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Progress and Prospects of Salt Lake Research in China

ZHENG Mianping, SONG Pengsheng and KONG Weigang

MLR Key Laboratory of Saline Lake Resources and Environments, Institute of Mineral Resources, CAGS, Beijing 100037, China

1 Introduction

Salt lakes in China distributes in the east part of the salt lake belt of Northern Hemisphere, and they originated under complex morphological and geological background. The QT Plateau and its northern areas belong to active tectonic zone and stable tectonic zone respectively. With elevation varies from more than 5000 m to the lowest of -155 m, distributes in E-W direction, between 28°-56°N, bounded in the east by Great Khingan-Taihang-Qinling mountains, and they mainly sites in the zone with annual precipitation of less than 500 mm.

2 Progress of Salt Lake Research in China

The large scale survey of salt lakes in China started since the 1950s, and much progress has been made through 60 years of studies.

Salt lake sediments and palaeoclimate: For example, on the basis of the changes of Cenozoic salt lakes, the areas south to Nanling Mountains was proved to have a dry period during 65-57 Ma BP. For the first time, salt minerals are used as indicators for palaeoclimate, and come sedimentary salts have been classified to warm, cold and eurythennal types (Zheng et al., 2000).

Geological survey of salt lake mineral resources: Extensive assessments have been done for salt lakes in China, and ancient lake zone (Tertiary) and quaternary salt lake zone was classified (Zheng et al., 1993), which have served the geology and resource basis for the production of potassium, lithium, boron, and halite in China. Besides, many new salt minerals were discovered, including hungchsaoite, carboborite, hydrochlorborite, zabuyelite and qilianshanite, etc.

Study on fundamental chemistry for salt lake resources.

Due to the great importance for theoretical and engineering practice, solubility phase diagrams (stable and metastable) have been extensively studied, focusing on K, Li, B, bearing brines to serve fundamental data for salt lake exploitation (e.g., Zheng et al., 2007).

Mining engineering and chemical engineering for comprehensive utilization: Mining for industrial scale production of potash and boron and chemical engineering for industrial scale production of lithium. By 2013, there have been dozens of companies for the production of potash fertilizers, and their total output is 6 million tons of K₂O, and at least four facilities are on stream for lithium production, including the one at Zabuye salt lake.

Environmental protection and development of health and beauty products: Several field research stations have been established at selected salt lakes in Tibet, and have network with field monitoring stations at many salt lakes in other areas of China. In addition, remote sensing has been applied to investigate salt lakes. Floating, therapeutic mud etc, has been developed at several salt lakes.

Ecological and biological studies on salt lakes: Most of the studies concentrated on salt lakes in Inner Mongolia and on QT Plateau. From the 1980s, the investigation of algae and artemia have been started, and artemia has been found in more than 100 salt lakes. Since then, many products (cysts, algae products, etc.) have been developed in these salt lakes and solar ponds.

3 Prospects of Salt Lake Research in China

With the development of economics and the improvement of research level in science and technology, the following will be or keep being the important research directions in salt science in China.

Research on ancient salts deposits, salt lake geology and related deposits will still be the key and preferential tasks, and the exploration and comprehensive assessment of some strategic mineral resources (K, Li, B, Br, I, etc.) is

* Corresponding author. E-mail: zhengmp2010@126.com

essential for the safety of agriculture, industry, and national defense.

Rational development of salt industry, i.e. efficient utilization, effective management of mineral resources and related environmental protection are the most importance tasks today, which involves studies on salts related thermodynamics, Mining engineering, chemical beneficiation, chemical processes and chemical engineering(e.g. the promising Salt gradient solar pond), etc., which will drive to the formation of “Great salt lake industry”.

Salt lakes and salt bearing areas occupies various extreme environments, which are precious for biological studies, such as those on geoecology, systems biology, molecular biology, environmental biology, genebiology, biotechnology, and disciplines concerning biodiversity and its protection, etc.. More importantly, the progresses in these fields will greatly help on the formation of “salt lake agriculture” and “solonchak agriculture”.

Salt lakes and their sediments are good recorders of geological processes and environmental conditions, and studies on these can obtain rich information to help better understand related geological events, palaeoclimate, salt deposition processes, and the hydrocarbon accumulation. For example, salt lakes in Qaidam Basin, northern part of Qinghai-Tibet Plateau, has both the advantage of unique

geological and environmental conditions, and they have continuous Late Cenozoic deposits, thick and fine grained, which are detailed archives of Qinghai-Tibet Plateau uplift, the metallogenic response of oil, gas and salts, and palaeoenvironmental conditions in Neoid. Besides, the Mars-like geological and environmental conditions makes the salt lakes there one of the best sites for carrying out analogue studies on Martian salts.

Numerous health and beauty products can be developed from salt lakes and their sediments, and related researches can greatly promote the economic growth. Many salt lakes are fantastic places for tourism, and vigorously develop the tourism industry there can effectively promote the environmental protection in these regions.

Key words: China, Salt lake research, Progress, Prospects

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