

**EXPLANATORY NOTES**  
**FOR**  
**THE MINERAL DEPOSIT DATA**  
**OF**  
**MINERAL RESOURCES MAP OF EAST ASIA**  
  
**2007**

**Geological Survey of Japan, AIST**

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The mineral resources map of East Asia shows land area deposits of main metallic mineral and non-metallic mineral resources, except for construction materials. Uranium is included, although its principal utilization is for nuclear energy. About 3,000 mineral deposits are shown on the map regardless of their status of exploration and exploitation. In Japan and South Korea, many metallic mineral deposits have been exhausted during a couple of the last decades. The map does not, therefore, necessarily represent the present resources picture. In general, mineral deposits of economic size and grade are figured, but some low-grade occurrences have also been plotted on the map in order to indicate a resource potential.

The background geology of the Mineral Resources Map including the correlation diagram for map units (Fig. 1) was adopted from the Geological Map of East Asia (Teraoka and Okumura, 2003). The legend of the mineral resources map 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 colors, insofar as possible, indicate metals or minerals of similar type. For example, copper and associated metals are orange, precious metals are yellow, lead-zinc and associated metals are blue, and tungsten-tin and associated metals are red. The five shapes and ten colors indicated on the map's legend provide fifty combinations.

Three sizes of symbols(Fig. 2) denote the relative importance of the mineral deposits. Limits between the three sizes categories for each commodity are mostly in terms of metric tons of the substances contained before exploitation. Some deposits shown as the smallest symbols on this map correspond to mineral occurrences, but they are included because they may help identify and estimate prospective areas broadly favorable for exploration planning of specific metals and minerals.

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

*Magmatic and irregular massive deposits:* Podiform chromite, nickel-copper, carbonatite, magnetite and magnetite-ilmenite deposits. *Skarn and contact-metasomatic deposits:* Stratified, usually carbonate, rocks intruded by intermediate to acid igneous rocks. They are associated with a hydrothermal stage of mineralization. *Hydrothermal vein and fissure-filling deposits:* Crosscutting, epithermal to hypothermal deposits in any type of host rock. The major dimensions are transverse to stratification in sedimentary or volcanic hosts. *Pegmatite and greisen deposits:* Crosscutting, pegmatitic and greisenized lode deposits in any type of host rocks and closely related to acidic intrusive. *Porphyry deposits including stockwork and disseminated deposits:* Irregular disseminated deposits in or associated with acidic to intermediate intrusive rocks. Some deposits have been described as stockworks and/or disseminated deposits. *Stratabound deposits including volcanogenic sedimentary and sedimentary exhalative deposits:* Deposits of generally limited horizontal extent occur at more or less the same horizon in stratified rocks. 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. *Sedimentary deposits including sandstone-hosted deposits:* Deposits rigorously confined to one or more layers in sedimentary rocks. Evaporite and phosphorite deposits are usually syngenetic with enclosing rocks. *Metamorphic deposits:* Deposits formed by regional metamorphism like most graphite deposits.

*Residual deposits:* Deposits formed by surficial chemical concentration. These deposits include 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.

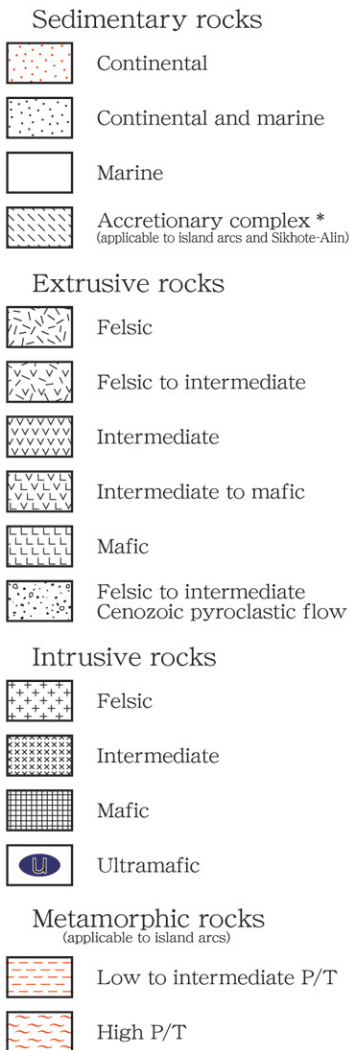
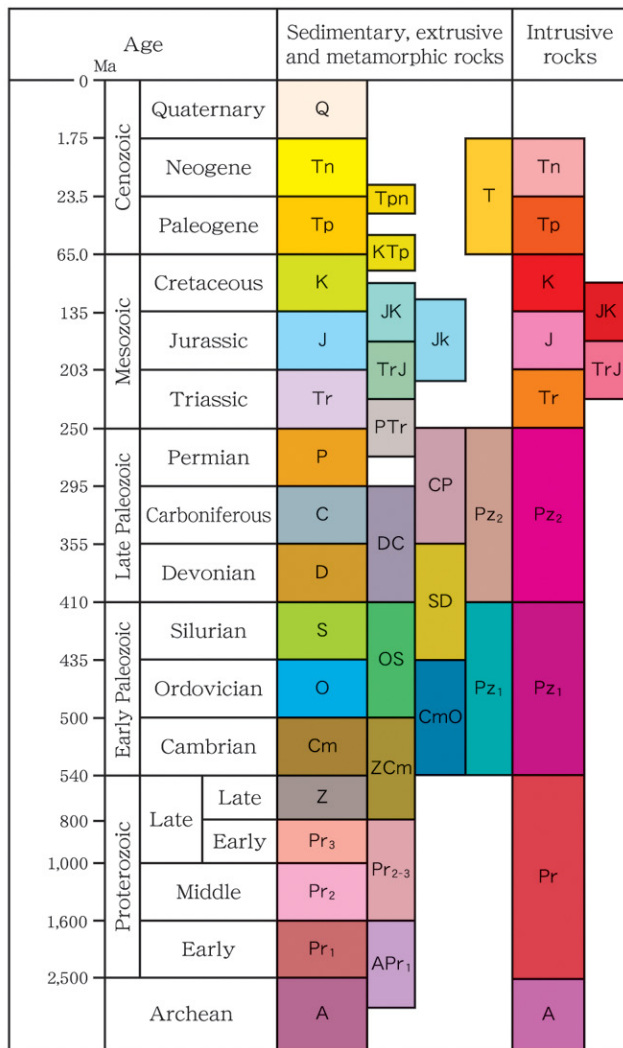
Mineral deposit numbers are given only for large-size deposits on the Mineral Resources Map, and all the deposit data including small and medium-size of deposits can be obtained from the data sheet of “Mineral deposit data of East Asia”.

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# CORRELATION DIAGRAM FOR MAP UNITS

# ROCK TYPE





















































\* Age of terrigenous clastic sediments is shown in case of accretionary complex which includes blocks of older rocks such as basalt, limestone and chert of oceanic origin.

Background geology after TERAOKA, Y. and OKUMURA, K. (2003) Geological Map of East Asia. Geological Survey of Japan.

iFigure 1 Correlation diagram for base map

# COMMODITIES

 W	 Sn	 WSn/ SnW	 NbTa/ TaNb	 Be/ Bi
 Cu	 Mo	 CuMo/ CuW	 CuZn/ CuPb	 CuNi
 Au	 Ag/ AgAu	 AgPb/ AgSb	 Gm	 Dm
 Py	 S	 Li	 Pp/ Ps	 Kl/ Rc
 Cr	 Ni/ NiCu	 PGE	 TiV	 Tl
 Na	 Tn	 K	 Gp/ Ah	 B
 Pb	 PbZn/ ZnPb	 Zn	 PbCu/ ZnCu	 Sr
 Hg	 Sb	 F	 AsCo	 Ba
 U	 V/ VU	 REE	 Gr	 P/ PFe
 Fe	 Mn	 Ti/ TiZr	 FeTi	 Al

Abbreviations; Ah: anhydrite, Dm: diamond, Gm: gemstones, Gp: gypsum, Gr: graphite, Kl: kaolin, PGE: platinum group elements, Pp: pyrophyllite, Ps: pottery stones, Py: pyrite, Rc: refractory clay, REE: rare earth elements, Tl: talc, Tn: thenardite

Figure 2 Commodity symbols

**Table 1 Abbreviation used in Mineral deposit data sheet**

<b>Commodity</b>	<b>Deposit type and shape</b>	<b>Geologic age</b>
Ag: silver	Alv: alluvial	A: Archean
Al: aluminum	Bed: bedded	C: Carboniferous
An: anhydrite	Cnt: contact-metasomatic	Cm: Cambrian
As: arsenic	Crb: carbonatite	D: Devonian
Au: gold	Dis: disseminated	J: Jurassic
B: boron	Evp: evaporite	K: Cretaceous
Ba: barium	Exh: exhalative	KTp: Cretaceous-Paleogene
Be: beryllium	Ffill: fissure-filling	Mz: Mesozoic
Bi: bismuth	Grs: greisen	Mz1: Early Mesozoic
Cd: cadmium	Hyd: hydrothermal	Mz2: Late Mesozoic
Co: cobalt	Irg: irregular	O: Ordovician
Cr: chromium	Lnt: lenticular	P: Permian
Cu: copper	Lyr: layered	Pcm: Precambrian
Dm: diamond	Mas: massive	Pr: Proterozoic,
F: fluorite	Mgm: magmatic	Pz1: Early Paleozoic
Fe: iron	Mtm: metamorphic	Pz2: Late Paleozoic
Ga: gallium	Pgm: pegmatite	Q: Quaternary
Gm: gemstones	Pdf: podiform	S: Silurian
Gp: gypsum	Plc: placer	T: Tertiary
Gr: graphite	Prp: porphyry	Tn: Neogene
Hg: mercury	Rpl: replacement	TnQ: Neogene-Quaternary
I: iodine	Sed: sedimentary	Tp: Paleogene
In: indium	Sht: sheet	Tr: Triassic
K: potassium	Skn: skarn	U: Unclassified
Kl: kaolin	Str: stratabound	
Li: lithium	Stw: stockwork	
Mg: magnesium	Tl: talc	
Mn: manganese	U: undifferentiated	
Mo: molybdenum	Vn: vein	
Na: sodium salt	Vol: volcanogenic	
Nb: niobium	Wth-Res: weathering-residual	
Ni: nickel		
P: phosphate		
PGM: platinum group elements		

Pp: pyrophyllite Ps: pottery stone Py: pyrite Pb: lead REE: rare earth elements S: sulfur Sb: antimony Sn: tin Sr: strontium Ta: tantalum Ti: titanium Tl: talc Tn: thenardite U: uranium V: vanadium W: tungsten Zn: zinc Zr: zircon		
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**Table 2 Deposit size used in Mineral deposit data sheet**

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
Aluminum (bauxite) (Al <sub>2</sub> O <sub>3</sub> )	100,000,000	1,000,000
Antimony (Sb)	500,000	10,000
Arsenic (As)	1,000,000	10,000
Barite (BaSO <sub>4</sub> )	5,000,000	50,000
Beryllium (BeO)	1,000	10
Boron (B <sub>2</sub> O <sub>3</sub> )	10,000,000	100,000
Chromium (Cr <sub>2</sub> O <sub>3</sub> )	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 <sub>2</sub> )	5,000,000	100,000
Gold (Au)	200	10
Graphite (fixed C.) ( Gr )	1,000,000	10,000
Gypsum-anhydrite (CaSO <sub>4</sub> )	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 <sub>2</sub> O)	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) <sub>2</sub> O <sub>5</sub> ]	100,000	1,000
Phosphate (P <sub>2</sub> O <sub>5</sub> )	200,000,000	1,000,000
Platinum group elements (PGE)	200	10
Potassium (KCl or K <sub>2</sub> O)	10,000,000	1,000,000
Precious gems (Gm)	20,000	1,000
Pyrite (FeS <sub>2</sub> )	20,000,000	200,000
Pyrophyllite/Pottery stone (ore)	50,000,000	1,000,000



Rare earth with Yttrium (RE <sub>2</sub> O <sub>3</sub> )	5,000,000	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 <sub>2</sub> SO <sub>4</sub> )	100,000,000	1,000,000
Tin (Sn)	100,000	5,000
Titanium (TiO <sub>2</sub> )	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    Abbreviation of minerals used in Mineral deposit data sheet**

The following abbreviation of minerals are used for the mineral deposit data sheet.

acn: acanthite	chc: chalcocite	gbs: gibbsite
alb: alabandite	chg: chlorargyrite	gld, gold
all: allanite	chl: chlorite	grn: garnierite
aln: alunite	chm: chromite	grp: graphite
amb: amblygonite	cll: collophanite	gth, goethite
anh: anhydrite	cls: celestite	gyp: gypsum
ank: ankerite	cnb: cinnabar	hal: halite
ant anataze	col: columbite	hem: hematite
apt: apatite	cor: corundum	hll: halloysite
apy: arsenopyrite	cov: covellite	hmc: hydromica
arg: argentite	cp: chalcopyrite	hsm: hausmannite
ars: arsenic	crhc: calciorhodochrosite	hss: hessite
aut: autunite	crn: carnotite	
azr: azurite	cup: cuprite	ill: illite
		ilm: ilmenite
bar: barite	dat: datolite	igl, ignition loss
bhm: boehmite	dgn: digenite	
bon: bornite	dic: dickite	jms: jamesonite
brn: braunite	dln: dolomite	jrs: jarosite
brt: berthierite	dm: diamond	
bry: beryl	dnb: danburite	kfs: potassium feldspar
bis: bismuthinite	dsp: diaspore	kln: kaolinite
bul: boulangerite		kmb: kimbelite
bun: bournonite	elc: electrum	
	emr: emerald	ldp: ludwigite,
cal: calcite	eng: enargite	lim: limonite
cam: camsellite		lnn: linnaeite
cas: cassiterite	f-c: fixed carbon	lpd: lepidolite
cbi: chrysoberyl	fl: fluorite	luz: luzonite
cbn: cubanite	frg: fergusonite	
cbt: cobaltite	fsp: feldspar	mal: malachite,
cer: cerussite		mcr: microlite
cff: coffinite	gal: galena	mcy: mercury

mic: mica	prs: proustite	syl: sylvine
mgt: magnetite	psl: psilomelane	szb: szeibelyte
mlb: molybdenite	ptb: pitchblend	
Mn-ox: manganese oxide	py: pyrite	tan: tantalite
mnz: monazite	pyc: pyrochlore	tll: tellurite
mrb: mirabilite	pyg: pyrargyrite	ten: tennantite
mrc: marcasite	pyl: pyrolusite	tet: tetrahedrite
mrg: miargyrite	pyr: pyrrhotite	thn: thenardite
mrm: marmatite		tlc: talc
msc: muscovite	qz: quartz	tmgt: titaniferous magnetite
mty: metatyuyamunite		top: topaz
	rhc: rhodochrosite	tph: tephroite
nbis: native bismuth	rhd: rhodonite	trm: tremolite
ncc: niccolite	rlg: realgar	trn: trona
ncp: native copper	rub: ruby	tum: tourmaline
nmn: naumannite	rut: rutile	
noc: nocerite		uph: uranophane
nph: nepheline	sch: scheelite	urn: uraninite
ntll: native tellurium	ser: sericite	
ntr: niter	sid: siderite	vilm: vanadiferous ilmenite
	slf: sulfur	vll: valleriite
orp: orpiment	slt: rock salt	
ort: orthite	slv: silver	wit: witherite
	smt: smithonite	wlf: wolframite
par: paricite	spc: specularite	
pbl: pitchblende	spd: spodumene	xnt: xenotime
pet: petalite	sph: sphalerite	
phal: polyhalite	spp: sapphire	
phn: phenacite	stb: stibnite	
plb: polybasite	stn: stannite	zir: zircon
pnt: pentlandite	stp: stephanite	znc: zincite
pph, pyrophyllite	str: strontianite	znc: zinkenite

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