

News and Highlights

What Mineral Resources will China Need to Discover by the Mid-21st Century?

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In the past 40 years of China's reform and opening up, China's economy has been developing rapidly, and industrialization and urbanization have begun to take shape. At present, China is heading towards an information society. Mineral resources have played a great supporting role during this process. During the whole of 2017, China consumed 2.344 billion tons of iron ore, 2.4 billion tons of cement and 3.65 billion tons of raw coal (Fig. 1).

China's industrialization and urbanization progress is almost completed. It is deduced that in the next 15–20 years, the demand for mineral resources supporting industrialization and urbanization, such as iron, copper, aluminum, coal, cement, will fall sharply, and the geological prospecting work of traditional mineral resources will also come to the end of its history. Facing the new trend, we have to consider what mineral resources China needs in the mid-21st Century and what mineral ores should geologists discover.

Analysis of the current world economic and

technological development trends indicates that mineral ores related to energy conservation, new energy, new materials and other emerging industries will have a widespread demand. This work considers that the following eight fields, including hundreds of mineral ores, will be the focus of future geological prospecting work, which mainly concentrates on rare minerals, rare earths and non-metallic mineral resources (Table 1).

We should also pay close attention to certain minerals that the Chinese government has explicitly restricted in order to avoid risks. In February 2018, China's Ministry of Environmental Protection issued the “Comprehensive Directory of Environmental Protection (2017 Edition)” to society, which contains two parts: one is the list of “high pollution and high environmental risk” products (abbreviated as “double high” products), including 885 items; the other is the list of key equipment for environmental protection, including 72 instruments. Among them, there are four kinds of mineral resources involved in mineral development (Table 2). In the future,

Table 1 Mineral types needed for future emerging industries

Industries	Demanded minerals
Information-technology industry	Lithium, indium, tellurium, rhenium, selenium ores, high-purity quartz, graphite
New-energy auto industry	Lithium ore, germanium ore, vanadium ore, nickel ore, lead ore, indium ore, fluorite, apatite, graphite
New energy industry	Lithium, gallium, selenium, indium, rare earth, germanium, beryllium, zirconium, hafnium, rubidium, cesium, scandium, cadmium, tellurium ores and high-purity quartz
High-end equipment manufacturing industry	Diamond, perovskite, tungsten, cobalt, nickel, indium, niobium, tantalum, beryllium, zirconium, rubidium, cesium and rare earth ores
New material industry	Zinc, magnesium, titanium, lithium, rare earth, scandium, thallium, cadmium, tellurite, rhenium, gallium, germanium, selenium, rubidium, caesium, high-purity quartz and basalt
Energy saving and environmental protection industry	Tin, indium, germanium, gallium, scandium, phosphate, boron, arsenic, high-purity quartz, graphite, talc, diatomite and bentonite
Biological and medical industry	134 kinds listed in Compendium of Materia Medica, including 28 kinds of metals, 14 kinds of jade, 72 kinds of stone, and 20 kinds of halite (dissolved in water), such as gold, silver, copper, iron, platinum, tin, mica, quartz, agate, cinnabar, mercury, stalactite, magnetite, medicinal stone, diamond, salt, sulphur, alum, borax, realgar, orpiment, plaster, talcum, calcite, kaolin, clay
China's short-supply minerals	Iron, chromite, copper, bauxite, cobalt, nickel, niobium, tantalum, beryllium, zirconium, boron, high-purity quartz, lithium, diamond, rubidium, caesium and hafnium ores

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Table 2 Mineral species to restrict mining in the “Comprehensive Directory of Environmental Protection (2017 Edition)”

Product code	Product name	Industry name	Industry code	Characteristics
0704000000	Mashgas (mashgas pit, except for those with reliable and safe gas extraction technology)	Natural gas mining	0720	High pollution products (GHW)
0903990000	Ionic-type rare earth concentrate	Mining and beneficiation of rare earth ores	0932	High pollution products (GHW) High environmental risk products (GHF)
1007990000	Asbestos (amphibole) asbestos	mining and beneficiation of asbestos and mica	1091	High pollution products (GHW)
1009010100	Scaly natural graphite	mining and beneficiation of graphite and talc	1092	High pollution products (GHW)



Fig. 1. Simple open-pit coal mining field.

these minerals will be restricted in production, export and consumption in order to slow down and eliminate the environmental damage and environmental hazards formed by the “double high” products in order to obtain more market space for green products, green technology and new energy technology.

With this in mind, geological personnel should attach great importance to this report, otherwise, they will toil for no gain.

Acknowledgement

Thanks are given to Susan Turner for her improvement of English.