中国锰矿志

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RECORDS OF CHINA'S MANGANESE ORE DEPOSITS

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内 容 简 介

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

全书共分两篇：第一篇“总论”，概略地论述了锰的物理化学性质和地球化学特征，工业锰矿物、锰矿石及其工业要求，我国锰矿资源、地质情况、地质勘查工作和成果，以及锰矿工业开发与加工技术；第二篇“各地区的锰矿床”，分省（或大区）综述了中国锰矿状况，详细介绍了72个锰矿床的矿区地质、矿床地质特征、发现与勘查史、开采技术条件和开发利用情况，并附有必要的地质图件。

本书涉及范围广，时间跨度大，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参考。

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Synopsis

The "Records of Chian's Manganese Ore Deposits" is a book in which a comprehensive and systematical review of Manganese ore resources, prospecting, exploitation history and present condition of Manganese ore deposits in China are persented.

The book is divided into two parts. Part Ⅰ, "General description", outlines Mn physicochemical properties and geochemical characteristics, industrial Mn minerals and ores and industrial requirements. Mn resources, geological conditions, geological prospecting projects and achievements and techniques of Mn ore exploitation and processing have also been briefed. Part Ⅱ, "Mangenese ore deposits in each provinces, municipalities and autonomous regions", summarized Mn ore deposits in each province (or in each region), gives a detailed description of 72 Mn ore deposits on the geological characteristics of mining areas and mineral deposits, discovered and prospecting histories, mining technical conditions as well as the exploitation and utilization. In addition, mecessary geological maps have been attached.

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

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序

锰矿是冶金工业的重要原料。据统计，世界上约90%～95%的锰用于冶金工业。锰在炼钢过程中是不可缺少的脱氧剂和脱硫剂，也是重要的合金组分。工业用钢中常含有一定量的锰，熔炼成低锰合金钢和高锰合金钢。“无锰不成钢”，这句话就充分体现了锰在钢铁工业中的特殊地位和重要意义。在现代工业中，锰的应用越来越广泛，约有5%～10%的锰用于化学工业、轻工业、国防工业、建材工业、电子工业、环境保护和农牧业等。

新中国成立以来，为了满足经济建设对锰矿资源的需求，地质勘查部门对锰矿资源进行了大量的找矿勘探和科学研究工作，投入地质事业费约5.7亿元，完成钻探工程量约187万米，取得了令人瞩目的成绩。截止1992年底，全国共计探明锰矿产地209处，累计探明储量6.44亿吨，保有储量5.92亿吨。目前，正在生产和建设的矿山共有110处，锰矿石产量逐年提高，1992年生产锰矿石531.5万吨，对钢铁工业生产建设发挥了重要作用。

当前，锰矿资源存在的主要问题是贫矿多，富矿严重短缺。全国保有碳酸锰矿石储量3.94亿吨，占总储量的66.5%，矿石含锰16.39%～43.12%，平均品位只有21.14%；保有氧化锰矿石储量1.44亿吨，占总储量的24.4%，矿石含锰20.78%～39.52%，平均品位也只有24.56%。这是影响我国锰业发展和矿石自给的制约因素和严重障碍。

按照锰矿资源保证程度论证分析，到2000年钢产量达到1.2亿吨时，需生产锰矿石838万吨，排产规模约552万吨，供需矛盾非常突出，不足部分需要依靠进口富锰矿石。由此看来，我国锰矿资源无论从数量还是质量上，都存在着一些不容乐观的问题。在今后一个时期内，广大地质勘查工作者仍要把锰矿，特别是富锰矿的找矿当作一项迫切的任务。

为了全面总结锰矿地质勘查和锰矿开发生产的历史经验，继出版《中国铁矿志》之后，冶金工业部地质勘查总局和冶金工业部矿山司联合下文，决定组成编委会和主编办公室，着手编写《中国锰矿志》。编写工作会议于1993年5月26日在济南市召开。近两年来，在编委会的领导下，在主编办公室的统一协调安排下，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、具有实际指导意义的长达80万字的《中国锰矿志》和广大读者见面了。这是我国锰矿地质勘查和开发工作中值得庆贺的一件大事。在本书正式出版之际，谨对参加编写、审稿、编辑、绘图、抄写、打印，以及付出过劳动的有关人员，表示衷心的感谢！对冶金工业部各地勘局、院领导给予的大力支持表示诚挚的谢意！我们特别要感谢冶金工业部全国锰矿技术委员会、广东省

冶金矿山公司、广西壮族自治区锰矿公司、福建省冶金矿山公司等单位在出版经费上给予的资助！

本书是锰矿勘查、科研和开发工作的历史回顾和经验总结，是广大锰矿地质工作者集体劳动成果的结晶。这里特别要申明的是，一个矿床从发现到勘探完毕，往往要经历一个长期、反复的认识过程，加之40多年来机构、单位名称和人员变化较大，因此，书中涉及矿床的发现和勘查的单位或个人，难免有遗漏甚至错误之处；同时由于本书涉及面广，篇幅较长，引用文献较多，很难一一列出。在此特请广大读者谅解，并欢迎提出宝贵意见。

FOREWORD

Manganese ore is an important raw materials for metallurgical industry. According to statistics, the manganese of 90 ~95% in the world is used in metallurgical industry. The manganese is not olny a requisite deoxidizer and desulfurizer in the steelmaking, but also an important alloy composition. A certain amount of manganese is often added in the steel for industrial use, which is melted into the steel making as low-Mn alloy steel or high-Mn alloy steel. The saying "no manganese can not make steel" gives a full expression of its special position and importance in the iron and steel industry. The application of manganese becomes wider and wider in contemporary industries. The manganese of 5~10% is used in chemical industry, ligh industry, national defence, building materials, electronics, environmental protection, farming and animal husbandry, etc.

The geological prospecting for manganese has made a great contribution to the prospecting and scientific research for manganese ore resources to meet the demands in economic development and construction after the founding of new China. Remarkable achievements have been gained on the basis of having invested geological expenditure of 570 million Yuan 'RMB and 1. 87 million meters drilling has been completed and 209 Mn deposit sites have been discovered by the end of 1992. The proved ore reserves are 644 million tons as a whole, in which the preserved reserves are 529 million tons. 110 Mines are under production and construction at present. The production volume of Mn ores was 5. 315 million tons in 1992 and is increasing year by year, contributing a lot to China' s iron and steel production.

The main problem we are facing at present in China' s Mn ore resources is that poor ores are dominant, in other words, rich ores are severely inadequate. For instance, the preserved reserves of manganese-carbonate ores are 394 million tons that is 66. 5% of the total reserves, but the Mn content of the ores is only 16. 39 ~ 43. 12% and the average grade is 21. 14%. The preserved reserves of oxidized manganese ores are 144 million tons which is 24. 4% of the total reserves, but the Mn content in the ores is only 20. 78 ~39. 52% and its average grade is 24. 56%. All these figures show the constraints factors and critical problems having an effect on China' s manganese industry development and the self sufficiency of the ore.

Concerning the guarantee level of China' s Mn ore resources supply, the steel production volume will reach 120 millions in the year of 2000 that means 8. 38 million tons Mn ores will be required. But the available planned production volume of Mn ores is only about 5. 52 million tons. There is a sharp contradic-

tion between the supply and the demand. The gap has to be filled by the import of rich Mn ores from abroud. It shows that some nonnegligible problems exist both in quantity and quality in China's Mn ore resources. Therefore, Chinese geological workers should take Mn ore prospecting, especially looking for rich Mn ores, as an urgent task in the near future.

To comprehensively sum up the historic experience of geological prospecting and exploitation for Mn ore deposits, the General Bureau of Geological Exploration and the Bureau of Mines of the Ministry of Metallurgical Industry issured a joint document after the publication of "Records of China's Iron Ore Deposits" decided to set up the editorial committee and the office of chief editor for the compilation of "Records of China's Manganese Ore Deposits". The editorial working meeting was held in Jinan City on May 26, 1993. Under the leadership of the editorial committee and the arrangement of the chief editor's office a 0.8 million words book "Records of China's Manganese Ore Deposits" with rich and accurate information, highly readability and important guidance to the practice now eventually sees the world in the cooperative efforts of all editorial groups of geological exploration bureaus and academies and relevant experts after two years. This is an event worthy of being celebrated in China's geological prospecting and exploitation for Mn ores. In the time of formal publication of this book, we wish to express our sincere appreciation to the personnel who took part in the writing and editing, viewing, figuring, copying and typewriting and to relevant persons who have contributed to this book as well as to the great support by the leaders of geological exploration bureaus and academies of the Ministry of Metallurgical Industry. Especially, we wish to express our appreciation to the National Committee of Mn Ore Techniques, Guangdong Metallurgical Mine Company, Guangxi Mn Ore Company, Fujian Metallurgical Mine Company, etc for their financial supports to the publication of this book.

This book is a historic review and the experience summary of the geological prospecting, scientific research and exploitation for Mn ores and collective effort result of all geological workers for Mn ores in China. It must be pointed out here that it is often a longterm and repeated process of recognition from the discovery to completion of prospecting for Mn ore deposit. In addition, omissions or even errors of some units and persons involving the discoveries and prospecting for manganese deposits in this book are unavoidable owing to the changes of the unit names or personnel positions. Meanwhile, it is very difficult to list all the literatures because of the wider involving aspects, longer space and more references, we hope that the readers would forgive us and the criticism is always welcome.

前言

《中国锰矿志》是冶金矿产志的系列丛书之一。《中国铁矿志》的出版，为《中国锰矿志》的编写积累了经验，奠定了基础。《中国锰矿志》的编写提纲和编写方法基本参考了《中国铁矿志》的要求。在“总论”部分增加了中国锰矿地质特征、成矿规律，以及锰矿开发与加工技术等方面的内容。其他章节也有较多的充实和延伸。

《中国锰矿志》分为两大部分，即第一篇“总论”和第二篇“各地区的锰矿床”。

第一篇“总论”，概略地论述了我国锰矿资源、地质情况、地质勘查工作和成果，并介绍了锰矿工业开发与加工技术状况。本篇第一章讨论了锰的物理化学性质和地球化学特征，从地球化学角度解释锰在内、外生条件下的成矿作用；阐述了工业锰矿物、锰矿石及其工业要求；详细介绍了我国锰矿资源的特点及分布，并从锰矿开发利用现状及存在的问题出发，评述了锰矿资源对生产建设的保证程度，提出了必要的对策。

锰矿勘查实践的发展和研究成果的积累，使得有可能全面、系统地总结我国锰矿地质和找矿理论认识。第二章，从含矿建造角度，将我国锰矿分为7大建造类型；从成因角度，将锰矿划分为4大类型和11个亚类。本章从不同侧面，介绍了锰矿分布的地质背景、产出特征和赋存规律。以地质条件和分布规律为基础，划分出5个Ⅰ级锰矿成矿区、12个Ⅱ级成矿带、34个Ⅲ级矿带，同时对我国锰矿资源总量进行了预测，对资源潜力作了评估。

我国锰矿勘查和开发是伴随近代及现代工业（主要是钢铁工业）的兴起而发展起来的。第三章首先叙述了近代锰矿业的发展历程和兴衰变迁，然后重点叙述40多年来锰矿地质勘查工作和进程，突出了各阶段重要锰矿的发现意义和勘查工作特点。同时，介绍了锰矿勘查工作中地球物理和地球化学探矿方法的应用和技术发展现状。本章还总结了我国锰矿地质理论研究的成果，重点是80年代以来锰矿系列课题的研究成果，归纳了成矿理论和技术方面的进展，如锰矿形成的构造—沉积环境、成矿物源和成矿作用（机制）等方面的新认识；还列述了为解决难选矿石所进行的工艺矿物学方面的研究进展。根据锰矿资源不足的情况，展望了未来锰矿资源及开发前景。

我国锰矿地质和研究工作，虽然取得了很大的成绩，但目前尚未有全面论述锰矿的地质专著。本书的前三章期望能弥补这方面的一些缺陷。

“总论”的第四章主要介绍我国锰矿开发和加工技术现状、采选技术方法、技术装备、工艺流程、技术经济指标及效果。针对我国锰矿“贫、

杂、细、薄、缓”的不利条件，在开采方面已研究和采用了预支顶板锚杆房柱法、人工柱锚杆房柱法等新工艺；在选矿方面，推广了强磁选、重—磁选、强磁—浮选及火法富集等技术；在冶炼及深加工方面，矿粉造块、锰铁(硅)合金及金属锰等生产技术得到长足的进步。上述内容基本上反映了我国锰矿采、选、冶的技术进展和总体水平。

第二篇“各地区的锰矿床”是《中国锰矿志》的主要组成部分，包括第五章至第十五章，分省(或大区)综述锰矿资源状况，并对各入选矿床(区)分别按矿区地质、矿床地质特征、发现与勘查史、开采技术条件和开发利用情况5个方面进行详细介绍，并附有必要的地质图件，资料翔实，数据可靠，论述清楚。

本书共收入全国72处矿床(区)，其中，广西13处，湖南12处，四川8处，云南6处，贵州5处，广东4处，福建4处，湖北3处，陕西3处，新疆3处，辽宁3处，山西2处，天津、内蒙古、河北、甘肃、江苏及江西各1处。上述锰矿床(区)基本上包括了主要矿床类型、已探明的大、中型矿床，以及主要生产矿区(山)。

《中国锰矿志》将锰矿地质、采矿、选矿和冶炼加工作为一个完整的“系统工程”，从历史到现状，从理论成果到技术方法，从锰矿地质总体规律到个别矿床特征进行了全面、系统的阐述，力求做到资源和地质数据、采选冶技术指标及工艺参数等系统、完整。这是本书的一个特色，不失为锰矿地质及锰业开发方面一本难得的工具书。

为形像地反映某些历史性的勘查活动、锰业发展情况和有意义地质现像，本书选辑了有关典型锰矿物、锰矿地质地貌、野外勘查活动、大型采矿场(工作场面)、重要选厂的图片，作为历史实录，以为本书增色。

《中国锰矿志》忠于事实、尊重历史，力求全面记述锰矿勘查和开发过程，公正反映各工作部门及有关人员的功绩。毕竟，岁月流逝，追述我国早期锰矿勘查活动的全貌十分困难。本书对现状的记述显然要详于对历史阶段的评述，这是不足之处。

希望《中国锰矿志》的出版有助于推进我国锰矿勘查和开发事业。

编　者

1995年8月

PREFACE

The "Records of China's Manganese Ore Deposits" is one of the series books on metallurgical mineral products. The publication of the "Records of China's Iron Ore Deposits" has provided the basis and experience for the compilation of this book. Its compiling outline and method have basically taken the reference of requirements for "Records of China's Iron Ore Deposits". Chapters such as the geological feature of Chinese manganese ore deposits, discussion on the metallogenetic regularity, exploitation and processing techniques of manganese ore deposits are added in the part of "General Description" and more details are also added in other chapters.

This book can be divided into two parts, i. e. Part I "General description" and part Ⅱ "Manganese ore deposits in each provinces, municipalities and autonomous regions".

Part I "General description" gives an outline presentation of the manganese ore resources, geological information, geological prospecting work and the achievements in China as well as the exploitation and processing state of manganese ore industry. The first chapter of this part discusses the physical, chemical and geochemical features of manganese, metallogenesis of manganese in endogenic and epigenic conditions in geochemistry, industrial manganese minerals, manganese ores and their industrial requirements, and gives a ditailed introduction of the features and distribution of manganese ore resources in China. The guarantee of manganese ore resources for the production and construction is commented and some necessary measures are recommended from the aspects of exploitation, utilization and present state of manganese ore deposits and the analysis of existing problems.

With the practical progress in prospecting for manganese ore deposits and the accumulation of research results, the comprehensive and systematic summarization of the geology of Chinese manganese ore deposits and the understanding of ore-finding theory have become available. Therefore in the second chapter, Chinese manganese ore deposits are able to divide into 7 formational types from the aspect of pay formation and 4 types and 11 sub-types by genesis. The geological background, occurrence features and characteristics of manganese ore deposit distribution are expounded from different aspects. And, 5 of Grade Ⅰ metallogenetic provinces, 12 of Greade Ⅱ metallogenetic belts and 34 of Grade Ⅲ ore belts are shown on the basis of the geological conditions and distribution regularities. The prediction to the total manganese ore resources in China and the estimation for the

resource potential are also given in this chapter.

The prospecting and exploitation for manganese ores have been developed with the spring-up of modern and contemporary industries (mainly the steel and iron industry). So the third chapter started with the historical course of modern manganese industry and its rises and falls and then emphasized on describing the geological prospecting work and progress during the past 40 years. The significance of the discoveries of main manganese ore deposits and their prospecting features in each periods have been stressed in this chapter. In the meantime, the application of geophysical and geochemical methods in prospecting for manganese ore deposits and the development on the ore finding techniques are presented. The achievements of research work on the geological theory of manganese ore deposits in China ane summarized, in which the stress has been laid on the series research subjects for manganese ore deposits since 1980's. The development in metallogenetic theory and techniques is summed up, such as new knowledge on the tectonic-sedimentary environment of manganese ore deposit, the source of ore forming material and metallogenics (mechanism). The research development on the technological mineralogy dealing with difficult problems on the ore dressing is also introduced. The future manganese ore resources and the prospects are predicted in view of the status of insufficient manganese ore resources.

Great achievements have been gained in Chinese manganese ore geology and scientific research, but no other special geological books on an overall introduction of manganese ore deposits were published before this book. The first three chapters in this book can be expected as a filling in the gap of this field.

The fourth chapter in Part I mainly presents the current status of the manganese ore exploitation and processing techniques, manganese ore mining and dressing techniques, technical equipments, technological programm, technical and economic indexes and efficiency in China. The manganese ore deposits in China have the characteristics of "lower gade, more inpurities, fine grain, thin bedding and slow slope". To overcome these disadvantages, the new technologies such as the methods of pre-supporting roofs, anchor bass and house pillars have been studied and adopted in mining operation; techniques such as strong magnetic seperation, gravity-magnetic seperation, strong magnetic-floatation seperation and fire concentration have been developed in the ore dressing; production processes such as block-making with mineral powders, Mn-Fe (Si) alloys and manganese metal have been also greatly developed in metallurgy and deep processing. The above contents can basically indicate the Chinese manganese ore mining, dressing and metallurgy.

Part I "Manganese ore deposits in each provinces, municipalities and autonomous regions", including chapters 5—15, is the key part of this book, which

overviews the resources of manganese ore deposits in each provinces (or large regions) and gives an extensive account of each selected ore deposit in accordance to the geological settings, ore deposit features, discovery and prospecting history, technical conditions for mining and the status of development and utilization. The neccessary geologic maps of each mining districts are also attached. This part has provided to the readers with full and accurate information, reliable data and clear description.

72 manganese ore deposits are introduced in this book. They include 13 in Guangxi, 12 in Hunan, 8 in Sichuan, 6 in Yunnan, 5 in Guizhou, 4 in Guangdong, 4 in Fujian, 3 in Hubei, 3 in Shaanxi, 3 in Xinjiang, 3 in Liaoning, 2 in Shanxi, 1 in Tianjin, 1 in Inner Mongolia, 1 in Hebei, 1 in Gansu, 1 in Jiangsu and 1 in Jiangxi. They cover mearly all the main types, the known large-sized and medium-sized ore deposits and the main mining production districts (Mines).

Considering manganese ore geology, mining, dressing and metallurgy as an integrated "systematic engineering", this book gives a comprehensive and systematic account from historical to current status, theoretic achievements to technical methods and the overall geological regularity to the features of individual deposit, so it makes the resources and geological data, technical indexes of mining, dressing and metallurgy and technological parameters, etc more systematic and complete. This is one characteristic of this book. It is also a rare tool book on manganese ore geology and development of manganese industry.

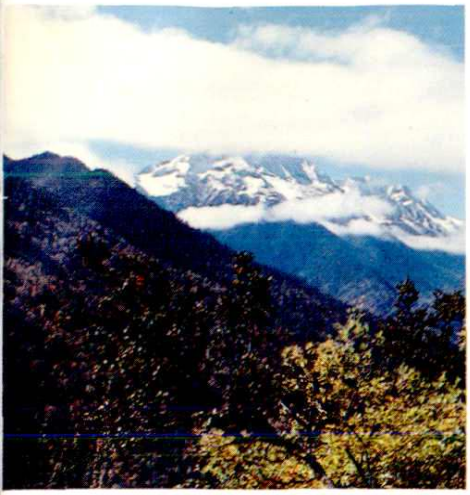
To show some historical prospecting events, development situation of manganese industry and meaningful geological phenomena vividly, some pictures about typical manganese minerals, geomorphology of manganese ore deposits, field prospecting events, large mine sites (working scenes) and important ore dressing plants are chosen and included as historical evidences in order to credit to this book.

Based on being true to the facts and respecting to the history, this book is expected to give a comprehensive description of prospecting and development process of manganese ore deposits and fairly to show the contributions of every departments and relative persons in China. However, it is very difficult to recall the whole picture of prospecting for manganese ore deposits in the early stage or early years due to the time passed, so the more description about present situation than that about the past is a deficiency of this book.

It is expected that the publication of this book will be helpful to promote the course of prospecting and exploitation of Chinese manganese ore deposits.

Editorial staff

August, 1995



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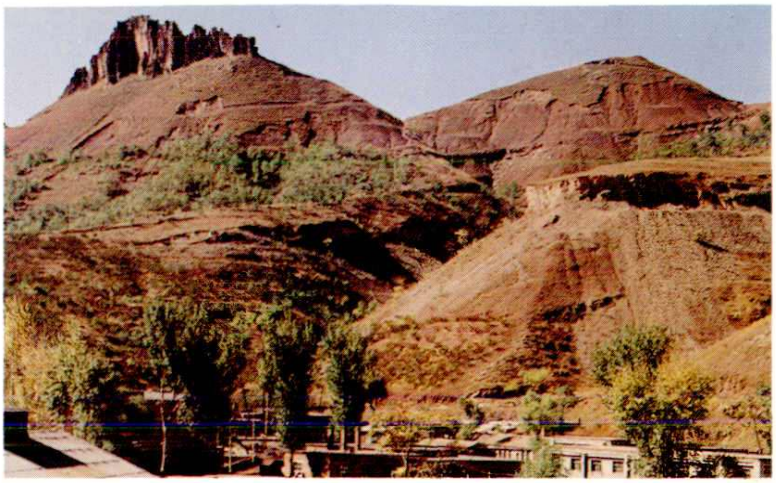

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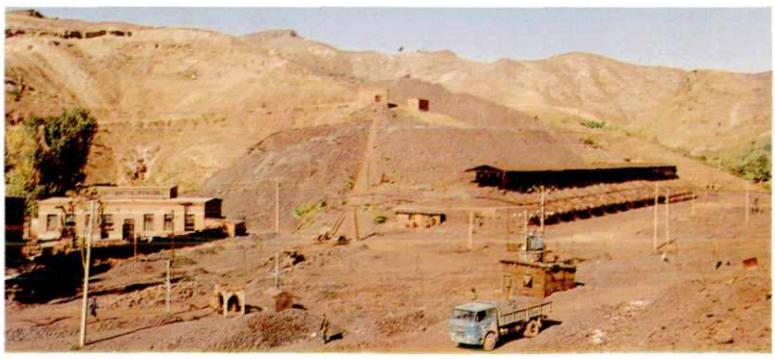
瓦房子锰矿地表三层矿露头

木圭锰矿松软矿层采样

个旧锰结核堆积区地貌



瓦房子锰矿鸡冠山矿区选厂

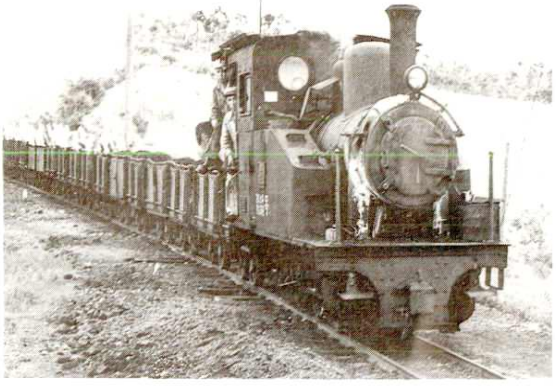
←湘潭锰矿提升矿石用井架

↑“锰都”湘潭

湘潭锰矿矿部

湘潭锰矿铁合金厂

亚洲最大的湘锰电解金属锰厂



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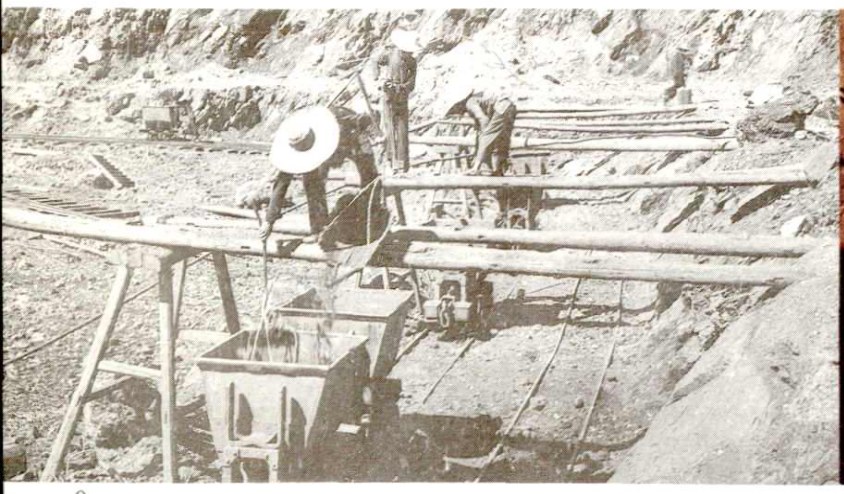

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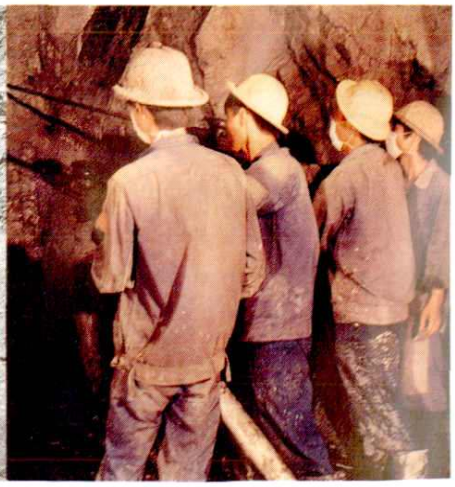

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