EXPLANATORY NOTES FOR THE MINERAL RESOURCES MAP OF CENTRAL ASIA

1:3,000,000

Masaharu KAMITANI*, Tetsuji OHNO*, Kimio OKUMURA*,
Yoji TERAOKA*and Yasushi WATANABE*

Geological Survey of Japan, AIST

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The mineral resources map of Central Asia adjoins the mineral resources map of East Asia published in 2007 and includes the Central Asian and part of the neighboring countries.

The map of Central Asia shows land area deposits of main metallic mineral and non-metallic mineral resources, except for limestone, dolomite, magnesite and construction materials. Uranium is included, although its principal utilization is for nuclear energy. About 2,700 mineral deposits are shown on the map regardless of their status of exploration, exploitation and mined out. However, it was difficult to obtain creditable and detailed mineral deposit information couldn't get from some areas and countries due to their own complicated social and political environments. The map does not, therefore, necessarily represent the present resources figure.

In the mineral resources map, the size of mineral deposits; large, medium and small, are figured, and some sub-economic mineral deposits including mineral occurrences are also plotted on the map in order to indicate a resource potential in individual metallogenic area.

The background geology of the Mineral Resources Map was adopted from the Geological Map of Central Asia (1 to 3,000,000 scale; Teraoka and Okumura, 2007). The geology of the northeastern part of the map was newly added after the publication of the Geologic Map of Central Asia (Teraoka and Okumura, 2007) for this mineral resources map.

The legend of the mineral resources map is the same as the Mineral resources map of the East Asia (Kamitani et al., 2007) and conforms fundamentally to that of the Circum-Pacific mineral resources map (Guild, 1981;

Kamitani et al., 1999). The commodity symbols show the metal or mineral content of the deposits by colored geometric shapes with some modification.

The ten colors and five shapes indicated on the map's legend provide fifty combinations composed of metals and minerals and their associations.

The colors, insofar as possible, indicate metals or minerals of similar type. For example, copper, molybdenum and associated metals (tungsten, led-zinc and nickel) are orange, precious metals (gold, silver, platinum group metals) and diamond and precious stones are yellow, lead-zinc and associated metals are blue, and tungsten-tin and associated metals are red.

Three sizes of mineral deposits on Table 2 denote the relative importance of the mineral deposits. Definition of the three sizes categories for each commodity are mostly in terms of metric tons of the substances contained before exploitation or an actual output. Some deposits shown by the smallest symbols on this map correspond to mineral occurrences, but they are included because they may help identify and evaluate prospective areas broadly favorable for exploration planning of specific minerals. There are some differences on the deposit size category between this map and Seltmann *et al*. (2001), Shatov *et al*. (2001), Geological Survey of India (2001) and others. Their criteria of the large-sized deposits were frequently adopted, unless the information of appropriate reserve/resource quantity of individual deposit is available.

Eleven deposit types including undifferentiated deposit shown on the map are as follows;

Magmatic and irregular massive deposits: deposits associated with differentiated mafic-ultramafics (Cu-Ni-PGE, Ti-Fe, Cr) , associated with ophiolites (Cr), with anorthosites (P-Ti-Fe) and kimberlites (Dm). Alkaline intrusion related deposits (REE, Apatite-REE, Zr-REE, K), Carbonatite-related deposits (Apatite-REE, REE, Fe-REE, Fe-Ti±Ta- Nb, Mo, Cu).

Skarn and contact-metasomatic deposits: deposits related to felsic to intermediate intrusions (Au, B, Cu±Fe, Mo, Sn, W±Mo, Pb-Zn, Fe, Fe-Zn). Stratified, deposits, usually in carbonate rocks intruded by intermediate to acid igneous rocks are included. They are commonly associated with a hydrothermal stage of mineralization.

Pegmatite and greisen deposits: Crosscutting, pegmatitic and greisenized lode deposits in any type of host rocks and closely related to acidic intrusive rocks (REE-Li, Nb-Ta-Sn±Be, W-Mo-Be).

Porphyry deposits including stockwork and disseminated deposits: Disseminated deposits in or associated with acidic to intermediate intrusive

rocks (Cu±Au, Cu-Mo, Au, Mo±W, Sn). Some deposits have been described as stockworks and/or disseminated deposits.

Hydrothermal vein and fissure-filling deposits: Crosscutting, epithermal to hypothermal deposits in any type of host rock (Au-Ag, Ag-Pb, Au-As, F, Hg-Sb, Mn, Pb-Zn±Au-Ag/Ba, Cu±Pb-Zn, Sn-W, Hg, U etc.). They are related to mafic to acidic extrusive and intrusive rocks. The major lode of dimensions are transverse to stratification in sedimentary or volcanic hosts.

Stratabound deposits including marine extrusive rock-related massive sulphide, volcanogenic-sedimentary deposits and stratiform/stratabound deposits. Deposits of generally limited horizontal extent occur at more or less the same horizon in stratified rocks (Cu-Zn, Zn-Pb-Cu, Pb-Zn±Cu, Fe, Mn). It may be partly concordant or partly discordant with the enclosing rocks. Some deposits are stratiform with wide lateral extent and syngenetic with enclosing rocks. Examples are iron formation and sedimentary and exhalative copper, lead and zinc deposits. Most massive sulfide deposits belong to this category. Stratiform and stratabound carbonate-hosted Mississippi Valley-type (MSSV) Pb-Zn deposits, sedimentary exhalative Pb-Zn (SEDEX) deposit, barite deposits are related to hydrothermal-sedimentary processes.

Sedimentary deposits including sandstone-hosted deposits: Deposits as massive to disseminated Fe, Mn, Fe-Mn and Cu oxide and carbonate deposits are rigorously confined to one or more layers in sedimentary rocks. Evaporite Na, K, gypsum/anhydrite and phosphorite deposits are usually syngenetic with enclosing rocks. B and Li are concentrated in some lakes and brines.

Metamorphic deposits: Almost graphite deposits are formed by regional metamorphism, contact metamorphism of coaly sediment. Some talc deposits are originated from dolomitic and ultramafic rocks.

Residual deposits: Deposits are formed by surficial chemical concentration. These deposits include nickeliferous laterite, bauxite, uraniferous calcrete and some manganese oxide deposits. The criterion is that supergene processes were responsible for producing ore grade materials.

Placer deposits: Deposits formed by a surficial mechanical concentration. Examples are alluvial and beach placer deposits, such as gold, ilmenite, monazite and diamond.

Mineral deposit numbers are given only for 169 large-sized deposits on the Mineral Resources Map, and all the data including small and medium-sized deposits can be obtained from the home page of the Geological Survey of Japan (http://www.gsj.jp/Map/EN/overseas.htm) of the AIST (National Institute of

Advanced Industrial Science and Technology).

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The main metallogeny and the prosperity potential of the metallic mineral deposits of the Middle East region including Iran, Pakistan and Afghanistan were suggested by Dr. J. Hedenquist.

Dr. K. Naito, formerly belonged to the International Geological Cooperation Division, International Department (AIST) promoted the compilation project of the Geological Map and the Mineral Resources Map of Asia. Mineral deposit data sheets of a several Central Asian countries were input by Mrs. S. Miyano and other geologists.

The authors wish to express their deep gratitude for everyone's contribution for preparing the Mineral Resources Map of the Central Asia and neibouring area.

Table 1 Abbreviation used in the mineral resources map and in Table 3

Commodity	Deposit type and shape	Geologic age
Ag: silver	Alt: hydrothermally altered	Ar: Archean
Al: aluminum	A-mts: alkaline metazomatic	C: Carboniferous
As: arsenic	Bed: bedded	Cm: Cambrian
Au: gold	Brc: breccia	D: Devonian
B: boron	Brn: brine	E: Early
Ba: barium	Ch: carbonate hosted	J: Jurassic
Be: beryllium	Crb: carbonatite	K: Cretaceous
Bi: bismuth	Crl: carlin	K-Tp: Cretaceous-Paleogene
Cd: cadmium	Dis: disseminated	Mz: Mesozoic
Co: cobalt	Evp: evaporite	Mz1: Early Mesozoic
Cr: chromium	Exh: exhalative	Mz2: Late Mesozoic
Cu: copper	Ff: fissure-filling	L: Late
Dm: diamond	Grs: greisen	O: Ordovician
F: fluorite	Hyd: hydrothermal	P: Permian
Fe: iron	Irg: irregular	P-T: Permian-Triassic
Gm: gemstone	Lnt: lenticular	Pt: Proterozoic,
Gp: gypsum	Lyr: layered	Pz1: Early Paleozoic
Gr: graphite	Mas: massive	Pz2: Late Paleozoic
Hg: mercury	Mgm: magmatic	Q: Quaternary
K: potassium	MSSV: Mississippi valley	S: Silurian
Kl: kaolin	Mtm: metamorphic	S-D: Silurian-Devonian
Li: lithium	Mts: metasomatic	T: Tertiary
Mg: magnesium	Pdf: podiform	Tn: Neogene
Mn: manganese	Pgm: pegmatite	TnQ: Neogene-Quaternary
Mo: molybdenum	Pip: pipe	Tp: Paleogene
Na: sodium salt	Plc: placer	Tr: Triassic
Nb: niobium	Prp: porphyry	U: Unclassified
Ni: nickel	Rpl: replacement	
P: phosphorus	Sbl: sublimation	
PGE: platinum group elements	Sed: sedimentary	
Py: pyrite	SEDEX: sedimentary exhalative	
Pb: lead	Sh: sandstone hosted	
Rb: rubidium	Sht: sheet	

Rc: refractory clay	Sil: silicified		
REE: rare earth elements	Skn: skarn		
S: sulfur	Str: stratabound		
Sb: antimony	Stw: stockwork		
Se: selenium	U: undifferenciated		
Sn: tin	V: volcanogenic		
Sr: strontium	VMS: volcanogenic massive sulphide		
Ta: tantalum	Vn: vein		
Te: tellurium	Wth-res: weathering-residual		
Th: thorium			
Ti: titanium			
Tl: talc			
Tn: thenardite			
U: uranium			
V: vanadium			
W: tungsten			
Y: yttrium			
Zn: zinc			
Zr: zirconium			

Table 2 Mineral deposit size used in the mineral resources resources map

Size limits are shown in metric tons of metals or minerals except for diamond and precious gems in carats. Past production and/or reserves totaled.

Commodity \ Size	Large >	Medium >	Small
Aluminum (bauxite) (Al_2O_3)	100,000,000	1,000,000	
Antimony (Sb)	500,000	10,000	
Arsenic (As)	1,000,000	10,000	
Barite ($BaSO_4$)	5,000,000	50,000	
Beryllium (BeO)	1,000	10	
Boron (B_2O_3)	10,000,000	100,000	
Chromium (Cr_2O_3)	1,000,000	10,000	
Cobalt (Co)	20,000	1,000	
Copper (Cu)	1,000,000	50,000	
Diamond (Dm)	20,000	1,000	
Fluorite (CaF_2)	5,000,000	100,000	

Gold (Au)	200	10
Graphite (fixed C.) (Gr)	1,000,000	10,000
Gypsum-anhydrite ($CaSO_4$)	100,000,000	5,000,000
Iron (ore) (Fe)	100,000,000	5,000,000
Kaolin/Refractory clay (ore)	50,000,000	1,000,000
Lead (Pb)	1,000,000	100,000
Lithium (Li_2O)	100,000	10,000
Manganese (ore:≧40%Mn)	10,000,000	100,000
Mercury (Hg)	20,000	1,000
Molybdenum (Mo)	500,000	25,000
Nickel (Ni)	500,000	25,000
Niobium-Tantalum [$(Nb,Ta)_2O_5$]	100,000	1,000
Phosphate (P_2O_5)	200,000,000	1,000,000
Platinum group elements (PGE)	200	10
Potassium (KCl or K_2O)	10,000,000	1,000,000
Precious gems (Gm)	20,000	1,000
Pyrite (FeS_2)	20,000,000	200,000
Pyrophyllite/Pottery stone (ore)	50,000,000	1,000,000
Rare earth with Yttrium (RE_2O_3)	2,000,000	50,000
Silver (Ag)	10,000	500
Sodium (NaCl)	100,000,000	1,000,000
Strontium (Sr)	1,000,000	10,000
Sulfur (S)	100,000,000	1,000,000
Talc (ore)	10,000,000	1,000,000
Thenardite (Na_2SO_4)	100,000,000	1,000,000
Tin (Sn)	100,000	5,000
Titanium (TiO_2)	10,000,000	1,000,000
Tungsten (W)	50,000	1,000
Uranium (U)	50,000	1,000
Vanadium (V)	10,000	500
Zinc (Zn)	1,000,000	100,000

Table 3 Large size mineral deposits in the mineral resources map.
168 large size mineral deposits are listed based on Table 2

Afghanistan (13 Deposits)		**5030**	**Darrahe Pech**	**Be, Li, Ta, Nb**	**Pgm/Vn**	**K**
		5059	**Aynak Central**	**Cu**	**V-Sed/Bed**	**Pt**
		5088	**Bakhund**	**F, Pb, Zn**	**Hyd/Lyr-Vn**	**Tr**
		5094	**Hajigak**	**Fe**	**V-Sed/Bed**	**Pt**
		5118	**Pasghushta**	**Li, Nb, Ta, Sn**	**Pgm/Vn**	**U**
		5119	**Jamanak**	**Li**	**Pgm/Vn**	**U**
		5120	**Lower Pasghushta**	**Li**	**Pgm/Vn**	**U**
		5121	**Yaryhgul**	**Li, Be**	**Pgm/Vn**	**Tp**
		5122	**Drumgal**	**Li, Ta, Nb, Be**	**Pgm/Vn**	**U**
		5123	**Tsamgal**	**Li**	**Pgm/Vn**	**U**
		5124	**Paskhi**	**Li**	**Pgm/Vn**	**U**
		5128	**Shamakat Area**	**Li, Ta, Sn, Be**	**Pgm/Lnt**	**Tp**
		5129	**Taghawlor Pegmatite Area**	**Li, Be, Ta, Nb, Sn**	**Pgm/Lnt**	**Tp**
Bhutan (3 Deposits)		**5210**	**Khothakpa**	**Gp**	**U**	**U**
		5211	**Uri Chu**	**Gp**	**U**	**U**
		5212	**Khepchishi Hill**	**Gr**	**Mtm/Lyr**	**U**
China (42 Dep.)	***Gansu***	**5258**	**Jintieshan**	**Fe**	**Sed/Bed**	**Pt**
		5276	**Ta'ergou**	**W, Be, Bi, Sn**	**Skn-Hyd/Vn**	**Pz1**
	Nei Mongol	**5295**	**Qiyishan**	**W, Sn, F**	**Hyd/Vn-Dis**	**Pz2**
	Qinghai	**5316**	**Tuolugou**	**Co, Au**	**SEDEX/Lnt**	**Pz1**
		5349	**Kunteyi Area**	**K**	**Evp**	**T**
		5350	**Dalangtan Area**	**K**	**Evp**	**Q**
		5352	**Mahai Field**	**K, Mg**	**Evp**	**Q**
		5353	**Qarhan Area**	**K**	**Evp**	**Q**
		5354	**Yiliping**	**Li, B**	**Evp**	**Q**

		5355	**Taijienaier Salt**	**Li, B**	**Evp**	**Q**
		5357	**Keke**	**Na**	**Evp**	**Q**
		5358	**Chaka**	**Na**	**Evp**	**Q**
		5361	**Xitieshan**	**Pb, Zn**	**V-Sed/Lyr**	**Pz1**
		5376	**Dafenshan**	**Sr**	**U**	**T**
		5377	**Chahansilatu**	**Tn**	**Evp/Bed**	**Q**
	Tibet	**5406**	**Zabuye**	**B, Na, K, Li**	**Evp/Bed**	**Q**
		5411	**Duobuza**	**Cu, Au**	**Prp**	**K**
		5418	**Bangpu**	**Cu, Pb, Zn**	**Skn**	**Tn**
		5421	**Jiama**	**Cu, Pb, Zn**	**Skn**	**Tn**
		5422	**Zunuo**	**Cu, Ag**	**Prp**	**Tn**
		5424	**Chongjiang**	**Cu, Au, Ag**	**Prp**	**Tn**
		5425	**Qulong**	**Cu**	**Prp-Skn**	**Tn**
		5429	**Tinggong**	**Cu**	**Prp**	**Tn**
		5432	**Zhibula**	**Cu, Pb, Zn**	**Skn**	**Tn**
		5442	**Danqu**	**Fe**	**Hyd/Lnt**	**J**
		5445	**Nyixung**	**Fe, Cu**	**Skn/Irg-Lnt**	**K**
		5465	**Maergaicaka**	**Na, Tn**	**Evp**	**Q**
	Xinjiang	**5554**	**Qunkur**	**Be, Ta, Nb**	**Pgm/Vn**	**Pz2**
		5558	**Askart**	**Be**	**Pgm-Grs/Lnt**	**Pz2**
		5562	**Koktohai/Keketuohai**	**Be, Li, Nb, Ta**	**Pgm/Vn**	**Pz2**
		5565	**Ashele**	**Cu, Pb, Zn, Au**	**Vol/ Mas**	**D**
		5568	**Karatungke**	**Cu, Ni**	**Mgm/Lnt-Vn**	**Pz2**
		5578	**Tuwu**	**Cu, Au, Ag**	**Skn-Prp**	**Pz2**
		5579	**Yandong**	**Cu**	**Prp**	**Pz2**
		5592	**Kumutag**	**Fe, Gp**	**V-Sed/Bed**	**Pz2**
		5597	**Tianhu**	**Fe**	**Sed/Bed**	**Pt**
		5601	**Cihai**	**Fe**	**Hyd-Rpl/Lnt**	**Pz**
		5614	**Uyongbulak**	**Na**	**Evp**	**Q**
		5615	**Awart**	**Na**	**Evp**	**Q**
		5616	**Lop Nur**	**Tn, Na**	**Evp**	**Q**
		5629	**Hoxbulak**	**Pb, Zn**	**SEDEX/Lnt**	**D**
		5632	**Kaktale/Keketale**	**Pb, Zn, Ag**	**SEDEX/Bed**	**D**

India (3 Deposits)		**5665**	**Khetri**	**Cu, Au**	**V-Sed/Ln**	
		5709	**Chandradinga Hill**	**Fe**	**Sed/Bed**	**Pt**
		5747	**Islamabad & Dhansaiy**	**Gr**	**Mtm**	**U**
Iran (12 Deposits)		**5876**	**Reza**	**Cr**	**Mgm/Pdf**	**K**
		5877	**Shahriar Shahin**	**Cr**	**Mgm/Pdf**	**K**
		5913	**Meiduk Lachar**	**Cu, Au, Ag, Mo**	**Prp**	**U**
		5920	**Sarcheshmeh**	**Cu, Mo, Au, Ag**	**Prp**	**Tn**
		5978	**Chador Malu**	**Fe, P**	**Mgm/Pip**	**LPt**
		5982	**Choghart**	**Fe, P**	**Mgm/Pip**	**LPt**
		5993	**Neyshabur**	**Gm/Tq**	**Pgm-Hyd/Irg**	**U**
		6043	**Shahrokh**	**Mn**	**U**	**U**
		6156	**Siahkuh**	**Pb, Zn**	**Hyd/Rpl**	**U**
		6172	**Mehdiabad**	**Pb, Zn, Cu, Ag**	**MSSV**	**U**
		6211	**Iran Kuh/Esfahan**	**Zn, Pb, Ba**	**Hyd/FF**	**K**
		6216	**Kushk**	**Zn, Pb**	**SEDEX**	**Cm**
Kazakhstan (33 Dep.)	***Central***	**6221**	**Vasilkovskoe**	**Au, Sb, As**	**Skn-Hyd**	**Pz1**
		6299	**Bozshakol**	**Cu, Mo, Au**	**Prp**	**Pz1**
		6311	**Dhilandinskiy Group**	**Cu**	**Sed/Bed**	**Pz2**
		6325	**Zhezqazgan**	**Cu**	**Sed/Bed**	**Pz2**
		6331	**Kounrad/Qonyrat**	**Cu, Mo**	**Prp**	**Pz2**
		6333	**Zhaman-Aibat**	**Cu**	**Sed/Bed**	**Pz2**
		6362	**Koktenkol**	**Mo, W, Bi, Cu**	**Hyd/Vn-Stw**	**Pz2**
		6365	**Zhanet**	**Mo**	**Hyd/Vn-Stw**	**Pz2**
		6377	**Zhairem**	**Pb, Zn**	**SEDEX**	**Pz2**
		6387	**Syrymbet**	**Sn, Bi, Mo, Be**	**Hyd/Vn-Stw**	**Pz1**
		6388	**Donetskoe**	**Sn, Bi, Mo, Be**	**Hyd/Vn-Stw**	**Pz1**
		6405	**Kosachinoe**	**U**	**Hyd/Vn**	**U**

		6432	Verkhnee Qairaqty	W, Mo, Bi, Be,	Hyd/Vn-Stw	Pz2
		6435	Batystau	W, Mo	Hyd/Vn-Stw	Pz2
		6437	Akshatau	W, Be, Mo, Bi	Hyd/Vn-Stw	Pz2
	East	6458	Bakyrchik	Au	Hyd/Ff	Pz2
		6470	Vasilievskoe	Au	Hyd/ Dis	U
		6525	Nikolaevskoe	Cu, Zn	V-Sed/Mas	D
		6533	Aktogai	Cu, Mo, Au, Ag	Prp	Pz2
		6535	Koksai	Cu, Mo	Prp	U
		6540	Orlovskoe	Pb, Zn, Cu	VMS	Pz2
		6553	Tishinskoe	Pb, Zn, Cu	VMS	Pz2
		6557	Maleevskoe	Pb, Zn, Cu	VMS	Pz2
		6559	Zyryanovskoe	Pb, Zn, Cu	VMS	Pz2
	South	6637	Mynkduk	U	Sed/Sh	K
		6639	Inkai/Chu-Sarysum	U	Sed/Sh	T
		6643	Muiunkum	U	Sed/Sh	T
		6648	North Kharasan	U	Sed/Sh	T
	West	6690	20 Let Kaz SSR	Cr	Mgm/Lnt	Pz2
		6697	Benkala North	Cu, Mo	Prp	U
		6702	50 Let Octyabrya	Cu, Zn	V-Sed/Mas	U
		6721	Dorozhilovskoe	Mo	Hyd/Vn-Stw	U
		6724	Dzhaksyklych	Na	Evp	Q
Kyrgyz (12 Deposits)		6748	Sandik	Al	Mgm	Pt
		6751	Zardalek	Al	Mgm	U
		6772	Kumtor	Au	Hyd/Lnt-Stw	Pz2
		6796	Kolesai	Be	Hyd/Ff-Stw	U
		6797	Uzun-Tash	Be	Skn/Lnt-Stw	S
		6809	Kuru-Tegerek	Cu, Au, Mo	Skn	U
		6811	Bala-Chichkan	Fe, Ti, V	Mgm	O
		6816	Dangy	Fe	Sed/Lyr	LPt
		6828	Chonkoy	Hg	Hyd/Ff-Dis	U
		6838	Chauvai	Hg, Sb	Hyd/Ff-Dis	U

		6845	**Khaidarkan**	**Hg, Sb**	**Hyd/Vn-Dis**	**U**
		6940	**Trudvoye**	**Sn, W, F**	**Skn-Grs**	**P**
Mongolia/*West*		**6972**	**Beltesin Gol**	**Al**	**Mgm/Mas**	**Pt-Cm**
(8 Deposits)		**6988**	**Khaltar Uul II**	**Au, Ag**	**Hyd/Ff**	**U**
		7044	**Huh Adar/Khu Adar**	**Cu, Zn, Pb**	**Hyd**	**U**
		7083	**Bagatsaan Gol**	**Mn, Fe**	**V-Sed/Lnt**	**Pt-Cm**
		7115	**Hubsugul**	**P**	**Sed/Bed**	**Pt**
		7137	**Hitagiin Gol**	**V, Fe**	**Sed/Bed**	**Cm**
		7139	**Achitnuul**	**W, Be,Sn**	**Grs/Vn-Stw**	**Pz2**
		7151	**Dulaan-Khal-Uul**	**Zn, Pb, Au, Ag**	**Hyd/Vn-Lnt**	**Pz2**
Pakistan		**7262**	**Saindak/Fort Saindak**	**Cu, Mo**	**Prp**	**Tn**
(3 Deposits)		**7264**	**Reko Diq**	**Cu**	**Prp**	**Tn**
		7301	**Dera Ghazi Khan**	**Gp**	**Sed/Bed**	**Tp**
Russia	***Siberia***	**7376**	**Kharlinskoye**	**Al**	**Mgm/Mas**	**Pz1**
(18 Dep.)		**7377**	**Bayan-Kol**	**Al**	**Mgm/Mas**	**D**
		7378	**Dahu-Murskoye**	**Al**	**Mgm/Mas**	**S-D**
		7401	**Kharlovskoye**	**Fe, Ti, V**	**Mgm/Lyr**	**U**
		7402	**Karasugskoye**	**Fe, REE**	**Mgm/Crb**	**K**
		7403	**Chesnokovskoye**	**Fe**	**Skn/Lnt**	**U**
		7404	**Inskoye**	**Fe**	**Skn/Mas-Dis**	**Pz**
		7412	**Kholzunskoye**	**Fe**	**V-Sed/Bed**	**D**
		7414	**Kalgutinskoye 2**	**Fe**	**V-Sed/Lnt**	**D**
		7433	**Akalakhinskoye**	**Li, Ta, Nb, REE**	**Mgm-Pgm/ Mas-Vn**	**U**
		7436	**Malo-Oinogorskoye**	**Mo**	**Prp**	**J**
		7454	**Ulug-Tanzek**	**Ta, Nb, REE**	**Mgm/Dis**	**U**
		7470	**Dzhidinskoye**	**W, Mo**	**Hyd-Grs/Vn**	**T**
		7475	**Kalgulinskoye**	**W, Mo**	**Grs/Vn-Stw**	**U**
		7479	**Korbalihinskoye**	**Zn, Pb, Cu**	**Str/Mas**	**D**
	Ural	**7507**	**Sibai**	**Cu, Zn, Au, Ag**	**Str/Mas**	**D**
		7513	**Podolskoe**	**Cu, Zn**	**Str/Mas**	**D**

	7515	Gaiskoe	Cu, Zn	Str/Mas	D
Tajikistan (7 Deposits)	7550	Adrasmanskoye	Ag	Hyd/Vn-Stw	U
	7575	Akarkhar	B	Skn	U
	7576	Baritovaia Gorka	Ba	Hyd/Vn	U
	7577	Akmogol	Ba	Hyd/Vn	U
	7584	Chokadambulak	Fe, Pb	U	U
	7596	Jezhikrut	Sb, Hg	Str/Lyr	U
	7600	Chorukh-Dairon	W, Mo	Skn	U
Uzbekistan (14 Deposits)	7612	Actepe/Aktepe	Ag, Co, Ni, Pb	Hyd/Vn-Stw	P
	7616	Kokpatash	Au, Ag	Hyd/Stw	U
	7618	Muruntau	Au, W	Skn-Hyd/Dis	P
	7620	Daughyztau	Au, Ag	Hyd/Vn-Dis	U
	7634	Zarmitan	Au	Hyd/Vn	U
	7642	Dalnee	Cu, Mo, Au	Prp	U
	7643	Kalmakyr	Cu, Mo, Au	Prp	Pz2
	7667	Uchkulach	Pb, Zn	Str/Mas	U
	7668	Khandizin	Pb, Zn, Cu	VMS	U
	7677	Uchkuduk	U	Sed/Sh	T-Q
	7680	Aktau	U	Sed/Sh	T-Q
	7681	Sugraly	U	Sed/Sh	T-Q
	7695	North Bukynay	U	Sed/Sh	T-Q
	7710	Sarytau	W	Skn-Hyd/Stw	U

Selected bibliography

1. General

Guild, P. W. (1981) Preliminary metallogenic map of North America; a numerical listing of deposits. U.S. Geological Survey Circular, 858－A, 93p.

Hedenquist, J. W. and Daneshfar, B. (2001) Strategic prospectivity review of mineral potential: Middle East Region. Hedenquist Consulting Inc., Ottawa, 68 p.

Kamitani, M., Piper, D. Z., Swint-Iki, T. R., Fan, P-F., Kanehira, K., Ishihara, S., Shimazaki, Y., Radkevich, K., Palfreyman, W. D., Sudo, S., McCoy, F., Manheim, F. T., Lane-Bostwick, C. M., Sullivan, L. G., Mizuno, A. and Luepke, G. (1999) Mineral-Resources Map of the Circum-Pacific Region, Scale 1:10,000,000, with explanatory note, 29p., Northwest Quadrant. Circum-Pacific Council for Energy and Mineral Resources, U.S. Geological Survey.

Kamitani, M., Okumura, K., Teraoka, Y., Miyano, S., and Watanabe, Y. (2007) Mineral Resources Map of East Asia. Scale 1: 3,000,000 with Explanatory note, 15 p., Geological Survey of Japan, AIST.

Teraoka, Y. and Okumura, K. (2007) Geological Map of Central Asia, Scale 1: 3,000,000, Geological Survey of Japan, AIST.

2. Afghanistan

Abdullah, Sh., Chemyrinov, V. M, Alekseev, K. F., Stazhilo-Alekseev, K. F., Dronov, V. I., Gannan, P. J., Rossovskiy, A. Kh., Malyarov, E. P. (1977) Mineral Resources of Afghanistan. United Nations Development Program, 419 p.

ESCAP: Economy and Social Commission for Asia and the Pacific (1995) Geology and mineral resources of Afghanistan. Atlas of Mineral Resources of the ESCAP region, United Nations. v. 11, 85p.

MAR: Mining Annual Review (2001) Afghanistan 1. The Mining Journal Ltd. 2001.

MMAJ: Metal Mining Agency of Japan (2002) Committee for Analysis of fundamental geologic information of Afghanistan and Pakistan. 186 p. (in Japanese).

Pakul'nis, G. V. and Komarnitskii, G. M. (1995) The Khanneshin uranium deposit at the carbonatite volcano margin (Afghanistan). Geology of Ore Deposits, v. 37, n. 5, p. 427-436.

3. Bhutan

ESCAP: Economy and Social Commission for Asia and the Pacific (1991) Geology and mineral resources of Bhutan. Atlas of Mineral Resources of the ESCAP region, United Nations. v. 8, 56 p.

Westerhof, A. B. (2004) Geological reconnaissance for tungsten mineralization of section Kame-Chu, Karabari (Wangdi Phodrang) Bhutan. Bhutan Geology, no. 7, p. 70-76.

4. China

CAGS: Chinese Academy of Geological Sciences (2003) Iron resources map of China, Scale: 1 to 5,000,000, with explanatory notes (in Chinese), Geology Publishing House, Beijing.

CAGS: Chinese Academy of Geological Sciences (2006) Copper resources map of China, Scale: 1 to 5,000,000, with explanatory notes (in Chinese), Geology Publishing House, Beijing.

Cao, Y. (Chief ed.) (1996) The discovery history of mineral deposits of Tibetan Autonomous region, China. 76p. Geological Publishing House, Beijing. (in Chinese with English abstract).

Cui, Y., Zhang, D., Li, D., Gu, G., and Feng, C. (2000) Geology, geochemistry and genesis of the Tanjianshan gold deposit, Qinghai province. Mineral Deposits, v. 19, p. 211-221, (In Chinese with English abstract).

Cun, G., Chen, J., Zhang, F., Li, Q., Li, S., Dong, J. and Mu, T. (1992) Gold Deposits of China. Institute of Gold Deposit, Beijing, 218 p. (in Chinese).

Fang, W., Gao, D., Zhang, L., and Zhu, H. (2007) Geological characteristics of the Leqingla iron deposit, Tibet and their prospecting significance. Geology in China, v. 34, no. 1, p. 110-116 (in Chinese with English abstract).

Feng, C., Zhang, D., She, H., Dang, X., Li, D., Li, J., and Cui, Y. (2006) Tectonic setting and metallogenic mechanism of Tuolugou cobalt (gold) deposit, Qinghai province. Mineral Deposits. Beijing, v. 25, p. 544-561, (in Chinese with English abstract).

Feng, D. (Chief ed.) (1996) The discovery history of mineral deposits of Qinghai Province, China. 233p. Geological Publishing House, Beijing. (in Chinese with English abstract).

Goldfarb, R. J, Mao, J., Hart, C., Wang, D., Anderson, E. and Wang, Z. (2003) Tectonic and metallogenic evolution of the Altay shan, Northern Xinjiang Uygur Autonomous region, Northwestern China. *in* Tectonic evolution and metallogeny of the Altay and Tianshan. Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 19-30.

Han, C., Rui, Z., Mao, J., Yang, J., Wang, Z., and Yuan, W. (2003) Geological characteristics of the Tuwu copper deposit, Hami, Xinjiang. *in* Tectonic evolution and metallogeny of the Altay and Tianshan. Proceedings volume of

the IGCP-473 project. IAGOD Guidebook Series 10, p. 249-260.

Han, C., Xiao, W., Zhao, G., Mao, J., Li, S., Yan, Z., and Mao, Q. (2006) Major types, characteristics and geodynamic mechanism of Upper Paleozoic copper deposits in northern Xinjiang, northwestern China. Ore Geology Reviews, v. 28, p. 308-328.

Hart, C. Jr. Wang, Y., Goldfarb, R. Begg, G., Mao, J., and Lianhui, D. (2003) Axi and associated epithermal gold deposits. *in* Tectonic evolution and metallogeny of the Chinese Altai and Tianshan, Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 206-226.

Hou, Z. and Cook, N. J. (2009) Metallogenesis of the Tibetan collisional orogen: A review and introduction to the special issue. Ore Geology Reviews, v. 36, p. 2-24.

Hou, Z., Yang Z., Qu, X., Meng, X., Li, Z., Beaudoin, G., Rui, Z., Gao, Y. and Zaw, K. (2009) The Miocene Gangdese porphyry copper belt generated during post-collisional extension in the Tibetan orogen. Ore Geology Review v. 36, p. 25-51

Hou, Z., Ma, H., Zhang, Y., Wang, M., Pan, G., and Tang, R. (2003) Himalayan porphyry copper belt: product of large-scale strike-slip faulting in eastern Tibet. Economic Geology, v. 98, p. 125-145.

Hou, Z., Song, Y., Li, Z., Yang, Z., Liu, Y., Tian, S., He, L, Chen, K., Wang, F., Zhao, C., Xue, W., and Lu, H. (2008) Thrust-controlled, sediment-hosted Pb-Zn-Ag-Cu deposits in eastern and northern margins of Tibetan orogenic belt: Geologic features and tectonic model. Mineral Deposits. v. 27, p. 124-144 (in Chinese with English abstract).

Hong, D., Wang, S., Xie, X., Zhang, J., and Wang, T. (2003) Granitoids and related metallogeny of the Central Asian orogenic belt. *in* Tectonic evolution and metallogeny of the Chinese Altai and Tianshan, Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 75-106.

Jiang, S., Nie, F., and Liu, Y. (2008) Discussion on genetic type of Mayun gold deposit in Tibet. Mineral Deposits. v. 27, no. 2, p.220-229 (in Chinese with English abstract).

Lang, X., Tang, J., and Wang Z., (2007) Geological Characteristics and prospecting guide of the Zhemoduola copper-gold deposit in central Gandise, Tibet. v. 16, no. 1, p. 29-33. Geology and Resources, China. (in Chinese with English abstract).

Li, G., Zheng, Q., Yong, Y., Gao, D., Wang, G., and Liu, B., (2005) Discovery of epithermal Au-Sb deposit. Mineral Deposits, v. 24, no. 6, p. 595-602. (in Chinese with English abstract).

Li, J., Qin, K., Li, G., Xiao, B., Zhang, T., and Lei, X. (2008) Characteristics of rutiles from Duobuza gold rich porphyry copper deposit in Banggong Lake Belt of northern Tibet and their significance. Mineral Deposits, v. 27, no. 2, p. 209-219.

Liu, C., Jiao, P., Wang, M. and Chen, Y. (2007) Sedimentation of glauberite and its effect on potash deposits formation in Lop Nur Salt Lake, Xinjiang, China. Mineral Deposits. v. 26, no. 3, p. 322-329 (in Chinese with English abstract).

Lu, Z.(Chief ed.) (1996) The discovery history of mineral deposits of Inner Mongolian Autonomous region, China. 279p. Geological Publishing House, Beijing. (in Chinese with English abstract).

Mao, J., Pirajno, F., Zhang, Z., Chai, F., Wu, H., Chen, S., Chen, L., Yang, J. and Zhang, C. (2008) A review of the Cu-Ni sulphide deposits in the Chinese Tianshan and Altay orogens (Xinjiang Autonomous region, NW China): Principal characteristics and ore-forming processes. Journal of Asian Earth Sciences 32 p. 184-203.

MEG: Metals Economics Group (1995) China: Emerging mineral opportunities. Canada. 218p.

Meng, X., Hou, Z., Ye, P., Yang, Z., Li, Z., and Gao, Y. (2007) Characteristics and ore potentiality of Gangdese silver-polymetallic mineralization belt in Tibet. Mineral Deposits. v. 26, no.2, p. 153-162. (in Chinese with English abstract).

Nie, F., Jiang, S., Bai, D., Wang, X., Su, X., Liu, Y. and Zhao, X (2001) Metallogenic studies and ore prospecting in the conjunction area of Inner Mongolia Autonomous region, Gansu province and Xinjiang Uygur Autonomous region (Beishan Mt.), Northwest China. 408p. Geology Publishing House, Beijing (in Chinese with English abstract).

Qin, K., Li, G., Zhao, J., Li, J., Xue, G., Yan, G., Su, D., Xiao, B., Chen, L. and Fan, X. (2008) Discovery of Shalang large-scale molybdenum deposit, the first single molybdenum deposit in Tibet and its significance. Geology in China, v. 35, no. 6, p. 1001-1112 (in Chinese with English abstract).

Qin, K., Zhang, L., Xiao, W., Xu, Z., Yan, Z., and Mao, J. (2003) Overview of major Au, Cu, Ni, and Fe deposits and metallogenic evolution of the eastern Tianshan mountains, northeastern China. *in* Tectonic evolution and metallogeny of the Chinese Altai and Tianshan, Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 227-248.

Qu, X., Xin, H. and Xu, W. (2007) Petrogenesis of the ore-hosting volcanic rocks and their contributions to mineralization in Xioncun super large Cu-Au deposit, Tibet. Acta Geologica Sinica. v. 81, no. 7, p. 964-971 (in Chinese with English abstract).

Qu, X., Zengqian, H., Khin, Z., and Li, Y. (2007) Characteristics and genesis of Gangdese porphyry copper deposits in the southern Tibetan Plateau; Preliminary geochemical and geochronological results. Ore Geology Reviews, 31, p. 205-223.

Quan, Z. and Li, Z. (2002) Geological characteristics and genesis of the Shihongtan sandstone-type uranium deposit. Xinjiang Geology, China. v. 30, no. 2, p. 186-191 (in Chinese with English abstract).

Rui, Z., Goldfarb, R. J., Qiu, Y., Zhou, T., Chen, R., Pirajno, F., and Yun, G. (2002) Paleozoic and Early Mesozoic gold deposits of the Xinjiang Autonomous Region, northwestern China. Mineralium Deposita, v. 37, p. 393-418.

Rui, Z., Lu, Y., Wang, L., and Wang, Y. (2003) Looking forward to the prospects of porphyry copper deposits in Tibet. Geology in China, v. 30, no. 3, p. 302-308.

She, H., Feng, C., Zhang, D., Pang, G., and Li, G. (2005) Characteristics and metallogenic potential of skarn copper-lead-zinc polymetallic deposits in central eastern Gandese. Mineral Deposits, v. 24, no. 5, p. 508-520. (in Chinese with English abstract).

Tang, J., Zhong, K., Liu, Z., Li, Z., Dong, S. and Zhang, Li. (2006) Intracontinent orogen and metallogenesis in Himalayan Eoch: Chandu large composite basin, Eastern Tibet. Acta Geologica Sinica, v. 80, n. 9, p. 1364-1376.(in Chinese with English abstract)

Tang, Z. (chief ed.) (1996) The discovery history of mineral deposits of Gansu Province, China. Geol. Pub. House, Beijing, 188p. (in Chinese with English summary).

Wang, D., Xu, Z., Zou, T., Chen, Y., and Wan, L. (2003) Major types and regional metallogeny of rare metal deposits in the Altai Mountains, Xinjiang. *in* Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 117-130.

Wang, J., Wang, T., Wang, S. and Ding, R. (2003) The Koktal Pb-Zn massive sulphide deposit. *in* Tectonic evolution and metallogeny of the Chinese Altai and Tianshan, Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 169-180.

Wang, Y., and Zhao, D. (2003) Gold deposits in Xinjiang, China. 204p. Geological Publishing House, Beijing (in Chinese with English summary).

Wang, Y., Wang, J., Wang, S., Ding, R., and Wang, L. (2003) Geology of the Mengku iron deposit, Xinjiang-a metamorphosed VMS? *in* Tectonic evolution and metallogeny of the Chinese Altai and Tianshan, Proceedings volume of the IGCP-473 project. IAGOD Guidebook Series 10, p. 181-200.

Wang, Z., Hou, Z., Tian, S., Liu, Y., Yang, Z., Song, Y., Liu, Y., Zhang, H., Wang, M. and Liu, H. (2009) Structural characteristics of Cenozoic strata and relationship between two types ore deposits in Zaduo area, southern Qinghai. Mineral Deposits. v. 28, p. 157-169 (in Chinese with English abstract).

Xu, W., Qu, X., Hou, Z., Yang, Z., Pang, F., Cui, Y., Chen, W., Yang, D. and Lian, Y. (2007) The Xiongcun copper-gold deposit in Tibet; characteristics, genesis and geodynamic application. Acta Geologica Sinica. v. 80, p. 1392-1406.

Yang, J., Zhong, K., Liu, Z., Li, Z., Dong, S. and Zhong, L. (2006) Intracontinent orogen and metallogenesis in Himalayan Epoch; Changdu large composit basin, Eastern Tibet. Acta Geologica Sinica. v. 80, no. 9, p. 1364-1376 (in Chinese with English abstract).

Yang, Z., Hou, Z., Gao, W., Wang, H., Li, Z., Meng, X. and Qu, X. (2006) Metallogenic characteristics and genetic model of antimony and gold deposits in south Tibetan detachment system. v. 80, no. 9, p. 1377-1391 (in Chinese with English abstract).

Yao, P. (Chief ed.) (1993) Records of China's iron ore deposits. Ministry of Metallic Industry, 662p. (in Chinese).

Yuan, J., Kao, S., Luo, X. and Hu, W. (2008) Discovery, characteristics and significance of the Nyixung skarn iron-copper field in Coqen County, Tibet. Geology in China, v. 35, no. 1, p. 88-94. (in Chinese with English abstract).

Zhang, D., Dang, X., She, H., Feng, C., Li, D., and Li, J.(2005) Ar-Ar dating of orogenic gold deposits in northern margin of Qaidam and east Kunlun mountains and its geological significance. Mineral Deposits, China. v. 24, p. 87-98 (in Chinese with English summary).

Zhang, Z. (Chief ed.) (1996) The discovery history of mineral deposits of Xinjiang Uygur Autonomous Region, China. Geological Publishing House, Beijing. 181p. (in Chinese with English summary).

Zheng, M., Xiang, T., Wei, X. and Zheng, Y. (1989) Saline lakes on the Qinghai-Xizhang (Tibet) plateau. Beijing Scientific and Technological Publishing House, 431p. (in Chinese with English abstract).

Zheng X., Tang, Y., Xue, C., Li, B., Zhang, P., and Yu, S. (1988) Saline lake of Tibet. 190p. Scientific Publication, Beijing.

Zheng, Y., Duo, J., Wang, R., Cheng, S., Zhang, G., Fan, Z., Gao, S., and Dai, F. (2007) New advances in the study of the gigantic Gandese porphyry metallogenic zone, Tibet. Geology in China, v. 34, no. 2, p. 324-334. (in Chinese with English summary).

Zhou, T., Goldfarb, R. J. and Phillip, G. (2002) Tectonics and distribution of gold

deposits in China-an overview. Miner. Deposita, v. 37, p.249-282.

Zhu, X., Peng, X., Wang, Y., Zhong, C., Wang, Z., Wang, J. and Liu, J. (2004) Isotope geochemistry of Shihongtan interlayer oxide zone type sandstone uranium deposit. Mineral Deposits, v. 23, no. 4, p. 443-451 (in Chinese with English abstract).

5. India

Bisht, B. S., Sharma, Y. C., Virnave, S. N. and Kaul, R. (1990) The Proterozoic iron formations and associated rocks of the Daling group at Maro and Gamkak, Arunachal Pradish, India: some aspect of geology, geochemistry, and uranium mineralization. Exploration and Research for Atomic Minerals, v. 3, p. 69-81.

Chaki et al., (1992) Petrogenesis of the uranium mineralized granitoids of Nangalbibla-Siju area, Garo Hills, Meghalaya, India. Exploration and Research for Atomic Minerals, v. 3, p. 13-25

Geological Survey of India(1981) Exploration for copper, lead and zinc ores in India. Bull. of the Geological Survey of India, Series A-Economic Geology no. 47, 222p.

Geological Survey of India (1999) Mineral Map of India. Scale 1:5,000,000.

Geological Survey of India (2001a) Atlas of India, with List of Minerals with detailed information. 210p.

Geological Survey of India (2001b) Geology and mineral resources of Rajasthan. Miscellaneous Publication, no. 3, part 12, 113p.

Kaul, R., Singh, R., Sen, D. B., and Gupta, R. K. (1991) Uranium exploration in the Proterozoic rocks of Northwestern Himalaya, India. Exploration and Research for Atomic Minerals, v. 4, p. 1-12.

Kaul, R. and Varma H. M. (1990) Geological evolution and genesis of the sandstone type uranium deposits at Domiasiat, West Khasi Hills district, Meghalaya, India. Exploration and Research for Atomic Minerals, v. 3, p. 1-16.

Knight, J., Sejen, J., Lowe, J., Cameron, J., Merrillees, J., Nag, S., Shah, N., Dua, G. and Jhala, K. (2002) The Khetricopper belt, Rajasthan: iron oxide copper-gold terrane in the Proterozoic of NW India. In Porter, T. M. ed., Hydrothermal iron-oxide copper-gold & related deposits; A global perspective, v. 2, PGS Publishing, Aderade, p. 321-341.

Singh, R. (1992) Evolution of exploration concepts for sandstone-type uranium deposits in Meghaya, India. Exploration and Research for Atomic Minerals, v. 5, p. 1-11.

6. Iran

Asadi, H. H., Vonken, J. H. L., Kuhunel, R. A., and Hale, M. (2000) Petrography, mineralogy and geochemistry of the Carlin-like gold deposit, northwest Iran. Mineralium Deposita, v. 35, p. 656-671.

Bagheri, H., Moore, F. and Alderton, D. H. M. (2007) Cu-Ni-Co-As(U) mineralization in the Anarak area of Central Iran. Jour. of Asian Sci., v. 29, p. 651- 665.

Boni, M., Gilg, A. G., Balassone, G., Schneider, J., Allen, C. R. and Moore, G. (2007) Hypogene ores in Angouran deposit, NW Iran. Miner. Deposita, v. 42, p. 799-820.

Daliran, F. (2008) The carbonate-rock hosted epithermal gold deposit of Agdarreh, Takab, geothermal field, NW Iran, NW Iran-hydrothermal alteration and mineralization. Mineralium Deposits, v. 43, p. 383-404.

Forster, H.(1994) The Bafk mining district in Central Iran-a highly mineralized Infracambrian volcanic field. Economic Geology, v. 89, p. 1697-1721.

Forster, H. and Jafarzadeh, A. (1984) The Chador Malu iron ore deposit (Bafk district, Central Iran)-Magnetite filled pipes. N. Jb. Geol. palaeont. Abh., v. 168, p. 524-534.

Ghazban, F., McNutt, H. and Schwalz, H. P. (1994) Genesis of sediment-hosted Zn-Pb-Ba deposits in the Irankuh district, Esfahan, west-central Iran. Economic Geology, v. 89, p. 1262-1278.

Gilg, H. A., Boni, M., Balassone, G., Allen, C. R., and Moore, F. (2006) Marble-hosted sulfide ores in the Angouran Zn-(Pb-Ag) deposit, NW Iran: interaction of sedimentary brines with a metamorophic core complex. Miner. Deposita, v. 41, p. 1-16.

GSI: Geological Survey of Iran (1976) Mineral distribution map of Iran. Scale 1:2,500,000, compiled by Taghizadehn N. and Mallakpour, M. A.

GSI: Geological Survey of Iran (1993) Mineral distribution map of Iran. Scale 1:1,000,000, compiled by Lotfy, M., Mir Mohammad Sadeghi, M., and Omrani, S.J.

GSI: Geological Survey of Iran (2008) National Geoscience Database of Iran-Mine Information. Http://www.ngdir.com/Mining Info/Mine Detail. Asp. PID=2868

Hezarkhani, A., Williams-Jones, A. E., and Gammons, C. H. (1999) Factors controlling copper solubility and chalcopyrite deposition in the Sungun porphyry copper deposit, Iran. Miner. Deposta, v. 34, p. 770-783.

Jami, M., Dunlor, A. C., and cohen, D. R. (2007) Fluid inclusion and stable isotope study of the Efordi apatite-magnetite deposit, Central Iran. Economic Geology, v. 102, p. 1111-1128.

JNCDI: Japan Nuclear Cycle Development Institute (2001) Exploration of overseas

Uranium resources. 382p.

Karimzadeh Somarin, A. and Moayyed, M. (2002) Granite and gabbrodiorite-associated skarn deposits of NW Iran. Ore Geology Reviews, v. 20, p. 127-138.

Liaghat, S., Moore, F., and Jami. M. (2000) The Kuh-e-Surmeh mineralization, a carbonate-hosted Zn-Pb deposit in the simply folded belt of the Zagros Mountains, SW Iran. Miner. Deposita, v. 35, p. 72-78.

Meharabi, B., Yardley, B. W. D., and Cann, J. R. (1999) Sediment-hosted disseminated gold mineralization at Zarshuran, NW Iran. Miner. Deposita, v. 34, p. 673-696.

MEG: Metals Economic Group (2001) Mine Search Project Information. Project Full-report Canada, Http://www.metals economics.com/egi-win/wwegi.d//?

Metal Mining Agency of Japan (MMAJ) Mining development environment of Islamic Republic of Iran. 54p. (in Japanese).

Shafiei, B., Haschke, M. and Shahabpour, J. (2009) Recycling of orogenic arc crust triggers porphyry Cu mineralization in Kerman Cenozoic arc rocks, southeastern Iran. Miner. Deposita, v. 44, p. 265-283.

Shahapour, J. (1992) Unroofing "fragmentites" as a reconnaissance exploration pool in the Central Iranian porphyry copper belt. Economic Geology, v. 87, p. 1599-1606.

7. Kazakhstan

Birka, G. I. and Shul'gin, A. S. (2001) Zonality of Uranium mineralization in Low-Temperature sodic metasomatites (by the example of ore fields in northern Kazakhstan). Geology of ore deposits, v. 43, no. 4 p. 288-308.

Glukhan I. V. and Serykh V. I. (1996) Geology and tectonic evolution of Central Kazakhstan. In Shatov, Seltmann, Kremenetsky, Lehmann, Popov and Ermonov (Eds) Granite-related ore deposits of central Kazakhstan and adjacent areas. INTAS- 93--1783 Project. St. Petersburg 1996. p.11-24.

JICA: Japan International Corporation Agency (1995) Preliminary report of development program of non-ferrous metal industry, Republic of Kazakhstan. 136p. (in Japanese).

JNCDI: Japan Nuclear Cycle Development Institute (2001) Exploration of Overseas Uranium Resources. 382p.

Kudrayavtsev Yu. K..(1996) The Cu-Mo deposits of central Kazakhstan. i*n* Shatov, Seltmann, Kremenetsky, Lehmann, Popov and Ermo (eds.), Granite-related ore deposits of central Kazakhstan and adjacent areas. INTAS-

93--1783 Project. St. Petersburg 1996. p. 119-144.

Malchenko, E. G. and Ermolov, P. V. (1996) Metallogenic summary of central Kazakhstan and adjacent areas. *In* Shatov, Seltmann, Kremenetsky, Lehmann, Popov and Ermonova (eds.) Granite-related ore deposits of central Kazakhstan and adjacent areas. INTAS- 93--1783 Project. St. Petersburg 1996. p. 67-81.

MGPUR: Ministry of Geology and Preservation of Underground Resources of the Republic of Kazakhstan (1994) Kazakhstan mineral investment opportunities. 148p.

MGPB: Ministry of Geology and Protection of Bowels, Republic of Kazakhstan (1997) Map of gold deposits and promising areas location. Scale 1:4,000,000, The Information-Presentation Centre of the Republic of Kazakhstan.

MMAJ: Metal Mining Agency of Japan (1987) Mineral Resources Map of C.I.S. 1 to 5,000,000 scale, 4 sheets (in Japanese).

MMAJ: Metal Mining Agency of Japan (1994a) Non-ferrous metal resources of Kazakhstan (in Japanese). 5p.

MMAJ: Metal Mining Agency of Japan (1994b) Geology and mineral resources of CIS countries, *in* Report of the Committee of Geological Analysis (in Japanese). 421p.

MMAJ: Metal Mining Agency of Japan (1995) Preliminary Report of Development in Non-ferrous Metal Industry (in Japanese). 136p..

MMAJ: Metal Mining Agency of Japan (1997) Non-ferrous metal deposits of C.I.S. countries and Mongolia. 20p.

MMAJ: Metal Mining Agency of Japan (1998) Report of overseas geologic structural exploration-the eastern area of Kazakhstan (in Japanese). 96p.

NAS & MGPB: National Academy of Science and Ministry of Geology and Protection of Bowels of Kazakhstan (1996) Mineral Resources of Kazakhstan -Gold-, 1:2,000,000 scale.

OECD/NEA/IAEA: Organization for Economic Co-operation and Development-Nuclear Energy Agency, International Atomic Energy Association (1995) Uranium-Resources, Production and Demand. 382p.

OECD/NEA/IAEA: Organization for Economic Co-operation and Development-Nuclear Energy Agency, International Atomic Energy Association (2007) Uranium-Resources, Production and Demand. 498p.

Seltmann R., Shatov V., Kremenetsky A., Lehmann B., V.Popov, and Ermolov P., 1996, Granite related ore deposits of central Kazakhstan and adjacent areas-editorial. *In* Shatov, Seltmann, Kremenetsky, Lehman, Popov and

Ermonov (eds.) Granite-related ore deposits of central Kazakhstan and adjacent areas. INTAS- 93-1783 Project. St. Petersburg 1996. p. 5-8.

Seltmann R., Shatov V., and Yakubchuk A. (eds), 2001, Mineral deposits map of Central Asia, scale 1:5,000,000. International Association on the Genesis of Ore Deposits (IAGOD).

8. Kyrgyz

ESCAP: Economic and Social Commission for Asia and the Pacific (1998) Geology and atlas of mineral resources of Kyrgyzstan. Atlas of mineral resources of the ESCAP region. UN, v. 13, 153 p.

Jenchuraeva, R. J., Pak, N. T. and Usmanov, I. A. (2001) The Makmal gold deposit. International Geological Correlation Programme (IUGS/UNESCO, IGCP Project 373), Institute Geology, National Academy of Science, Bishkek, Kyrgyz Republic and National History Museum, London, United Kingdum. 82-96p.

MMAJ: Metal Mining Agency of Japan (2004) Mining and metallurgical industries of Kyrgyzstan-its present and problems (in Japanese). Tokyo, 80p.

Seltmann, R. and Jenchuraeva, R. (eds.) (2001) Paleozoic geodynamics and gold deposits in the Kyrgyz Tien Shan. International Geological Correlation Programme (IUGS/UNESCO, IGCP Project 373), Institute Geology, National Academy of Science, Bishkek, Kyrgyz Republic and National History Museum, London, United Kingdum. 180p.

Seltmann, R., Shatov, V., and Yakubchuk, A. (eds.) (2001) Mineral Deposits Map of Central Asia. Scale 1:1,500,000. Natural History Museum and International Association of Genesis of Mineral Deposits (IAGOD).

Shatov, R., Seltman, R and Rafailovich, M. (2001) Mironovskoe copper-bithmuth-gold deposit. International Geological Correlation Programme (IUGS/UNESCO, IGCP Project 373), Institute Geology, National Academy of Science, Bishkek, Kyrgyz Republic and National History Museum, London, United Kingdum. 129-138p.

9. Mongolia

ESCAP: Economic and Social Commission for Asia and the Pacific (1999) Geology and mineral resources of Mongolia. Atlas of Mineral Resources of the ESCAP Region, ESCAP, United Nations, vol. 14, 192p.

GIC: Geological Information Center (2003a) Brief information on mineral commodities of Mongolia, Au, Ag (Location map series 1). Mineral Resources Authority of Mongolia, Ulaanbaatar, 38p.

GIC: Geological Information Center (2003b) Brief information on mineral commodities of Mongolia, Cu (Location map series 2). Mineral Resources Authority of Mongolia, Ulaanbaatar, 38p.

GIC: Geological Information Center (2003c) Brief information on mineral commodities of Mongolia, Base metals (Pb, Zn, Ni, Co, Al) (Location map series 4). Mineral Resources Authority of Mongolia, Ulaanbaatar, 10p.

GIC: Geological Information Center (2003d) Brief information on mineral commodities of Mongolia, Sn, W, Be, Ta, Nb, Li (Location map series 5). Mineral Resources Authority of Mongolia, Ulaanbaatar, 12p.

Jargalsaihan, D., Kazmer, M., Baras, Z. and Sanjaadorj, D. (1996) Guide to the Geology and Mineral Resources of Mongolia. Geological Exploration, Consulting and Services Co. Ltd., Ulaanbaatar, 329p.

MMAJ: Metal Mining Agency of Japan (2003) Overseas mining information. vol. 33, p. 15－29, (in Japanese).

Nokleberg, W. J., Tatiana, T. V., Miller, R. J., Semenskiy, Z. V., and Diggles, M. F. (eds.) (2003) Significant metalliferous and selected non-metalliferous lode deposits, and selected placer districts for northeast Asia. USGS Open-file report 03-220, Version 1.0.

10. Nepal

ESCAP: Economic and Social Commission for Asia and Social Commission for Asia and the Pacific (1993) Geology and mineral resources of Nepal. Atlas of mineral resources of the ESCAP region. UN., v. 8, 107p.

Jashi, P. R. (1991) Primary gold mineralization in Lungri Khola area, Rolpa district, eastern Nepal. Journal of Nepal Geological Society, v. 7, p. 41-58.

Tuladhar, R. M. (1991) Stratabound zinc-lead mineralization at Phakuwa, Sankhuwasabba district, eastern Nepal. Journal of Geological Society, v. 7, p. 41-58.

11. Pakistan

Ahmed, W. (1981) Metallogenic framework and mineral resources of Pakistan. Report of Geological Survey of Japan, no. 261, p. 47-76.

Bender, F. K. and Raza, H. A. (1995) Geology of Pakistan. Beitrage zur Regionalen Geologie der Erde. 414p.

JMEC: International Exploration Company of Japan (1992) Project Finding Report of Isramic Republic of Pakistan (in Japanese). 157 p.

MMAJ: Metal Mining agency of Japan (2002) Basic Information of Geological

Analysis of Afghanistan and Pakistan (in Japanese). 186p.

Perello, J., Razique, A., Schloderer, J. and Rehman, A. (2008) The Chagai porphyry copper belt , Buluchistan province, Pakistan. Economic Geology, v. 103, n. 8, p. 1583-1612.

12. Russia

Fershtater, G. (2000) The Magnitogorsk gabbro-granite series and related titanomagnetite ore and magnetite skarn deposits. *in* Excursion Guidebook, International field conference in the Ural, Russia. p. 58-68.

Maslennikov, V., Koroteev, V., Prokin, V., Yazeva, R., Bochkarev, V., and Fershtater, G. (2000) Massive sulfide deposits of the central and southern Urals. *in* Excursion Guidebook, International field conference in the Ural, Russia. p. 69-98.

MMAJ: Metal Mining Agency of Japan (1994) Geology and Mineral Resources of C. I. S. Countries (in Japanese). Report of Committee for Geological Analysis. 421p.

Nokleberg, W. J., Bundtzen, T. K., Dawson, K. M., Eremin, R. A., Goryachev, N. A., Koch, R. D., Ratkin, V. V., Rozenblum, I. S., Shpikerman, V. I., Frolov, Y. F., Gorodinsky, M. E., Melnikov, V. D., Ognyanov, N. V., Petrachenko, E. D., Pozdeev, A. I., Ross, K. V., Wood, D. H., Khanchuck, A. I., Kovbas, L. I., Nekrasov, I. Y. and Sidrov, A. A. (1996) Significant metalliferous and selected non-metalliferous lode deposits and placer districts for the Russian Far East, Alaska, and the Canadian Cordillera. U. S. Geological Survey, Open-file Report 96-513-A, p. 1－39.

Nokleberg, W. J., Baunaeva, T. V., Miller, R. J., Seminskiy, M. Z. and Diggles, M. F. (editors) (2003) Significant metalliferous and selected placer districts for Northeast Asia. Open-file report 03-220, version 10, U. S. Geological Survey.

Shatov, V., Seltmann, R., and Romanovsky, G. (2001) Gold mineralization map of the southern Urals. Scale 1: 1,000,000, International Association on the Genesis of Ore Deposits (IAGOD) and Natural History Museum, London.

13. Tajikistan

MMAJ: Metal Mining Agency of Japan (1994) Geology and Mineral Resources of C.I.S. Countries (in Japanese). Report of Committee for Geological Analysis. Tokyo, 421p.

MMAJ: Metal Mining Agency of Japan (1997) Non-ferrous Metallic Mineral Deposits of C. I. S. Countries and Mongolia. 20p.

Seltmann, R., Shatov, V., and Yakubchuk, A. (eds.) (2001) Mineral Deposits Map of Central Asia. Scale 1:1,500,000. Natural History Museum, London and

International Association of Genesis of Mineral Deposits (IAGOD).

14. Turkmenistan

MMAJ: Metal Mining Agency of Japan (1994) Geology and Mineral Resources of C. I S. Countries (in Japanese). 421p.

Troitsky, V., Petrov, I. and Grishaev, S. (1998) Industrial minerals of C. I. S. Countries. Industrial Mineral Information Ltd., England, 135p.

15. Uzbekistan

JMEC: International Mineral Exploration Company of Japan (1994a) Project Finding Report, Republic of Uzbekistan (in Japanese). Tokyo, 69 p.

JMEC: International Mineral Exploration Company of Japan (1994b) Project Finding Report, Republic of Uzbekistan (in Japanese). Tokyo, 177 p.

JMEC: International Mineral Exploration Company of Japan (1997) Project Finding Report, Republic of Uzbekistan (in Japanese). Tokyo, 113 p.

MMAJ : Metal Mining Agency of Japan (1994) Geology and mineral resources of C. I. S. Countries. Report of Committee for Geological Analysis of MMAJ (in Japanese). Tokyo, 421 p.

MMAJ: Metal Mining Agency of Japan (1997) Non-ferrous metallic mineral deposits of C. I. S. Countries and Mongolia (in Japanese). Tokyo, 20 p.

OECD/NEA-IAEA : Organization for Economic Co-operation and Development -Nuclear Energy Agency, International Atomic Energy Association (1995) Uranium-Resources, Production and Demand (translated by Technical Evaluation and Patent Office, Reactor and Nuclear Fuel Development Corporation, Tokyo, Japan), 382p.

SCGMR: State Committee for Geology and Mineral Resources. Republic of Uzbekistan (1996) Mineral Resource Base Presentation of the Republic of Uzbekistan, Tokyo-Tashkent, 101p.

Seltmann, R., Shatov, V., and Yakubchuk, A. (eds.) (2001) Mineral Deposits Map of Central Asia. Scale 1:1,500,000. Natural History Museum, London and International Association of Genesis of Mineral Deposits (IAGOD).

Shayakubov T., Islamov, F., Isakhojaev, B.,and Juraev, A. (2001) Gold, silver and copper deposits of Uzbekistan: An overview. *In* Excursion Guidebook of Au, Ag, and Cu deposits of Uzbekistan. International Field Conference of IGCP-373 Excursion B6 of the Joint SGA-IAGOD Symposium, London/Tashkent 27/28 August-4 September 1999, p. 5-16.

Shayakubov T., Islamov, F., Golovanov, I., Kashiesky, A., and Minzer, E. (2001)

Almalyk and Saukbulak ore fields. Excursion Guidebook of Au, Ag, and Cu deposits of Uzbekistan. International Field Conference of IGCP-373 Excursion B6 of the Joint SGA-IAGOD Symposium, London/Tashkent 27/28 August-4 September 1999, p. 75-90.

Shcuchetyochkin, V. N. and Kislyakov, Ya. M. (1993) Exogenetic-epigenetic uranium deporsits of the Kyzylkums and adjacent regions. Geol. Ore Deposits, 35 (3) p 199-220.