1.94	0.58
Al_2O_3	14.03	14.43	12.87	14.65	14.84	17.63	17.07	16.28	14.17	14.62
Fe_2O_3	5.18	6.76	4.41	4.35	7.01	4.13	1.23	4.40	3.12	1.86
FeO	3.35	2.45	3.92	4.09	5.01	6.86	5.13	6.93	7.86	4.43
MnO	0.17	0.15	0.15	0.16	0.19	0.23	0.12	0.22	0.19	0.07
MgO	7.72	2.71	11.73	7.53	3.63	9.15	5.46	5.53	4.63	2.58
CaO	7.14	11.82	10.47	12.10	4.08	4.45	4.22	4.82	6.18	0.56
Na_2O	4.67	0.28	2.04	2.53	6.74	4.46	4.99	3.73	4.72	1.59
K_2O	1.58	0.24	0.22	0.05	0.17	0.38	1.56	0.03	0.23	3.72
P_2O_5	0.06	0.02	0.01	0.01	0.04	0.04	0.10	0.01	0.21	0.07
LOI	5.93	3.27	5.42	5.76	1.41	4.53	6.71	3.62	7.07	2.76
Cr_2O_3	0.01	0.01	0.12	0.02	0.01	0.09	0.03	0.01	0.01	0.01
Total %	98.52	99.43	98.33	98.83	99.21	98.33	99.87	98.47	98.44	100.29
FeO*	8.51	8.53	7.89	8.01	11.32	10.58	6.24	10.89	10.67	6.10
Fe/Mg	1.10	3.15	0.67	1.06	3.12	1.16	1.14	1.97	2.30	2.37
Con.P	37.86	72.54	36.06	44.19	51.78	43.05	34.18	53.96	52.69	43.62
Q	0.00	29.14	0.00	0.27	2.42	0.00	0.00	8.02	0.00	36.49
C	0.00	0.00	0.00	0.00	0.00	1.89	0.00	1.38	0.00	7.13
or	9.34	1.42	1.30	0.30	1.01	2.25	9.22	0.18	1.36	21.99
ab	28.94	2.37	17.25	21.40	57.00	37.25	42.20	31.54	39.92	13.45
an	12.66	37.41	25.31	28.48	9.75	21.81	19.58	23.84	16.81	2.33
ne	5.72	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
wo	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
di-wo	9.34	7.81	11.08	13.14	4.27	0.00	0.29	0.00	5.21	0.00
di-en	7.65	6.75	8.79	10.18	3.20	0.00	0.18	0.00	2.83	0.00
di-fs	0.55	0.00	1.04	1.55	0.64	0.00	0.09	0.00	2.21	0.00
hy-en	0.00	0.00	15.31	8.57	5.84	0.00	6.92	13.77	6.28	6.42
hy-fs	0.00	0.00	1.80	1.30	1.17	0.00	3.43	8.08	4.90	5.77
ol-fo	8.11	0.00	3.57	0.00	0.00	15.96	4.55	0.00	1.70	0.00
ol-fa	0.64	0.00	0.46	0.00	0.00	5.81	2.49	0.00	1.46	0.00
mt	7.51	5.89	6.39	6.31	10.16	5.99	1.78	6.38	4.52	2.70
hm	0.00	2.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
il	2.00	1.63	0.46	1.58	2.24	2.41	2.17	1.63	3.69	1.10
ap	0.14	0.05	0.02	0.02	0.10	0.10	0.24	0.02	0.50	0.17
TOTAL	92.57	96.15	92.76	93.04	97.78	93.68	93.12	94.84	91.36	97.51
Femic	35.92	25.82	48.93	42.63	27.62	30.26	22.14	29.88	33.29	16.16
S.I	34.04	23.04	53.61	41.56	16.61	37.24	29.92	27.40	22.86	18.44

	H043	M200	M202	M205	M230	M261	M277	M287	M288	M289
Ba ppm	20	10	50	10	10	20	220	10	30	470
Nb	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Rb	28	5	< 5	5	< 5	11	43	< 5	5	76
Sr	10	350	110	70	30	50	200	210	70	< 10
Y	20	20	< 10	20	20	30	30	20	50	20
Zr	50	60	30	30	50	60	120	40	130	100

Area	Sample No.	Rock Name	Rock Unit	Location	Coordinates
Taşköprü	H043	Green schist	Çangal metaophiolite	Yalak Dere	2605020 4617920
Taşköprü	M200	Green schist	Çangal metaophiolite	S.Kuzpınar Sr	2574300 4599680
Taşköprü	M202	Green schist	Çangal metaophiolite	Alıclıduz Sr	2574850 4599480
Taşköprü	M205	Meta basalt	Çangal metaophiolite	S.Sazak D.	2574570 4593640
Taşköprü	M230	Meta basalt	Çangal metaophiolite	Gökyar T.	2594200 4609680
Taşköprü	M261	Green schist	Çangal metaophiolite	SW.Ortaköy	2604500 4616500
Taşköprü	M277	Meta basalt	Çangal metaophiolite	S.Taşlıtepe	2621200 4619220
Taşköprü	M287	Green schist	Çangal metaophiolite	E.Çaltepe	2598900 4614260
Taşköprü	M288	Green schist	Çangal metaophiolite	SE.Karaoglan M.	2580980 4603970
Taşköprü	M289	Meta basalt	Çangal metaophiolite	S.Çaylak T.	2595730 4618320

App. Fig. 6-5 Chemical Analysis and CIPW Norms (3/3)

	A008	H015	M049	Y009	Y096	Y097	M286	Y075
SiO_2 wt%	38.40	37.61	49.29	54.15	66.37	69.48	51.61	56.22
TiO_2	0.26	0.01	0.25	1.24	0.30	0.34	1.14	0.96
Al_2O_3	4.48	0.81	16.06	15.77	15.32	16.28	18.26	17.53
Fe_2O_3	4.48	3.85	3.40	4.45	0.86	0.86	2.60	1.98
FeO	8.11	3.43	2.98	5.12	2.01	2.14	3.99	4.18
MnO	0.19	0.11	0.13	0.12	0.06	0.04	0.03	0.12
MgO	31.28	39.11	10.05	4.47	1.56	1.24	5.23	4.28
CaO	3.58	0.89	11.93	4.62	3.34	2.87	8.62	6.43
Na_2O	0.19	0.11	1.51	5.94	3.40	3.13	4.34	3.54
K_2O	0.08	0.02	0.51	0.30	2.45	3.46	1.17	1.76
P_2O_5	0.01	0.01	0.01	0.03	0.12	0.15	0.07	0.20
LOI	5.78	12.38	3.03	2.42	5.61	1.53	2.57	2.07
Cr_2O_3	0.35	0.30	0.01	0.01	0.01	0.01	0.02	0.01
Total %	97.19	98.64	99.16	98.64	101.41	101.53	99.65	99.28
FeOt	12.14	6.90	6.04	9.13	2.78	2.91	6.33	5.96
Fe/Mg	0.39	0.18	0.60	2.04	1.79	2.35	1.21	1.39
Con.P	27.79	14.95	33.35	46.01	27.31	27.12	37.08	38.36
Q	0.00	0.00	2.02	1.79	26.91	29.23	0.00	8.02
C	0.00	0.00	0.00	0.00	1.29	2.53	0.00	0.00
or	0.47	0.12	3.01	1.77	14.48	20.45	6.92	10.40
ab	1.61	0.93	12.77	50.23	28.75	26.47	36.70	29.94
an	11.14	1.66	35.54	15.49	15.79	13.26	26.90	26.75
di-wo	2.74	1.12	9.84	3.02	0.00	0.00	6.43	1.61
di-en	2.13	0.95	7.90	2.06	0.00	0.00	4.65	1.04
di-fs	0.31	0.03	0.79	0.72	0.00	0.00	1.20	0.46
hy-en	12.76	17.68	17.12	9.07	3.88	3.09	1.80	9.62
hy-fs	1.82	0.60	1.71	3.18	2.60	2.73	0.46	4.22
ol-fo	44.14	55.18	0.00	0.00	0.00	0.00	4.61	0.00
ol-fa	6.94	2.07	0.00	0.00	0.00	0.00	1.31	0.00
mt	6.49	5.58	4.93	6.45	1.25	1.25	3.77	2.87
hm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
il	0.49	0.02	0.48	2.36	0.57	0.65	2.17	1.82
ap	0.02	0.02	0.02	0.07	0.28	0.36	0.17	0.47
TOTAL	91.04	85.95	96.10	96.20	95.80	99.99	97.06	97.20
Femic	77.84	83.25	42.78	26.92	8.58	8.07	26.55	22.11
S.I.	71.60	84.76	55.49	32.53	15.31	11.55	30.64	27.54

	A008	H015	M049	Y009	Y096	Y097	M286	Y075
Ba ppm	$<$ 10	$<$ 10	100	20	230	430	150	200
Nb	$<$ 10	$<$ 10	$<$ 10	$<$ 10	$<$ 10	$<$ 10	$<$ 10	$<$ 10
Rb	$<$ 5	$<$ 5	5	5	109	114	38	76
Sr	$<$ 10	$<$ 10	60	100	160	220	310	270
Y	$<$ 10	$<$ 10	10	30	10	10	30	20
Zr	10	$<$ 10	80	70	100	100	40	90

Area	Sample No.	Rock Name	Location	Coordinates
Küre	A008	Pyroxinite	N.Kızılsu	2558710 4629470
Küre	H015	Serpentinite	NW.Kızana M.	2556200 4632350
Küre	M049	Gabbro	NE.Kızılsu	2559020 4629400
Küre	Y009	Diorite	S.Küre	2559500 4629120
Küre	Y096	Dacite	Asiköy	2575220 4630793
Küre	Y097	Dacite	NW.Toykondu	2555770 4631800
Taşköprü	M286	Diorite	NE.Yalakdere	2605700 4619140
Taşköprü	Y075	Bio-granite	NE.Ambarkaya	2587740 4617790

App. Fig. 6-6 Analytical results of EPMA

wt%	A023 Cp	A023 Cp	A025 Cp	A027 Cp	A032 Cp	A034 Cp	A035 Cp
Cu	34.12	34.09	34.33	34.16	34.43	34.51	34.79
Ag	0.03	0.01	0.01	0.03	0.03	0.01	
Au		0.05		0.06			0.09
Fe	30.44	30.87	30.7	30.95	30.44	30.51	30.64
Zn							
Mn		0.02					0.01
Cd							
Te							
As			0.01	0.02			0.04
Sb				0.01	0.01		
Bi	0.02	0.06	0	0.03			
Sn							
S	34.86	34.79	34.45	34.76	35.02	34.87	35.03
Se	0.07		0	0.05			
Co	0.02	0.06	0.02	0.03	0.03	0.05	0.04
Ni	0.01		0.01				
In							
Total	99.57	99.95	99.53	100.1	99.96	99.95	100.63

Cp:Chalcopyrite

wt%	A023 Py	A023 Py	A023 Py	A023 Py	A025 Py	A027 Py	A032 Py	A034 Py	A035 Py
Cu									
Ag			0.01						
Au		0.09		0.01	0.02		0.02		
Fe	46.71	46.33	46.84	46.77	47.03	46.5	46.68	45.36	46.66
Zn									
Mn						0.01	0.01	0.01	0.01
Cd				0.03		0.04	0.04		0.04
Te									
As	0.09	0.02	0.19	0.04	0.06	0.09	0.05	0.28	0.17
Sb									0.02
Bi	0.15					0.03		0.03	
Sn									
S	52.49	52.91	52.88	53.02	52.93	52.74	53.63	52.6	53.27
Se	0.05	0.02	0.01	0.01	0.01		0.02	0.02	
Co	0.08	0.04	0.06	0.05	0.06	0.04	0.04	0.75	0.05
Ni		0.01		0.02		0.1	0.02		
In									
Total	99.57	99.42	99.99	99.95	100.11	99.55	100.51	99.05	100.22

Py:Pyrite

wt%	A023 Sp	A025 *1	A034 *2	A027 Pyrim	A027 Pycore
Cu	1.91	13.52	23.15		
Ag				0.02	0.01
Au	0.06	0.05			0.03
Fe	3.61	40.07	36.29	46.37	47
Zn	60.76				
Mn			0.02	0.01	0.03
Cd	0.13	0.02			0.03
Te					
As	0.02	0.17	0.1		0.22
Sb		0.01			
Bi	0.03			0.06	0.02
Sn					
S	32.87	46.07	40.91	52.52	52.78
Se	0.07		0.08	0.02	0.02
Co	0.01	0.28	0.41	0.05	0.04
Ni					
In					
Total	99.47	100.19	100.96	99.05	100.18

Sp:Sphalerite *1:Pyrite contained with dotted chalcopyrite
*2:Undecided minerals existing between chalcopyrite and pyrite
Pyrim:Rim of colloform oyrite
Pycore:Core of colloform pyrite

App. Fig. 6-7 Delta ^{34}S Values of Sulfur Isotope

No.	Description	$\delta^{34}S$ CDT
A023	Massive cp-py ore of Aşıköy	+5.56
A026	Vein-type cp ore of Aşıköy	+8.45
A027	Massive colloform py ore of Aşıköy	+5.75
A029	Crystallized py ore of Aşıköy	+5.64
A031	Py vein in basalt of Aşıköy	+12.45
A033	Massive py ore of Aşıköy	+12.72
A035	Massive cp-py ore of Bakibaba	+5.43

EXPLANATORY NOTE
ON
THE GEOLOGY AND ORE DEPOSITS
OF
THE KÜRE AREA,
THE REPUBLIC OF TURKEY

FEBRUARY 1995

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

PREFACE

The Government of Japan, in response to the request extended by the Government of the Republic of Turkey, agreed to conduct a metallic mineral exploration survey in the Küre Area, and commissioned its implementation to the Japan International Cooperation Agency (JICA).

The agency, taking the importance of the technical nature of the survey work into consideration, sought the cooperation of the Metal Mining Agency of Japan (MMAJ) to accomplish the task.

The Government of the Republic of Turkey appointed the Etibank to execute the survey as a counterpart to the Japanese team. The survey was carried out from 1992 jointly by experts from both governments.

The cooperative mineral exploration in the Küre has continued for three years. It consisted of geological and geophysical survey, and drilling exploration.

We hope that this report will serve for the development of the project and contribute to the promotion of friendly relationship between the two countries.

We wish to express our sincere appreciation to the officials concerned of the Government of the Republic of Turkey for their close cooperation extended to the team.

March 1995

Kimio FUJITA
President,
Japan International Cooperation Agency

Takashi Ishikawa
President,
Metal Mining Agency of Japan

CONTENTS

CHAPTER 1 Introduction

1-1 Background, Area and Objective of the Survey

The Turkey-Japan Cooperative Mineral Exploration has been carried out in four areas of the Republic of Turkey as an example, Çanakkale (1988-1990). As a result of these works, a large amount of information relevant to metallic mineral resources was obtained.

The Government of Turkey planned to conduct mineral exploration in the Küre area, and requested the cooperation of the Japanese Government. In December 1991, the Japanese Government, complying with the request, sent a mission for project- finding, discussing the Scope of Work and to make a preliminary survey trip to the area. As a result of consultations with Etibank, the counterpart of the Metal Mining Agency of Japan(MMAJ), an agreement was reached for cooperative mineral exploration work in the Küre area on March 11, 1992.

The principal objective of the project is to find a new mineral deposit in the Küre area through the exploration and examination of geology and mineralization. Technology transfer to the counterpart organization is also an important objective of the project.

The localities surveyed during this survey are the Küre, Taşköprü and Dikmendağ zones. The coordinates of each zone are as follows.

Küre Zone (22 km^2 in area)

	Latitude	Longitude		Latitude	Longitude
1.	41°50.77'N	33°43.58'E	7.	41°47.73'N	33°41.40'E
2.	41°50.77'N	33°44.48'E	8.	41°48.27'N	33°40.98'E
3.	41°49.00'N	33°44.17'E	9.	41°49.00'N	33°40.25'E
4.	41°47.62'N	33°43.68'E	10.	41°49.92'N	33°41.05'E
5.	41°47.26'N	33°43.78'E	11.	41°50.48'N	33°43.67'E
6.	41°47.25'N	33°42.50'E			

Taşköprü Zone (559 km^2 in area)

	Latitude	Longitude		Latitude	Longitude
1.	41°31.63'N	33°49.63'E	5.	41°40.77'N	34°30.00'E
2.	41°37.50'N	34°01.07'E	6.	41°37.50'N	34°13.27'E
3.	41°43.85'N	34°03.77'E	7.	41°31.55'N	34°00.00'E
4.	41°43.65'N	34°30.00'E	8.	41°30.17'N	33°49.63'E

Dikmendağ Zone (66 km^2 in area)

	Latitude	Longitude		Latitude	Longitude
1.	41°51.36'N	33°30.36'E	3.	41°45.41'N	33°33.92'E
2.	41°51.34'N	33°35.42'E	4.	41°45.42'N	33°30.31'E

1-2 Method, Amount of Work

The first phase survey of this project was carried out in fiscal 1992. The purpose of the first phase was to clarify the geological environment and thereby understand the occurrence and conditions of ore deposits of the Küre area. The works carried out in the first phase were; compilation of available geological and geophysical information, geological survey of the whole area, and geophysical survey over the Küre zone.

In fiscal 1993, four holes totaling 1,003.55m in length were drilled in the promising areas of the Küre zone, which were delineated by the geological and geophysical surveys during the previous year. Also two holes were electrically logged. Geophysical survey (IP, 21 line-km) was carried out at Cünür and Cozoğlu of the Tasköprü area since these were concluded to be promising by geological survey during the first year.

In fiscal 1994, drilling exploration comprising four holes totaling 953.70m in length continued on the Küre zone.

Methods and amount of work in each phase are summarized as follows.

CHAPTER 2 General Geology of the Survey Area

2-1 General Geology of Kastamonu Region

The Kastamonu region, bounded by the Bolu metamorphic massif on the west, covers the Daday-Devrekani metamorphic massif in the central part and the Ilgaz metamorphic massif to the east. It includes granitoid intrusions.

The Bolu massif consists of a metamorphic assemblage of Precambrian period, formed under the middle-pressure amphibolite facies and overlain by Silurian-Devonian age non-metamorphic arkose conglomerate.

The Ilgaz massif consists of metamorphic rocks of Precambrian period, formed under the conditions from glaucophane schist to green schist facies.

Two tectono-stratigraphic assemblages have been identified in the Daday-Devrekani massif. From bottom to top, they are composed of the Daday-Devrekani meta-sedimentary group of Precambrian period and the Çangal meta-ophiolite of pre-Liassic epoch.

Four major formations which are underlain by the above mentioned massif are distributed in the region; Akgöl Formation, Bürnük Formation, Inalti Formation and Çağlayan Formation.

The Akgöl Formation is composed of black shale, siltstone, fine-grained sandstone, limestone, spilite, diabase, gabbro and serpentinite. It has a common feature of deep marine environment. Some part of this formation are metamorphosed due to the Early Dogger tectonics and by the Dogger intrusions.

The Bürnük Formation which deposited in intermontane alluvial environment has lithologies such as red colored conglomerate, sandstone, siltstone and sandy limestone of Later Dogger to Early Malm epoch.

The Inalti Formation consists of calcareous rocks and sandstone of shallow marine environment of Malm epoch. It is mostly unconformable with the overlying Cretaceous system.

The Çağlayan Formation of Aptian-Cenomanian epoch consists of turbidity sandstone, conglomerate and carbonaceous shale.

Summery of Exploration Work in the Küre Area

Phase	Survey	Area	Amount of Work
First	Study of existing information	Whole area	
	Geological Survey	Kure Zone Taskopru Zone Dikmendag Zone	Area: 22km^2 Area: 559km^2 Area: 66km^2 [Lab. Work] Thin Sections 137 pcs Polished Sections of Ore 60 pcs X-ray Diffraction Analysis 12 pcs EPMA 7 pcs Sulphur Isotope Analysis 7 pcs Chemical Analysis Whole Rocks 30 pcs Ore Assay (Au,Ag,Cu, Pb,Zn,Co,S) 124 pcs
	Geophysical Survey	Kure Zone	Area: 22km^2 CSAMT 513 points IP 4 km Rock Properties Measurement 43 pcs
Second	Drilling Exploration	Kure Zone	Area: 6km^2 Drilling (4 Holes) 1,003.55 m [Lab. Work] Thin Sections 28 pcs Polished Sections of Ore 9 pcs X-ray Diffraction Analysis 12 pcs Chemical Analysis Ore Assay (Au,Ag,Cu,Co,S) 22 pcs
	Geophysical Survey	Kure Zone	Area: 6km^2 Electric Logging (2 Holes)
		Taskopru Zone Cunur Prospect	Area: 2km^2 IP 13.5 km Rock properties Measurement 12 pcs
		Cozoglu Prospect	Area: 1km^2 IP 7.5 km Rock Properties Measurement 11 pcs
Third	Drilling Exploration	Kure Zone	Area: 6km^2 Drilling (4 Holes) 953.70 m [Lab. Work] Thin Sections 15 pcs Polished Sections of Ore 11 pcs X-ray Diffraction Analysis 9 pcs Chemical Analysis Ore Assay (Au,Ag,Cu,Co,S) 31 pcs Rock Properties Measurement 30 pcs

2-2 Geology and Geologic Structure of the Survey area

(1) Küre Zone

The geology of the Küre zone consists of pre-Jurassic ultramafic rocks, Jurassic basalt, sedimentary rocks of the Küre Formation, grayish white fossiliferous limestone of the Lower Cretaceous Karadana Formation, pale brown and white marl of the Upper Cretaceous Çağlayan Formation, talus deposits, intrusive diorite and dacite. The major part of the zone is occupied by the Jurassic Küre Formation. The basalt is composed of pillow lava, hyaloclastite, and massive basalt. Sedimentary facies of the Küre Formation is composed of angularly fragmented graywacke and tectonically sheared/argillized black shale. The matrix consists of pelitic materials.

Basalt and brecciated sediments of the Küre Formation are interpreted as a constituent of melange.

The geologic structure of this zone is characterized by many faults. They are divided into two systems; N-S and E-W. The former system is crosscut by the latter. With the exception of diorite and dacite intrusive bodies and the Karadana Formation, the boundaries of all geologic units, including ultramafic bodies, have been displaced. The surface elongation of the intrusive bodies is harmonious with the strike of faults in the vicinity and with the boundary between sediments and basalt of the Küre Formation.

(2) Taşköprü Zone

The basement of this zone is composed of biotite gneiss of the Devrekani metamorphic rocks. This rock occurs in the northwestern part of the zone.

The Çangal meta-ophiolite has the largest exposure in fault contact with underlying Devrekani metamorphic rocks. The meta-ophiolite is composed of serpentinite, meta-basalt, green schist and pelitic schist.

The Kayadibi Formation occurs in the eastern part of this zone, comprising black shale, siltstone, fine-grained sandstone, limestone and basalt.

The Muzrup Formation of Latest Dogger to Early Malm epoch is distributed in the southern margin of the zone, covering unconformably on the Kayadibi Formation. This formation consists of red conglomerate, sandstone, siltstone and psammitic limestone.

Being underlain unconformably by the Muzrup Formation, the Kızacik Formation occurs in the northern margin of the zone. It is composed of calcareous rock and calcareous sandstone.

The Alaçam Formation consists of turbiditic sandstone, conglomerate and calcareous shale. It is distributed in the southern margin of the zone, and is underlain unconformably by the lower formation.

The Çayköy Formation is exposed in the southern part of the zone, comprising of sandstone, andesite lava and andesitic pyroclastic rocks. This formation has an unconformable relationship with underlying Alaçam Formation.

Granite occurs in the northern and eastern parts of the zone. Dacite is exposed in the central part of the zone.

The geologic structure of the Çangal meta-ophiolite is difficult to interpret because of the metamorphism. It is, however, inferred that the beds are generally steeply dipping and extend in the east-west direction.

(3) Dikmendağ Zone

The geology of the zone consists of Küre Formation, Köstekciler Formation and Satıköy Formation.

Küre Formation is composed of basalt and sedimentary rocks comprising black shale, siltstone and fine-grained sandstone. Sedimentary rocks occupies the major part of this formation.

Köstekciler Formation consists of calcareous rock and calcareous sandstone of Lower Cretaceous.

Satıköy Formation is composed of turbiditic sandstone, conglomerate and calcareous shale of Upper Cretaceous.

Dacite and diorite intrude into Küre Formation and the size of those intrusion is small.

Küre Formation is considered to be a melange same as that of Küre zone.

Köstekciler Formation and Satıköy Formation overlying Küre Formation have a synclinal structure with a NE-SW trending axis.

Köstekciler Formation adjoin with Küre Formation in relation of fault contact in the southern part of the zone.

2-3 Mineralization

(1) Küre Zone

Aşıköy, Toykondu, Bakibaba, and Kızılsu are the known ore deposits in this zone. These deposits occur at the boundary between hyaloclastite and black shale of the Küre Formation. They also occur within hyaloclastite. The other large mineralized zone which is distributed on the surface occurs in Zemberekler.

The Aşıköy Deposit is the largest one in this zone. It is composed of many orebodies which have the largest dimensions of 380m east to west, 200m north to south, and 15 to 30m thick.

Ores are classified into massive ore, brecciated ore comprising fragments of massive ore filled in a matrix of chalcopyrite and pyrite, brecciated ore comprising subrounded to subangular massive ore fragments of 10 to 30cm in diameter in black shale, network ore and disseminated ore. The ore contains very large amount of pyrite with smaller amounts of chalcopyrite, sphalerite and marcasite, and minor amount of covelline, tetrahedrite and pyrrhotite. The gangue minerals are quartz with rutile, leucoxene, clay minerals and carbonates.

The ore grade of Aşiköy in drill cores ranges from 1 to 9 % Cu and from 40 to 48 % S.

Hyaloclastite on the footwall side of massive ore is sometimes silicified for a thickness of 1-3 m containing a large amount of quartz and minor sericite. The host rock of network zone is generally green, but it is bleached and silicified where the network is dense and sulfide minerals are strongly disseminated.

The Toykondu Deposit comprises a massive orebody with 200 m x 50 m extension in a locality further north of the northern part of Aşiköy pit and several smaller bodies (50 m x 20 m) nearby.

The orebody to the north of the above pit confirmed by drilling is 3-15 m in core width with Cu 1-4 %, S 32-51 %.

The Toykondu massive ores contain large amount of pyrite, smaller amounts of chalcopyrite and sphalerite, and minor content of bornite, tetrahedrite, marcasite and pyrrhotite. The gangue mineral is quartz.

Hyaloclastite immediately below the massive orebody is leached and silicified (1-2 cm thick), but underlying hyaloclastite does not show signs of alteration except the occurrence of hematite.

Bakibaba Deposit comprises black shale, sandstone and massive orebody emplaced at the boundary of or within hyaloclastite. The massive orebody extends in the dip direction and the lateral section is oblong to circular with size ranging from 40 x 70 - 80 x 80 m. The dip of the orebody id 50-60° SE and extends over 130 m.

The Bakibaba massive ore contains a large amount of pyrite, smaller amounts of chalcopyrite and sphalerite, and minor amounts of covelline and pyrrhotite. The major gangue mineral is quartz. There are locally high grade parts with Cu 4-15 %, and S over 40 %.

Sulfide minerals on the surface have been oxidized to reddish colour within 600 x 500 m of Bakibaba Deposit.

Kızılsu Deposit consists of network and massive orebodies emplaced in hyaloclastite. The lateral extent of the orebodies are in the order of 300 x 150 m. Drilling results confirm that most of the orebodies are network and the massive body is 80 x 40 m in lateral extent and the core width is 15 m. Both massive and network ore contain a large amount of pyrite, smaller amount of chalcopyrite, and minor amount of sphalerite, bornite, covelline, tetrahedrite and marcasite. The major gangue mineral is quartz.

The assay of massive ore shows Cu 4 %, S 40 %. The upper parts of the orebodies are gossan and the host rock hyaloclastite is silicified and leached with a large amount of quartz and some sericite.

The geologic environment, mode of occurrence, and mineral composition of these orebodies show a common feature which is characteristic to the Cyprus-type ore deposits.

(2) Taşköprü Zone

Three types of sulfide mineralization are observed in this zone; bedded, lens-shaped and dissemination. The mineralization with a large amount of pyrite, a small amount of chalcopyrite and a minor amount of sphalerite occurs in the zone which is occupied mainly by metabasalt and green schist. The mineralization is accompanied by silicification and argillization.

There is also a zone where a large amount of slags and abandoned adits occur, but no mineralization has been discovered at the surface outcrops and within waste dumps.

Bedded cupriferous pyrite deposits are possibly expected in this zone.

(3) Dikmendağ Zone

A mineralized zone comprising limonite network and pyrite dissemination over an area of 300x50m occurs in basalt adjoining with dacite intrusion. Pyrite dissemination in basalt appears in two localities of the southern parts in small scale.

Aside from the mineralized zone, slag is discovered at three localities.

It is possible that Cyprus-type copper mineralization is expected to occur in this zone, as basalt similar to that of Küre zone is distributed in the zone

CHAPTER 3 OUTLINE OF THE SURVEY RESULTS

3-1 Küre Zone

3-1-1 Geological Survey

(1) Stratigraphy

< Ultramafic Rocks >

These rocks are the oldest rocks exposed in the zone and comprise black massive pyroxenite, peridotite and serpentinite. They are holocrystalline and contain serpentinized pyroxene, olivine, and small amount of plagioclase. They are in fault contact with the Küre Formation. These rocks do not have banded structure and have not exerted thermal metamorphism to the surrounding bodies. Thus they are considered to have intruded in solid state.

< Küre Formation >

This formation is composed of basalts, black shale, and sandstone.

The basalts are largely divided into pillow lava, hyaloclastite, and massive basalt. They are shown separately in the geological map where by the predominant rock type.

Although the mode of occurrence of the basalts are distinct as described above, there seems to be no characteristic microscopic texture associated with these types of occurrence. These rocks show various textures with plagioclase and augite phenocrysts and groundmass consisting of plagioclase, clinopyroxenes and opaque minerals. Even those appearing fresh contain alteration minerals such as calcite and other carbonates, sericite, chlorite, epidote and rarely prehnite. Parts of the pillow lava are spilitized.

It is seen that although the alkali contents are high in the altered basalts and they plot in the alkali rock area of the diagrams, the major chemical components and some minor element contents both indicate ridge-type tholeiite as the original rock.

Sandstone is fine- to medium-grained quartz wacke and it occurs as thick beds, alternation with black shale, or as lenses in black shale.
The black shale often has scaly cleavage particularly when lenses of sandstone are intercalated.

It is interpreted from the observation of drilling cores that sedimentary rocks of this formation consist of breccia containing allochthonous blocks as greywacke, and being filled by pelitic materials. A small block of basalt occurs in pelitic rock on the surface. Pelitic rocks filling breccia have schistose texture and scaly cleavages.
From above facts, it is inferred that these sedimentary rocks constitute a melange. Basalt is also inferred to be a constituent of the melange

< Karadana Formation >

This unit occurs unconformably overlying the lower Küre Formation. The formation consists of grayish white fossiliferous limestone.

< Çağlayan Formation >

It is in fault contact with the lower Küre Formation. It consists of stratified pale brown marl.

< Talus Deposits >

The talus is developed at the foot of the mountains formed by Çağlayan limestone in the northeastern part of the zone. It contains a large amount of limestone breccias.

(2) Intrusive Rocks

< Diorite >

It often is intruded into the massive basalt of the Küre Formation. These bodies consist of pale green diorite and dark green gabbro, they are holocrystalline with phenocrysts of plagioclase, hornblende, and augite.

< Dacite >

Dacite bodies occur as relatively thin dikes in the Küre volcanics or in mudstones. Dacite is gray and has porphyritic texture with phenocrysts of quartz, plagioclase, biotite, and matrix consisting of secondary fine-grained quartz and chlorite.

(3) Geologic Structure

The attitude of the boundary between the black shale and the sandstone of the Küre Formation vary considerably. It can be said from the frequency distribution of the attitude of the boundary that NE-SW and NW-SE and 30°- 60°S would be the most frequent strike and dip throughout the zone. In the northern part of the zone NW-SE strike and southward dip are most common, while in the south NE-SW strike and southward dip are often observed.

Basalt and brecciated sediments of the Küre Formation is interpreted as a constituent of a melange

(4) Küre Ore Deposit

< Aşıköy-Toykondu Deposit >

These orebodies are distributed in an area extending northward from the vicinity of the Aşıköy Pit. The Toykondu Orebody extends to the north from the northern part of the Pit and the Aşıköy Orebody is located from the central part of the Pit to the south. The Aşıköy Orebody is observed at the open pit and the lower and lateral extension is confirmed by drilling. A part of the Toykondu Orebody can be observed at the open pit, but the major part is explored only by drilling.

The Aşıköy Orebody occurs at the boundary of black shale and hyaloclastite of the Küre Formation or in the hyaloclastite. The ore occurs as massive, boulder, conglomeratic, and network types. The massive ore is more or less homogeneous to the unaided eyes, the boulder ore is subrounded to subangular ores of 10-30cm and occur in black shale, conglomeratic ore occurs with chalcopyrite and pyrite filling the interstices of the boulder ore, the network ore is emplaced in hyaloclastite.

The Aşıköy Orebodies are composed of a body situated in the central part of the open pit, that on the northern side of the open pit, and another to the southwest of the open pit. The northern orebody consists of massive ore extending 70 x 20m laterally and conglomeratic ore in the black shale adjacent to it to the south. The central body extends 380m east-west and 200m north-south, the ore is of massive and network type. The lateral distribution of the massive ore is convex southward.

The attitude of the boundary between the massive ore in the eastern part of the open pit and the overlying black shale is N-S strike and 50°-70° E and the thickness of the orebody is 15-35m. The grade of the massive ore in the drill cores is Cu 1-9%, S 40-48%. The network ore occurs as 0.1-1cm thick pyrite, chalcopyrite, quartz veinlets in hyaloclastite with dissemination of the sulfide minerals. The host rock of the network ore is generally green, but it is bleached and silicified where the network is dense and strongly disseminated. Most of the altered minerals is quartz with minor amount of sericite.

The hyaloclastite on the footwall side of the massive ore is sometimes silicified for a thickness of 1-3cm with large amount of quartz and minor sericite.

The orebody to the southwest of the open pit consists of massive and network ore confirmed by drilling. The southwestern extent of the body is not yet confirmed.

The massive ores of the Aşıköy Orebody is composed of a large amount of pyrite, smaller amounts of chalcopyrite, sphalerite, marcasite, minor amounts of covelline, tetrahedrite, and pyrrhotite. The gangue minerals are mostly quartz, rarely rutile, leucoxene, clay and carbonate minerals. The constituents of the network and disseminated ores are the same as massive ores.

The stratigraphic sequence of these bodies is, from the surface downward, black shale, massive ore, and hyaloclastite. The ore minerals are; large amount of pyrite, small amount of chalcopyrite, sphalerite, minor content of bornite, tetrahedrite, covelline, marcasite, and pyrrhotite. The gangue mineral is quartz. Assay result of massive ore of Drilling B-164 is Cu 6.92%, S 45.35%.

The hyaloclastite is silicified and thus bleached to a thickness of 1-2m immediately below the massive orebody. Further down, hematite is observed in the matrix of the hyaloclastite.

< Bakibaba Deposit >

The Bakibaba Deposit is located approximately 900 m east of the Aşıköy Orebody. This is the original deposit of the Küre mine and has been worked sporadically since the Greek times.

The ores occur at the boundary of black shale-sandstone and hyaloclastite and within hyaloclastite. They are massive ores are lenses elongated in the dip direction. The horizontal section of the orebodies are oval to circular with dimensions of 40 x 70m - 80 x 80m. The dip of the orebodies is 50°-60° SE and the extension in that direction has been confirmed up to 130m.

The massive ores of the Bakibaba Deposits is composed of a large amount of pyrite, small amounts of chalcopyrite and sphalerite, minor amounts of covelline and pyrrhotite, and the gangue minerals is quartz. The assay of the ore shows the grade to be Cu 4-15%, S over 40%, indicating locally high-grade copper zones.

Sulfide minerals have been oxidized on the surface near the orebodies and for 600 x 500m the surface is red with limonite.

There are mine slags 600m to the east of the orebodies and these contain minor amounts of chalcopyrite, bornite, covelline, pyrrhotite, magnetite and hematite with grades ranging from Cu 1 to 4%, Co 0.2 to 0.4%.

< Kızılsu Deposit >

Kızılsu Deposit lies 1.7km south of the Bakibaba Deposit, and the high- grade part confirmed by drilling is being mined. Drilling was carried out until recently.

The orebodies are network and massive type in hyaloclastite. The horizontal extent is 300 x 150m. The results of the drilling indicates that most of the ore is of network type with massive ores occupying 80 x 40m in horizontal extent and about 15m thick. Both types of ores consists of a large amount of pyrite, small amount of chalcopyrite, minor amount of sphalerite, bornite, covelline, tetrahedrite, and marcasite with quartz as the gangue mineral.

It is inferred that these ores were formed syngenetically without being affected by the deep sea water from the results of sulfur isotope study.

(5) Other Mineral Showings

Mineral showings and alteration zones occur in 14 localities. Zemberekler is the largest mineralized one in this zone.

3-1-2 Geophysical Prospecting (CSAMT and IP Methods)

The object of the survey is to clarify the subsurface structure of the Küre Zone by CSAMT electromagnetic method and also to understand the relation between the geologic structure and mineralization by IP electric method. Geophysical anomalies will be extracted at the same time in order to obtain guidance for future exploration.

The geophysical survey was conducted in Küre Zone in general which was the target for semi-detailed geological survey.

The method used is CSAMT and IP. CSAMT is generally a method used for investigating a specific area. During the present survey, array method for studying a linear profile and random point method for clarifying the resistivity structure of the whole Küre Zone were applied. With the IP method, three profiles totaling 4,000m were measured.

(2) Results of Geophysical Prospecting

< CSAMT Method >

The interpretation of the results of CSAMT array and random point surveys, one- and two-dimensional analysis are described below.

(1) As a whole, the resistivity of the Küre Zone is dominantly of intermediate values, 100-300ohm-m. This intermediate resistivity is distributed quite

widely in the vicinity of the area. The high resistivity zones of more than 1000ohm-m are concentrated in the central part of the area and extend in the NW-SE direction. The distribution of these high anomaly zones tend to expand toward the deeper parts and resistivity exceeding 300ohm-m extends throughout the area at 500m depth or more.

(2) Regarding low resistivity anomalies, those related to Aşıköy, Bakibaba, and Kızılsu Deposits are significant. A group of small anomalies to the southeast of Aşıköy Orebody was detected by the present work. Also small but strong low resistivity anomalies are confirmed to the north and south of the Bakibaba Deposit.

(3) Regarding weak anomalies, there is a northeastern Bakibaba weak anomalies which are considered to be related to the mineral showings at northeast of Bakibaba Orebody. Slag from old Bakibaba Mine is dumped widely to the south of these anomalies. Although not recorded as a mineral prospect because of the slag, significant east Bakibaba anomalies extending in the NNW-SSE direction have been identified below the slag heap. This anomaly zone continues for four traverse lines and is in en echelon position with the northeastern Bakibaba weak anomalies in the north, and the Zemberekler mineralized Zone is in the southern extension of this anomaly zone.

(4) Mineral prospect are known at Ersizlerdere and İpsinler in the northeastern part of Küre Zone. Random CSAMT points were established at these localities for investigation of the prospecting. Some lowering of resistivity was observed, but not to the extent of calling it anomaly. Thus these localities are considered to be not promising.

(5) Although Kızılsu and Zemberekler mineral showings are considered to have high mineral potential, CSAMT random points could not be established because of the noise from the high tension transmission cables.

(6) Significant low resistivity anomalies were identified at 400m north of Ersizler Prospect and 1km south of İpsinler Prospect by CSAMT random point measurements. Array CSAMT measurements were carried out in addition to the original plan, and notable low anomalies were analyzed at both localities. Both anomalies were detected in the talus deposits with tall limestone cliffs in the back. And IP exploration was carried out in order to check whether the anomalies were caused by mineralization or by factors other than mineralization such as groundwater.

(7) It is known that the distribution of the high anomalies agree well with that of basaltic rocks. The high anomalies are distributed with NW-SE to NNW-SSE trend and the line of resistivity discontinuity also trend in the same direction.

< IP Method >

FE anomalies of significance have not been detected by IP in the three traverse lines.

3-1-3 Drilling Survey (Second Phase)

(1) Outline of Work

Drilling survey of four holes totalling 1003.55 m were done this phase to clarify the conditions of subsurface copper mineralization in the south of the Aşıköy ore deposit and in the north of the Zemberekler mineralized zone.

(2) Results of the Survey

The geology of the area where drilling exploration was carried out this phase is composed of basalt and sedimentary rocks of the Küre Formation.

Basalt is pillow lava.

Sedimentary rocks consist of breccia. Fragments of graywacke, siltstone, black shale, cherty shale and chert are observed. Pyrite fragments are rarely observed.

The shape of breccia excluding cherty shale and chert is angular to subangular. The size of breccia ranges from several centimeters up to several meters.

Matrix of breccia is composed of pelitic rocks. Black shale surrounding breccia is sheared and argillized. It has a scaly cleavage. It is easily dissolved in water because it is clayey.

Under the microscope, schistose structure, micro-fault and micro-folding were observed in black shale which looked massive by naked eye. Black shale is composed of quartz, illite, chlorite and bituminous material.

Ore minerals observed in drill cores are pyrite, marcasite, chalcopyrite, chalcocite, sphalerite, bornite and hematite. Gangue minerals are quartz, calcite and chlorite.

The occurrence of ore minerals is breccia, lens and film of sulphides in sedimentary rocks, and veinlets and dissemination of sulphides in basalt.

Ore minerals in sedimentary rocks are pyrite and marcasite. Quartz is rarely observed as gangue mineral.

Veinlets in basalt are composed of a large amount of calcite and a minor amount of copper minerals. Disseminated sulphide mostly consists of pyrite.

3-1-4 Drilling Survey (Third Phase)

(1) Outline of Drilling

Geological and geophysical surveys of the first phase and the drilling of the second phase enabled the extraction of northern and southern extensions of both Aşıköy and Bakibaba Deposits as the promising targets for further exploration in the Küre area.

Four holes totaling 953.70 m in length were drilled.

(2) Result of the Survey

The rocks drilled during the present third phase are basalt and sedimentary rocks of the Küre Formation.

Basalt consists of pillow lava, massive basalt and hyaloclastite.

The pillow basalt consists of both close-packed and pillow breccia.

Ore minerals observed in drill cores are pyrite, marcasite, chalcopyrite, chalcocite, sphalerite, bornite and hematite. Gangue minerals are quartz, calcite and chlorite.

The mineralization observed in the cores are massive, veinlets to network and dissemination.

In MJTK-8, massive ores are confirmed at 59.25-60.0 m, it appears to the unaided eyes that pyrite and chalcopyrite grains fill the interstices of pyrite fragments (about 1 cm in diameter). It is in fault contact with the upper massive basalt. The alteration of the overlying basalt is weak. The orebody is in contact with the lower hyaloclastite at a high angle. The footwall hyaloclastite is argillized and consists of quartz, chlorite and siderite. The massive ore at this hole is; 75 cm in core width, Au 1.85 g/t, Ag 8.6 g/t, Cu 4.05 %, S 39.6 %.

These microscopic characteristics are similar to those of the Aşiköy and Bakibaba ores.

3-1-5 Electric Logging and Mesurement of Physical Properties on Cores

(1) Outline

The low CSAMT resistivity anomalies were drilled and electric logging was carried out for the drill holes in order to clarify the physical characteristics of the country rocks and the mineralized zones in the second phase. The measurement of physical properties on cores was done in the third phase.

(2) Results of Logging

It is reasonable to consider the source of the low resistivity at MJTK-4 to the existence of black shale to 175m depth.

It is seen from the result that it is reasonable to consider the source of the low resistivity at MJTK-6 to the existence of weathered basalt to 54m depth at this point.

(3) Results of the Measurement of Physical Properties of the Cores

The results of physical properties measurement is harmonious with that of the first phase collected from outcrops. It could confirmed that massive sulfide indicated low resistivity at 7.5 ohm-m, and black shale and some sandstone indicated low resistivity below 250 ohm-m. It is clarified from the work in this phase that pyrite dissemination or argillization in basalt which has high resistivity above 1,000 ohm-m possibly makes low resistivity zone.

3-2 Taşköprü Zone

3-2-1 Regional Geological Survey

(1) Stratigraphy

<Devrekani Metamorphic Rocks>

The lithology of this unit is mostly biotite gneiss with some muscovite.
The rocks have gneissose texture and consist mainly of quartz, biotite, chlorite and sericite.

These rocks are in fault contact with the overlying Çangal Meta-ophiolite. This metamorphic unit is considered to have derived from Paleozoic sedimentary rocks.

<Çangal Meta-ophiolite>

This body is composed of serpentinite, green rocks constituting the major part, and pelitic rocks. The orogenesis of the Dogger Epoch strongly affected these rocks and the green rocks were metamorphosed to metabasalt and green schist, and the pelitic rocks to pelitic schist.
Serpentinite occurs at the boundary with the underlying Devrekani Metamorphics and is partly intruded into the lower unit.
The green rock, the major constituent of this unit, consists of metabasalt and green schist. The metabasalt is believed to have derived from basalt and is massive and weakly metamorphosed. The green schist is believed to have derived from pyroclastics. Pelitic schist gradually becomes dominant eastward. Metabasalt is dominant to the west and green schist to the east.

The metabasalt has intersertal, porphyritic, and ophitic texture characteristic of basalt. Chlorite, epidote, calcite, carbonates increase with the metamorphic degree and granoblastic and nematoblastic texture appears.

<Kayadibi Formation>

This formation comprises sedimentary rocks and basalts. The sediments are black shale, siltstone and fine-grained sandstone. The attitudes of these rocks vary considerably in places. The dip is generally steep, 60°-70°. It has been reported that the basalt is composed of spilite, diabase, gabbro, serpentinite and others, but the body consists of massive basalt near Mt. Cal and basalt dikes in western Kayadibi Village.

This unit overlies the Çangal Meta-ophiolite unconformably

<Muzrup Formation>

This formation has characteristics similar to alluvial fans in the mountainous areas, and namely it comprises red conglomerate, sandstone, siltstone and psammitic limestone. Fragments of shale, sandstone, diabase, gabbro, granite and granodiorite of the underlying formations are included in the conglomerates and metamorphosed dolomite and marble occurs as pebbles.

This formation unconformably overlies the Kayadibi Formation.

<Kızacik Formation>

This formation is composed of shallow marine calcareous rocks extending northward from the south. This was formed by the regional transgression during early Malm Epoch. This formation overlies the Kayadibi and Muzrup Formations unconformably.

<Alaçam Formation>

This formation comprises turbiditic sandstone, conglomerate, and calcareous shale. Bedding with east-west strike and southward dip is developed. This formation overlies the Çangal Meta-ophiolite unconformably and underlies the Çayköy Formation unconformably.

<Çayköy Formation>

This formation comprises well-bedded sandstone, andesite lava and andesitic pyroclastics, and psammitic limestone in the ascending order. All the constituents have narrow distribution and they occur separately. This formation overlies the Çangal Meta-ophiolite and the Alaçam Formation.

(2) INTRUSIVE ROCKS

<Çangal Granite>

The granite intrudes the Çangal Meta-ophiolite and Kayadibi Formation. The contact of these rocks with the granite is very clear without evidences of thermal metamorphism.

<Dacite>

The intrusive body considered to be dacite and quartz porphyry occurs with NE-SW trend near Mt. Cal in the eastern part of the survey zone. Here, it is quartz porphyry and has intruded into the basalts of the Kayadibi Formation.

Small bodies of dacite occur along the road between Mt. Kirtiltürbe and Taşköprü and in the middle reaches of Kara Stream. These bodies intrude into the

Çangal Meta-ophiolite. These are all silicified and argillized and the alteration mineral is sericite.

(3) Geologic Structure

The Çangal Meta-ophiolite occurs widely in the survey zone and the attitude of the lamina cannot be determined because of the effect of metamorphism. Thus the geologic structure is very difficult to determine. Lithologically, it changes from ophiolitic lava in the west to pelitic rocks in the east. It is in contact with the underlying basement, Devrekani Metamorphics, through NE-SW trending tectonic line.

(4) Mineralization and Alteration

There are eight mineral showings, namely, Cozoğlu, Cünür, Boyalı, Musabozarmut, Sey Yayla, Kepez, and East of Cünür, These showings consist of a mineralization with copper and zinc in the Çangal Meta-ophiolite

3-2-2 Cozoğlu Prospect

(1) Geology and Geologic Structure

The geology in this prospect is composed mainly of Çangal Meta-ophiolite, Kizacik Formation, and Alaçam Formation. The Meta-ophiolite comprises pelitic schist, massive metabasalt and green schist.

(2) Mineralization and Alteration

There are two openings of old adits on the surface. A large amount of mine waste is found in the vicinity. These are all in the Çangal Meta-ophiolite.

There are some mine waste dumps within 400x150m range. Samples from two of these dumps show Cu 1.0-4.8% and chalcopyrite and bornite are observed microscopically.

(3) Geophysical Exploration (IP)

The objective of the survey is to clarify the electric characteristics of the deeper subsurface zones and thus obtain information regarding the mineral potential of these zones.

Chargeability anomalies of 60mV/V were detected corresponding to the distribution of slag and also those of 30-50mV/V in the northwestern part and anomalies in the southern part.
The former anomalies extend further eastward. The resistivity is low at 50-100ohm-m, similar to that of sandstone and shale, and as this is not due to massive deposits, the possibility of the existence of large massive deposits is low. The shape of these anomalies on cross sections may indicate that bedded cupriferous pyrite deposits probably occur within these zones.

Of the latter anomalies, that of the southern end is confirmed by all lines, but the total feature is not clear because of the fact that it is at the end of the traverse lines. The anomaly is strong and it is continuous for significant distance. The shape of the anomaly suggests sulfide dissemination, but manifestations of mineralization are not found in the surface rocks (sandstone, shale, pelitic schist) of the anomalous zone.

3-2-3 Cünür Prospect

(1) Geology and Geologic Structure

The geology of the prospect is Çangal Meta-ophiolite consisting of pelitic schist, massive basalt, and green schist. The pelitic schist strikes NE- SW and the dip is mostly within the range of 20°-70° N.

(2) Mineralization and alteration

The mineralized zones comprise eight lenses and bedded gossan bodies in green schist. The gossans extend in the NE-SW direction harmonious to the bedding and the maximum lateral extension is 400x50m. They are silicified and argillized parts of mafic rocks with quartz-limonite-pyrite network veinlets and limonite dissemination. Azurite and chrysocolla occur in parts of the gossan in the central part of the zones and the assay of the sample is Cu 4.3%, Zn 1.4%. Pyrite veinlets occur in the gossan in the northeastern part of the zone with assay result of Au 1.9g/t, Ag 115g/t and S 40%.

Silicified rocks occur widely around the gossans. These silicified bodies are derived from mafic rocks and limonite does not occur.

(3) Geophysical Prospecting (IP)

Electric survey (time-domain IP method) was applied in the Cünür area that was considered to be promising by the geological survey. The objective of the survey is to clarify the electric characteristics of the deeper subsurface zones and thus obtain information regarding the mineral potential of the prospect.

Time-domain IP survey was carried out in an area centered around the silicified zone. Anomalies related to the outcrops of gossan and other evidences of mineralization confirmed on the surface could not be detected. Although the silicified zone is distributed widely in the survey area, high resistivities do not occur in this zone, while such anomalies exceeding 300ohm-m occur in the unaltered northwestern and eastern parts of the area. This indicates that the silicification is not strong and the existence of mineralization comprising magnetite, pyrrhotite and other sulfide minerals lowered the resistivity.

The chargeability values are generally not high in this area, they range in the order of 5-10mV/V (background). This is interpreted to be the result of relatively weak mineralization or oxidation or leaching of the sulfide minerals that accompanied silicification. The electrode interval of this survey was relatively large at 100m and it is difficult to detect small deposits and narrow mineralized zones. Information is available only to the depth of 250m and if oxidation and leaching occur to this depth, the low chargeability of the silicified zone can be explained.

Two profile lines were added for studying the weak anomaly (>20mV/V) detected in the southeastern part of the survey area and the promising gossan.

The weak anomaly is continuous in the E-W direction that is the same as the trend of the elongation of the known gossan and it has the shape of anomalies of the dissemination deposits. This weak anomaly extends westward. This is considered to be caused by sulfide dissemination.

3-2-4 Alayürek Prospect

(1) Geology and Geologic Structure

The Çangal meta-ophiolite is the geologic unit in the prospect. The lithology is pelitic schist, massive basalt, and green schist. The attitude of the pelitic schist is NE-SW strike and 30° N dip. There are many faults of N-S and E-W systems in the southeastern part of the area.

(2) Mineralization and Alteration

The mineralization consists of pyrite dissemination and limonite network at two localities. One is stratiform dissemination-network zone extending in the east-west direction over 600 x 70m in the western part. The mineralizations differ by the nature of the host rock. Strong dissemination occurs in green schist while network veinlets are developed in massive basalt. The higher of the assay values of the network samples is Au 1.5g/t, Ag 100g/t, Cu 0.9%. The green schist is almost totally non-altered, but the massive basalt is partly silicified.

The other mineralized zone occurs to the east of the above zone and is a relatively small pyrite dissemination over 100 x 10m extending N-S along faults. In the vicinity of this zone bounded by N-S and E-W faults, mafic rocks have been silicified and bleached with large amount of quartz, some sericite and chlorite. The silicified zone does not contain metallic minerals.

3-3 Dikmendağ Zone

3-3-1 Regional Geological Survey

(1) Stratigraphy

<Küre Formation>

This formation is composed of sedimentary rocks and basalts. Sedimentary rocks are black shale, siltstone and fine sandstone. Basalts occur mostly between Masköy and Furuncuk Villages, while sedimentary rocks occur widely on the western side of the Dikmendağ Zone.

This formation occupies the lowermost horizon of the zone and is overlain unconformably by Köstekciler Formation.

<Köstekciler Formation>

The rocks constituting the formation are calcareous rocks and calcareous sandstone. These are shallow marine sediments extending from the south northward. They were formed during the regional transgression in the Malm Epoch.

This formation underlies the Satiköy Formation unconformably. This is correlated to the Çağlayan Formation of the Küre Area.

<Satıköy Formation>

The rocks constituting this formation are turbiditic sandstone, conglomerate, and calcareous shale. They occur as well bedded formation in the synclinal part.

This formation unconformably overlies the Köstekciler Formation.

(2) Intrusive Rocks

<Dioritic Rocks>

Diorite is intruded into sedimentary rocks of the Küre Formation in a relatively small scale. It is holocrystalline and is microscopically gabbroic in nature with idiomorphic plagioclase surrounded by hornblende and augite. Minor amount of opaque titanium minerals occur as an accessory.

<Dacite>

Many dacite with a shape of dome occur arranged in the NNE-SSW direction between Masköy and Ornu Villages. It has been intruded into the Küre Formation.

(3) Geologic Structure

The altitude of the sedimentary rocks of the Küre Formation varies considerably on strike and dip. Small scaled basalt bodies occur within sedimentary rocks. Muddy rocks with scaly cleavages are distributed in a basalt body like mud dikes. Black shale of the Küre Formation has scaly cleavage. Therefore, the Küre Formation is considered to be a melange.

A NE-SW trending synclinal axis passes through the vicinity of the center of the zone and Köstekciler and Satiköy Formations are distributed in the synclinal part.

A NEE-SWW trending fault occurs in the south and there are pyrite disseminations in the basaltic rocks cut by this fault.

(4) Mineralization and Alteration

Masköy Mineralized Zone is located in the northeastern part of the zone and weak mineralization accompanied by pyrite dissemination is observed in the basalt at north of Furuncuk Village and in Öcür Village in the southern part of the zone.

3-3-2 Masköy Prospect

(1) Geology and Geologic Structure

The geology around this prospect consists of the Küre Formation, dacite, and diorite.

The rocks constituting the Küre formation are basalt, black shale, siltstone and sandstone. The basalt is mostly massive, but is also partly pillow lava. Black shale and siltstone are the thicker units. These sedimentary units have NE-SW strike and the dip in most areas ranges 20°- 65° SE.

Dacite occurs as small stocks and dikes in the basalt and the sedimentary rocks. Diorite occurs as dikes in the sedimentary units.

(2) Mineralization and Alteration

This mineralized zone consists of limonite network/veinlets and pyrite dissemination over an area of 300 x 50m and gossan. It extends in the NE-SW direction. The host rock is basalt and it is silicified to dark grey in the pyrite disseminated parts of the zone. Both Cu and Zn grades of the rock samples from this zone are low.

CHAPTER 4 Discussions and Conclusions

4-1 Discussions

(1) Küre Zone

The geology of the Küre zone consists of pre-Jurassic ultramafic rocks, Jurassic Küre Formation, Lower Cretaceous Karadana Formation, Upper Cretaceous Çağlayan Formation, diorite and dacite which are intruded into the Küre Formation. The known ore deposits occur in the Küre Formation. The stratigraphic relationship of three formations, namely Küre Formation, Karadana Formation and Çağlayan Formation is unconformity. Ultramafic rocks are in fault contact with Küre Formation.

Küre Formation is composed of basalt, and brecciated formation comprising fragments of pelitic and flysh rocks, and being cemented by pelitic materials.

Basalt is divided into pillow lava, hyaloclastite and massive basalt. The chemical composition of the basalt is characterized by mid-ocean ridge basalt. Secondary minerals such as chlorite, epidote, prehnite and actinolite are generally observed in basalt under the microscope.

Breccia is composed of fragments of greywacke and black shale. The fragments are angular to subrounded and their size ranges from several centimeters to several meters. The matrix is pelitic and is either fractured and argillized or has scaly cleavage. This pelitic rock dissolves easily and is argillized. The black shale fragments are generally schistose with minor faults and minor folds in some places. There are in some localities, small basalt bodies within the breccia.

The geologic structure of this area is characterized by many faults and there are many fractured zones and faults in the basalt bodies.

It is thus considered that the Küre Formation is a melange.

The known ore deposits in this zone tend to occur at the boundary between hyaloclastite and black shale of the Küre Formation also within hyaloclastite. Ore is divided into massive, brecciated, disseminated and network ones. Massive and brecciated ores occur at the boundary between hyaloclastite and black shale. Disseminated and network ores occur within hyaloclastite.

The major part of massive ore is composed of sulphide minerals. The brecciated ore is composed of quartz, clay minerals and sulphide minerals.

The major ore minerals are pyrite and chalcopyrite with a minor amount of bornite, pyrrhotite, magnetite, sphalerite, galena, marcasite, electrum, bravoite and carrollite.

Massive and brecciated ores sometimes contain minute pyrite of colloform and gel-form together with coarse pyrite. In many cases, such pyrite shows cataclastic feature. Chalcopyrite fills the insterstices between the pyrite grains.

Alteration zone below massive ores is composed of chlorite, epidote, carbonate minerals, and locally quartz and sericite. Wall rocks of network zone generally show green color. They are silicified, and contain numerous veinlet and dissemination.

Basalt is submarine effusive rock. It is considered that the basalt erupted on the deep ocean floor, because tuffs formed by steam explosion do not occur in this zone. There are massive ores comprising a large amount of pyrite, a small amount of chalcopyrite and sphalerite, and a minor amount of marcasite and pyrrhotite.

Considering to these evidences, the known ore deposits in this zone are interpreted to be a Cyprus-type.

On the basis of these considerations, the process of ore deposit formation and emplacement is inferred as follows.

Hydrothermal systems accompanied by basalt eruption were formed on the mid-ocean ridge. Massive ores were formed from minute pyrite of colloform and gel-form together with coarse pyrite, and chalcopyrite filled among the pyrite grains.

After the formation of ore deposits, ores were covered by deep ocean pelitic sediments. The ores with basalt and pelitic sediments were sheared and mixed with flysh sediments which deposited around the subduction zone by obduction. Thus a melange was formed.

The period of melange formation is interpreted to be Middle Jurassic, prior to the intrusion of dacite.

The Küre Formation which is interpreted as a melange, is characterized by the arrangement of basalt and sedimentary rocks which extend in the direction of N-S to NNW-SSE. This direction is harmonious with the major faults. It agrees with the distribution of pillow lava and hyaloclastite around the Asiköy and Bakibaba ore deposits. It also agrees with the surface elongation of intrusive rocks.

Tectonically dislocated ore deposits are distributed in the same direction as the distributions of Aşıköy - Toykondu and Bakibaba - Kızılsu ore deposits.

During the first phase, low resistivity anomalies were confirmed by CSAMT and IP survey. These anomalies are considered to be related to ore deposits of Aşıköy, Bakibaba and kızılsu. Of particular interest is the many small anomalies detected southeast of Aşıköy orebody as these occur as several linearly oriented groups of anomalies and they apparently are continuous to the Kizilsu deposit to the southeast. Also small but continuous anomalies were detected to the north and south of Bakibaba Deposit. Weak anomalies were detected near the mineral showings to the northeast of Bakibaba and these are considered to continue to the Zemberekler mineralized zone.

Also the following three localities were selected to be being promising for future prospecting from study of the results of the above survey as well as those obtained by ETiBANK previously and the conditions of the mineral showings and the known deposits. These areas are; (1) south and north of Aşıköy Deposit, (2) north and south of Bakibaba Deposit, and (3) north-northwestern extension of the Zemberekler mineralized zone.

Eight holes were drilled with the above anomalies as targets. They are; (1) southeast of Aşıköy Deposit MJTK-1,2 and 7, (2) north of Bakibaba Deposit MJTK-3, (3) north of Aşıköy Deposit MJTK-5, (4) southwest of Bakibaba Deposit MJTK-8, (5) NNW extension of Zemberekler mineralized zone, and a locality between Aşıköy and Bakibaba Deposits MJTK-6.

It is now clear from the holes drilled in this study that the low resistivity anomalies identified by CSAMT survey are caused mainly by the existence of massive sulfides, vein network of sulfides, black shale, breccia and shear zone.

Ore deposits occur very close to a mineralized zone in footwall basalt. The existence of mineralized zone in basalt suggests some possibility of massive ore occurrence in the vicinity of such zones.

Massive sulfide deposit was confirmed at one borehole during the course of the present survey. Although the core width of the orebody was rather thin at 75 cm, assay showed a high grade of Cu 4 %, and this confirmed the existence of a massive sulfide orebody to the southwest of Bakibaba Deposit. This borehole is located to the southwest of Bakibaba and it is also to the south of the mineralized alteration zone on the surface. Drilling conducted at this location supports the hypothesis that tracing the mineralized alteration zone is a very effective guide for mineral exploration.

Aşıköy and Toykondu Deposits are accompanied by mineralized hyaloclastite on the footwall side and by black shale on the hanging wall side, and thus it is believed that they retain the stratigraphic relations at the time of ore formation.

On the other hand, the network and dissemination zones occur at a stratigraphic position higher than the ore horizon at the Bakibaba Deposit and overturned structure is inferred. It is believed that this overturned structure continues from Bakibaba Deposit to the southeast of Kızılsu Deposit.

The mineralized alteration zone exposed between the above two deposits is very likely the footwall altered zone of the deposit anticipated to occur in this zone.

Drilling at the northern extension of the Zemberekler mineralized zone results in finding veinlets and dissemination of sulphide minerals in pillow lava. The known massive ore deposits occur in hyaloclastite. The mineralized zone in the drill hole MJTK-4 occurs in pillow lava. As hyaloclastite is considered to occur at the flank of and above pillow lava, new massive ore deposits are possibly expected to occur around this hyaloclastite.

(2) Cozoğlu Prospect in the Taşköprü Zone

There are two openings of old adits on the surface. A large amount of mine waste is found in the vicinity. These are all in the Çangal Meta-ophiolite.

One of two adits could be a collapsed incline, a shaft or a ruin of old mining. Near the opening, there is a 30cm thick quartz vein in the green schist with malachite flecks in the cracks.

There are some mine waste dumps within 400x150m range. Samples from two of these dumps show Cu 1.0-4.8% and chalcopyrite and bornite are observed microscopically.

It is difficult to determine the type of mineralization from the surface showings. A similar type of the Aşıköy deposit in the Küre Zone or stratiform copper-zinc deposit is a possible type of deposit. The reasons are; lack of strong alteration of green schist on the surface, the occurrence of copper and zinc oxide minerals, and the existence of a large amount of slags.

IP measurements were carried out during the second year. Chargeability anomalies of 60mV/V were detected corresponding to the distribution of slag and those of 30-50mV/V in the northwestern part. The anomalies extend further eastward.

The interpretation for the above geophysical anomaly is harmonious with the fact that the attitude of the old adit is steep. The existence of the stratiform ore deposits is promising from the comprehensive interpretation of the survey results.

(3) Cünür in the Taşköprü Zone

Eight lenses and bedded gossans occur in green schist in the Cünür prospect. The gossans extend in the NE-SW direction which is harmonious to the bedding plane. The maximum lateral extension is 400x50 m. The mineralization is quartz-limonite-pyrite network and limonite dissemination in the silicified and