

Geological collaboration between Japan and Mongolia

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Before 1989 Mongolia was one of the friendly nations to the former USSR being influenced in economy and social systems. Consequently Mongolian academic research as well as political, economical and social activities had been controlled by the communism ideology. Under such circumstance mineral production as a base of infrastructure construction was considered important to protect the communist countries against the western capitalism. Geological survey and mineral exploration had been done all over the country with aid of COMECON countries such as USSR, German Democratic Republic and Czechoslovakia. These efforts had resulted in the discoveries of many ore deposits including the world-scale porphyry copper-molybdenum deposits of Erdenetiin ovoo and other normal-scale tungsten mines. The mineral production has increased year by year to account for almost half of the Mongolian domestic production and to become comparable to or over the production of cattle breeding.

In 1990 Mongolia was opened to the western side and has been rapidly democratized. The government promoted economical, cultural and scientific exchanges with western countries for the modernization of Mongolia. At the beginning of 1990, the Geological Survey of Japan (GSJ) dispatched a project-finding team to Mongolia in order to seek cooperative research on geology and economic geology, and new collaboration between Mongolia and Japan started in various lines.

After some preliminary work in Mongolia, an ITIT (Institute for Transfer of Industrial Technology) Project by the Agency of Industrial Science and Technology of MITI started in Japanese fiscal year (FY) 1991 and ended in FY 1994. This project, entitled "Research on Exploration and Development of Mineral Resources in Mongolia" was a joint venture between the GSJ and the Institute of Geology and Mineral Resources of Mongolia (IGMR). One of the objectives for the project was the characterization of geology and mineral resources of the inner Asian continent of Mongolia in comparison with those of island-arc setting of Japan. The project also aimed to establish

new exploration methods and to promote the development of mineral resources including fuel resources. The main activities of the project were as follows.

- (1) Study of the geology in Mongolia, especially from the viewpoint of tectonic development of the Asian continent.
- (2) Metallogenic study of mineral deposits such as Cu, Pb, Zn, Sn, W, Mo and REE with emphasis on the relationship to magmatic activities.
- (3) Basic research for evaluation and utilization of Mongolian coal and oil shale.

Geological survey had been done in the Lake Huvsgul District of northern Mongolia and in the vicinity of Ulaanbaatar to study the Baikalian tectonic zone of the oldest geologic unit in Mongolia and to establish the Paleozoic stratigraphy in the Khangai Caledonian zone respectively. In 1992 a long-distance expedition were conducted by a Japanese-Mongolian team from Ulaanbaatar to the Mongol Altai Mountains through the Khangai High Land in order to survey the geology and mineral resources in western part of Mongolia.

The detailed surveys of ore deposits were carried out in the Erdenetiin ovoo deposit, and in M \ddot{o} ng \ddot{o} n \ddot{O} nd \ddot{o} r and \ddot{O} nd \ddot{o} r-tsagaan polymetallic deposits together with other Pb, Zn, Cu, Mo, W and Sn deposits. To understand the metallogenic features in eastern and southern Mongolia, several metal and nonmetal deposits such as Pb-Zn-Ag deposits at Tsav, porphyry copper deposit at Tsagaan Svarga and some fluorite deposits were examined. With respect to coal and oil shale, the geology and occurrence of the deposits were investigated in three coal fields and three oil-shale fields of the Central Gobi Basin. Chemical analysis of oil shale specimens showed high content of organic carbon in some localities. Based on this promising fields of oil shale could be found by further investigation including drilling survey.

Beside the ITIT project, three dispatch programs of individual GSJ's expert were conducted by the Japan International Cooperation Agency (JICA) to support the fuel and mineral resources sector of Mongolia. During the course of these expert activities, the GSJ advised to promote further

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cooperative activities between Mongolia and Japan, which resulted in JICA's Project-Type Technical Cooperation (PTTC) in March, 1994. The overall goal of the project is to contribute to the promotion of the mineral resources development in Mongolia by improving technologies in resource investigations and chemical/mineralogical analyses. This project is expected to make the Institute of Geology and Mineral Resources improved in research ability by the following joint activities for five years.

- (1) Planning for mineral resources investigations and instrumental analyses.
- (2) Compilation and reviews of existing data.
- (3) Sample preparation techniques for instrumental analyses.
- (4) Mineralogical, geochemical and geophysical analyses.
- (5) Interpretation and integration of data.
- (6) Archiving data and data base construction.
- (7) Formulation of working manuals.

After 1990 the government of Mongolia has tried repeatedly to reconstruct its organization and to reduce the size into an appropriate scale from the previous enlarged administrative system which was typical for communist countries. Consequently our counterpart IGMR and its supervising ministry were reorganized almost every year. In 1997 the IGMR moved into the Mongolian Academy of Sciences. The PTTC was continued with the newly established institute, the Mongolian Geological Survey, under the Mineral Resources Authority of Mongolia which directly belonged to the Minister of Agriculture and Industry. The scientific contributions of the cooperative research have been published in several geological journals and the first Mongolian geological journal, *the Mongolian Geoscientist*, which was established under the PTTC project.

This publication is a special issue for mineral wealth in Mongolia and includes data and information which were obtained in our ITIT and

JICA activities. Editorial handling was done by the extra members, S. Murao, T. Nakajima, Y. Kanazawa and Y. Seki, all from the GSJ. The first paper by Professor Gerel is an invited contribution and is a handy review of representative mineral deposits of granitic affinity. Murao *et al.* and Yamamoto *et al.* are the contributions from the ITIT Project for the Öndör-tsagaan ore field and Züünbayan oil-shale district respectively. Ooka *et al.* is another invited contribution which reports the extraction of alteration zone in highly prospective areas of southern Mongolia. Dejidmaa and Naito summarize studies, mainly by Russian researchers, on the Erdenetiin ovoid deposit which is the largest copper producer in Mongolia. Lkhamasuren and Hamasaki cover the information of another important commodity in Mongolia, fluorite. The short note by Jargalan and Murao describes geology and mineralogy at the Tsagaan tsakhir uul gold zone. Nukushina's manual which is placed last in this issue was prepared for geologists and engineers who often get confused in transcription of Cyrillic into Roman letters. In the appendices of the manual Professor Nukushina kindly listed up all of the place names in this issue, to which the editors express their sincere gratitude.

Unfortunately many counterparts at IGMR have left the institute and joined private companies. The importance of mineral exploration and production, however, has been increasing more than before for the development of Mongolia. The geological research cooperation with Mongolia is expected to continue furthermore and we do hope this special issue will be assistance for those who are involved in exploration and exploitation in this graced country in human and natural resources.

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