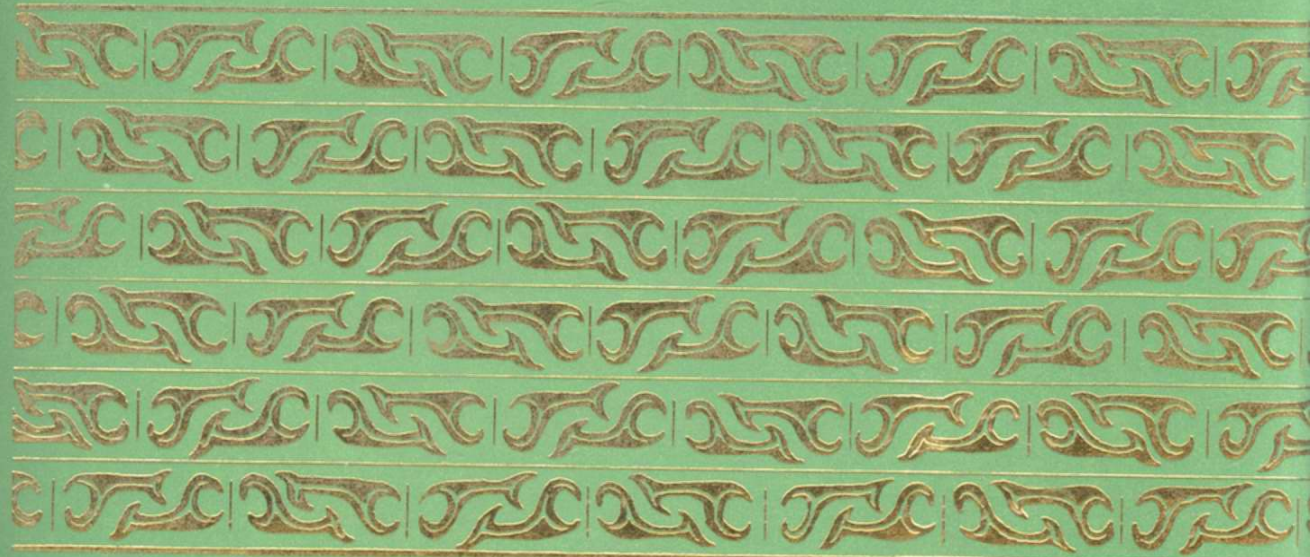


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中国铬矿志



冶金工业出版社

中国铬矿志

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内 容 简 介

《中国铬矿志》是一部全面、系统反映我国铬矿资源状况、勘查开发历史和现状的志书。

全书共分两篇：第一篇“总论”，概述了铬的性质、用途、地球化学特征，铬矿物、矿石及工业要求，我国铬矿资源与开发利用情况；叙述了我国铬矿地质特征：含铬岩体和成矿条件，铬矿建造类型和矿床成因类型，成矿带和找矿前景；综述了我国铬矿地质勘查史、勘查方法，地球物理探矿技术与应用，铬矿地质科学研究及理论发展。第二篇“各地区的铬矿床”，详细地介绍了我国 29 个铬矿床的矿区与岩体地质、矿床地质特征、矿床发现与勘查史、开采技术条件和开发利用情况。

本书涉及范围广泛，内容丰富，资料翔实，可供领导干部、地质人员、矿山工作者、管理人员和大专院校师生阅读和参考。

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RECORDS OF CHINA'S CHROMITE DEPOSITS

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Synopsis

The "Records of China's Chromite Deposits" is a book which gives a comprehensive and systematic review of chromium ore resources, prospecting, exploitation history and present condition of chromite deposits in China.

The book is divided into two parts. Part I, "General description", outlines Cr properties, uses, geochemical characteristics, Cr minerals and ores and industrial requirements, Cr resources and the basic situation of its exploitation and utilization. It briefly introduces geological features of the Chinese chromite deposits including the types of chrome-bearing rock bodies and the metallogenetic conditions, the China's chrome mineralization belts and prospecting prospects. It also introduces the Chinese chromite geological exploration history, the processes of geological exploration for the chromite deposit, geophysical prospecting techniques and their applications, the scientific research and the theory development of chromite deposits. Part II, "Chromite deposits in Provinces, and Autonomous Regions of China", gives a detailed description of the Chinese 29 known chromite deposits and the mafic-ultramafic rock bodies, the geological features of the deposits, the discoveries and exploration history and technical conditions of the deposit development and their exploitation and utilization.

The book covers many aspects, including abundant data and valuable information. It is a useful reference book for those who are engaged in geological prospecting mining management, scientific research and design, and for university teachers and students.

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序

《中国铬矿志》的出版，为《中国铁矿志》、《中国锰矿志》这三部黑色金属矿产志的编撰、出版工作，画上了一个圆满的句号。冶金工业部从事地质工作的一批老同志，历时五载，伏案笔耕、字斟句酌，将自己一生为之奋斗的黑色金属矿产勘查成果录于志中，也把全地质行业同行们勘查黑色金属矿产的成果凝于其中。它既是一套学术著作，也是一套手册，还是一套史书。一套志书在手，中国铁矿、锰矿、铬矿资源的全景，铁、锰、铬矿产勘查工作的过去、现在和未来的展望，都呈现在读者的面前。这一浩繁的工程实现了编志的初衷。希望一切从事地质勘查与科学研究的同行、矿山开发的朋友和所有的读者们，三部志书立于你们的案头，供工作时参考，闲暇时回味。

刘益康

1996年2月

前言

继《中国铁矿志》、《中国锰矿志》出版发行之后,《中国铬矿志》也和广大读者见面了。这是铬矿地质勘查工作中的一件值得庆贺的事!也是铬矿地质勘查工作者和矿山工作者值得高兴的事!

铬矿是冶金、耐火材料、化工等原材料工业部门极为重要的矿物原料。据联合国经济和社会发展理事会 1979 年的统计,世界铬矿消耗量的 76% 用于冶金工业; 13% 用于耐火材料和铸造业; 11% 用于化学工业。应用铬矿石冶炼出来的高强度合金钢和不锈钢具有硬度大、韧性好、耐腐蚀等特点,是机械工业和军事工业不可缺少的重要原材料。耐火材料工业生产铬镁砖,化学工业生产铬酸盐类等都不能离开铬矿石。

从 50 年代起,根据国家经济建设对铬矿资源的迫切需求,我国铬矿地质工作者爬高山、穿密林、过荒漠、涉江河,从东海之滨到青藏高原,从大兴安岭到三江峡谷,开展了大规模的地质勘查和科学研究工作,为查明我国铬矿成矿条件和提供铬矿资源作出了卓越的贡献。据不完全统计,这些成果主要表现在:完成 1/5000~1/2000 比例尺的重力、磁法测量面积约 315.12 平方公里;投入地质勘查事业费约 4.28 亿元,完成钻探工程量约 292.6 万米,坑探 5.8 万米;提交科研报告约 223 份,发表论文约 278 篇;查明我国基性一起基性岩岩体总数不少于 11443 个,出露面积 11147 平方公里,其中超基性岩体 8635 个,总面积 4516 平方公里。截至 1993 年底,全国已勘查铬矿区 56 处,累计探明铬矿储量 A+B+C 级 1305.3 万吨,经开采之后尚保有储量 1121.8 万吨,其中工业储量 (A+B+C 级) 405.5 万吨;提交了一批可供生产建设的铬矿。目前生产和在建矿区 259 个 (含民采矿点),1992 年生产原矿石 10.6 万吨,1994 年原矿石生产只有 5.58 万吨,下降了 47%。由此可以看出,铬矿石的生产很不稳定。

尽管铬矿地质工作者做了大量的工作,提交了一定数量的储量,但距离国家对铬矿生产建设的需求仍然有很大的差距。从数量上看,我国铬矿保有的储量只占世界储量的 0.15%,而且矿床规模小,分布零散。我国属于贫铬国家。据统计,从 1952 年到 1994 年的 42 年间共进口铬矿石 868 万吨,年均进口 20.7 万吨,其中 1994 年 65.1 万吨;由此可见,供需之间矛盾十分突出。从质量上看,在保有储量中,富矿 (含 $\text{Cr}_2\text{O}_3 > 32\%$) 与贫矿大体各占一半。富矿储量只有 548.6 万吨,占全国保有储量的 48.9%,主要分布在西藏、新疆、青海等边远地区。随着钢产量的增长,铬矿石供应不足的状况势必更为严峻。

40 多年来,我国铬矿地质勘查和科研工作积累了大量资料和丰富经验,为进一步深入开展铬矿找矿奠定了一定的基础,但必须看到,随着地表已知含矿岩体的相继评价,找矿难度越来越大,只有在成矿理论和找矿方法上取得新的突破,地质找矿才能有较大的进展。为了系统地全面地总结铬矿地质勘查工作的经验,冶金部地质勘查总局决定继《中国铁矿志》、《中国锰矿志》之后,编写《中国铬矿志》。1995 年 3 月 28 日在湖北宜昌市中南冶金地质研究所召开了《中国铬矿志》编写工作座谈会。一年多以来,在编委会的

领导下，在《中国铬矿志》办公室的统一协调下，经各地勘局、院编写组及有关专家的共同努力，一部资料翔实、内容丰富、可读性强、具有指导意义的长达50多万字的《中国铬矿志》问世了。在本书正式出版之际，谨对参加本书编撰工作的作者、编审、绘图、抄写、打印以及有关人员表示衷心的感谢！对冶金部各地勘局、院领导给予的大力支持表示诚挚的谢意！在此，我们还要特别感谢地质矿产部全国储量管理局严铁雄和中国地质科学院白文吉、王希斌等长期从事铬矿勘查、科研工作的地质专家，感谢他们对本书进行了详细的评审，并提出了宝贵意见。严铁雄、白文吉两位专家还提供了不少珍贵的铬矿地质及工作方面的照片，为本书增色不少。此外，冶金部第一地质勘查局的李治华专家仔细审阅了铬矿物探方面的内容，在此一并表示谢忱。

《中国铬矿志》共分两篇。第一篇概述了铬的性质、用途及地球化学特征；铬矿物、铬矿石及其工业要求；我国的铬矿资源与开发利用基本情况。概要叙述了我国铬矿地质特征，包括含铬岩体类型和成矿条件，铬矿建造类型和矿床成因类型，我国铬矿成矿带及其找矿前景。还比较详细地综述了我国铬矿地质勘查史，铬矿地质勘查工作方法，地球物理探矿技术与应用，铬矿地质科学研究及其理论发展。第二篇详细记述了我国29个知名的铬矿床的矿区及岩体地质、矿床地质特征，矿床发现与勘查历史，矿床开采技术条件和矿床开发利用情况。这些矿床有贺根山铬矿、柯单山铬矿、索伦山铬矿、高寺台铬矿、平顶山铬矿、放马峪铬矿、毛家厂铬矿、桐峪铬矿、萨尔托海铬矿、鲸鱼铬矿、大道尔吉铬矿、玉石沟铬矿、百经寺铬矿、绿梁山铬矿、三岔铬矿、楼房沟铬矿、冯家山铬矿、松树沟铬矿、罗布莎铬矿、东巧铬矿、香卡山铬矿、依拉山铬矿、切里湖铬矿、洛绒铬矿、江措铬矿、大槽铬矿、小绥河铬矿、洋淇沟铬矿、太平溪铬矿，同时还对我国华北、西北、西南等各省（区）铬矿进行了综合叙述。

本书是铬矿勘查和科研工作的历史回顾和经验总结。这里需要说明的是，在铬矿找矿和科研工作过程中，对铬矿地质理论的认识是不断发展的。《中国铬矿志》本着历史唯物主义的观点，叙述铬矿勘查及科研工作的发展，对各时期的研究成果实事求是的再现，难免出现早期理论与现代研究成就相悖的状况；本书遵从写志的准则，对各时期的代表性观点不加偏袒，兼收并蓄，请读者鉴谅。同时，一个矿床从发现到勘探完毕，往往需要经过长期反复的认识过程，加之40多年来组织机构变化颇大，书中涉及矿床发现和勘查的单位或个人，难免有遗漏或错误之处；由于本书涉及面广、篇幅较长，引用文献较多，很难一一列出，特别是对一些有争议的成矿理论问题，在资料掌握有限的情况下，很难加以全面反映，希望广大读者理解，并欢迎提出宝贵意见。

编者

1996年元月

PREFACE

The publication of the "Records of China's Chromite Deposits" has marked a successful completion of the series books including the "Records of China's Iron Ore Deposits" and the "Records of China's Manganese Ore Deposits". A group of geologists and professors with seniority and prestige in the Ministry of Metallurgical industry have worked hard at their desks and compiled painstakingly and elaborately for five years, so that the exploration results of metallurgical mineral resource fighting for their whole lives themselves would be recorded into the series of the Records which are included with the results and contribution of national geological community. The series of the Records is not only a scientific works and a handbook but also a historical record. While you have the series of the records in your hands, the whole picture of Chinese iron, manganese and chromium resources and the past, present and future of exploration for iron, manganese and chromium mineral resources will be unfolded before your eyes. This vast project has realized the initial idea of compiling records. I hope my geological and explorational colleagues and my friends in mining development and all readers to have the series of the records on your desk for your references while you are working or calling them to your mind when you are free.

Liu Yikang
February, 1996

FOREWORD

Following the publication of the "Records of China's Iron Ore Deposits" and the "Records of China's Manganese Ore Deposits", the "Records of China's Chromite Deposits" now is presented to the reading public. This is a matter for congratulation in the field of geological exploration for chromite deposit. This is also a matter for joy of geological explorers and mining workers of the chromite deposit.

The chromium ore is the most important mineral raw material for metallurgy, refractory and chemical industry. According to the statistics of 1979 by the UN Economic and Social Development Council, the 76% consumption of worldwide chromium ore was used in metallurgical industry; 13% in refractory and casting industry; 11% in chemical industry. The high hardness alloy steel and the stainless steel smelted by chromium ore are characterized by high hardness, good toughness and against rust, which are the important raw material needed for machinery and military industries. The refractory material industry produces chromium — magnesium brick and chemical industry produces the chromites that are all needed to the chromium ore.

Since 1950's according to the urgent requirements of the national economic construction for the chrome mineral resource, the Chinese chromite geologists have developed a large — scale chrome geological exploration and scientific research by climbing high mountains, traveling forests and crossing deserts and rivers from eastern coastal areas to Qinghai — Tibet Plateau and up to Daxing'anling Ridge and down to three river (Sanjiang) canyons. As a result, they have made an outstanding contribution in finding out the chrome metallogenetic conditions and resources. The finished exploration work are mainly as follows: the gravity and magnetic survey with about 315.12 square km at 1 : 5000 ~ 1 : 2000 scales were completed; the operating expense of geological exploration for chrome was 428 million Yuan RMB and finished drill footage was about 2.926 million meters and exploratory drift was 58 thousand meters; the 223 scientific research reports were submitted and the 278 papers were published; a total number of 11443 mafic and ultramafic rock bodies in China were established. The outcropped area is 11147 square km and the ultramafic bodies are 8635 with total area of 4516 square km. By the end of 1993 there were 56 being explored chrome districts accumulated chromium ore reserves (A+B+C+D) of 13.053 million tons. Now the preserved reserves is 11.218 million tons in which the industrial reserve (A+B+C) is 4.055 million tons; a batch of chromite deposits were submitted for construc-

tion and production. At present the chrome mining districts in production and under construction are 259 (including local mining activities). In 1992 the chromium raw ore production was 106 thousand tons, while in 1994 the figure was only 55.8 thousand tons that were decreased by 47%. It is indicated that the chrome ore production is very unstable.

Although the chromite geological explorers in China did a lot of work and submitted a certain amount of the reserves, yet there is a big gap between the chrome ore production and the need of Chinese national economic development. From the view of quantity, the proved reserves of China's chromite deposit is only 0.15% of the world reserves and the sizes of the deposits are small and they distribute scatteringly. So, China is not rich in chrome resources. Based on the statistics from 1952 to 1994, China had imported the chrome ore of 8.68 million tons, the annual import was 207 thousand tons, in 1994 it was 651 thousand tons. From this it can be seen that the contradiction between the demand and the supply is obvious in China. From the view of quality, in the proved reserves, the rich ore ($\text{Cr}_2\text{O}_3 > 32\%$) and poor ore are roughly fifty-fifty. The rich ore reserve is only 5.486 million tons which is 48.9% of national proved reserves. They are mainly distributed in remote areas such as Tibet, Xinjiang and Qinghai. As the steel production in China is increasing, the situation of insufficient supply of the chrome ore will be more critical.

For more than 40 years, the Chinese chromite geological exploration and scientific research have accumulated a vast amount of data and rich experience that will lay the foundation for further detailed chromite exploration. However, we have to indicate that as the most known chrome-bearing rock bodies on the surface have been evaluated accordingly, it is more increasingly difficult to look for more chromite deposits. Only after the new breakthrough might be taken for the metallogenetic theory and exploration methodology of the chromite deposit, the geological exploration for chromite deposit would be able to get a more great progress. In order to summarize the experience of geological exploration for the chromite deposit systematically and completely, the General Bureau of Geological Exploration, M. M. I. has determined to compile the "Records of China's Chromite Deposits" after compiling the "Records of China's Iron Ore Deposits" and the "Records of China's Manganese Ore Deposits". On 28th March, 1995, a forum of compilation of the "Records of China's Chromite Deposits" was held at the Institute of Metallurgical Geology in Yichang City, Hubei Province. Being more than one year, under the leadership of the editorial committee and the arrangement of the chief editor's office, a 0.5 million word book "Records China's Chromite

Deposits" with rich and accurate information, highly readability and important guidance to practice now eventually sees the world in the cooperative efforts of the editorial groups of geological exploration bureaus and academies and relevant experts. On the occasion of formal publication of this book, we wish to express our heartfelt gratitude towards the authors, editors and revisers, drafters, copyists, typists and relevant personnel who took part in the compilation of this book! Sincere thanks to the leaders of each geological exploration bureau for their great support to the compilation. Here, we would like to express our special thanks to Mr. Yan Tiexiong, National Reserve Administration Bureau of M. G. M. R. and Mr. Bai Wenji and Mr. Wang Xibin, geologists of Chinses Geological Academy for their careful revision of this book and their valuable suggestions. Mr. Yan TieXiong and Mr. Bai Wenji, the two scientists also offered some collected photos of chromite deposit and the field work for this book. In addtion, Mr. Li Zhihua, a geophysical scientist of the First Geological Exploration Bureau, M. M. I. revised the context of the geophysics in this book, we are also very grateful to him for his help.

The "Recerds of China's Chromite Deposits" is divided into two parts. The part I generally describes the properties, uses and geochemical characteristics of chromium; chromium minerals, chrome ore and industrial requirements of chrome ore; China's chrome ore resources and the basic situation of its exploitation and utilization. It briefly introduces the geological features of Chinese chromite deposits including the types of chrome-bearing rock bodies, the metallogenetic conditions, the China's chrome mineralization belts and prospecting prospects. It also introduces in detail the Chinese chromite geological exploration history, the procedure of geological exploration for the chromite deposit, geophysical prospecting techniques and its applications, the scientific research and the theory development of the chromite deposits. The Part II describes in detail the Chinese 29 known chromite deposits and the mafic-ultramafic rock bodies, the geological features of the deposits, the discoveries and exploration history, and technical conditions of the deposit development and their exploitation and utilization. These deposits are Hegen-shan chromite deposit, Kedanshan chromite deposit, Suolunshan chromite deposit, Gaositai chromite deposit, Pingdingshan chromite deposit, Fangmayu chromite deposit, Maojiachang chromite deposit, Tongyu chromite deposit, Sartohai chromite deposit, Jingyu chromite deposit, Dadaorji chromite deposit, Yushigou chromite deposit, Baijingsi chromite deposit, Luliangshan chromite deposit, Sancha chromite deposit, Loufanggou chromite deposit, Fengjiashan chromite deposit, Songshugou chromite deposit, Luobusha chromite deposit, Dongqiao chromite deposit, Xiangkashan chromite deposit,



Yilashan chromite deposit, Qielihu chromite deposit, Luorong chromite deposit, Jiangcuo chromite deposit, Dacao chromite deposit, Xiaosuihe chromite deposit, Yangqigou chromite deposit and Taipingxi chromite deposit, meanwhile, the resources Chromite in the provinces of Northern, North—Western and South—Western China are also described generally.

This book is a historical review and a summary of experience in the chromite exploration and scientific research work. It is necessary to indicate that in the course of the chromite exploration and scientific studies, the knowledge and the understanding of the theory of chromite deposits are developed increasingly. The "Records of Chins's Chromite Deposits" has recorded the chromite exploration and scientific studies in the view of historical materialism, so it is reappeared the research results of various periods for the past time in practical and realistic mode. As a result, it is difficult to avoid the conflict cases between the earlier theory and moern research results; according to the criteria of compiling the records, this book has to collect the representative viewpoints of various periods in the chromite exploration. And what is more that for a chromite deposit from discovery to complete exploration it is a course of repeated understanding of recognition for a long period of time. Yet for the last 40 years there have been a lot of changes of administrative structure and personel, therefore the omissions and mistakes of the organizations and personel concerning the discoveries and exploration for the deposits are difficult to be avoided; it is not possible to list all the literatures in this thick book because of the wider involving aspects, longer time span and more references. Especially, it is difficult to reflect all of the issues of controversies over metallogenetic theory because of the limitation of the information. We hope that the readers would forgive us and criticism is always welcome.

Editors

January, 1996

中国主铬矿床分布略图

(图中数字所代表的矿名称见本书第二章第三节表1—11)

比例尺

0 100 200 300 400 500 600km



图
例

● 中型矿

● 小型矿

南海诸岛

244km

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