

矿冶科学与工程新进展

——庆祝北京矿冶研究总院建院 40 周年论文集

上册

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序

北京矿冶研究总院自 1956 年建院,至今已度过 40 个寒暑春秋。40 年,在历史的长河中只不过是短暂的一瞬,而在人生的旅途中却是一大段波澜起伏的历程。进入不惑之年的北京矿冶研究总院,在其发展史上七易院名,留下了一长串沉重的却又是闪光的足迹。在上级主管部门的领导下,为发展祖国的矿冶科技事业,广大矿冶人甘守清苦、勇克难关,年复一年地甚至是夜以继日地兢兢业业地工作。昔日的年轻人如今已鬓发斑白,脸上刻下岁月流逝的痕迹。近年来更有一批批的老同志离开了艰苦奋斗了几十年的工作岗位,与此同时,又有一批批的青年科技骨干迅速地跟了上来。正是这几代矿冶人不懈的拼搏,使其用血汗培育的科技硕果数以千计,遍及华夏大地的长城内外、大河上下,构筑了国家宝贵的资产。广大矿冶人自身也在为矿冶事业的奋斗中陶冶、形成了我们的矿冶风格,在与广大企事业单位同行的共同合作中结下了深厚的情谊。改革开放以来,矿冶人以只争朝夕的精神推动各项工作的快速发展,使全院已基本形成科学研究、工程设计和科技产业三位一体的发展模式,成为在国内外同行业中有较大影响的、以矿冶科学和工程技术为主体的大型综合性科研与设计机构。

为了纪念和庆祝北京矿冶研究总院建院 40 周年,交流和展示自改革开放以来我院在科技工作领域所取得的新成果,从一个侧面映射出我们的矿冶精神,传递最新科技信息,推动我国矿冶科技事业的发展,同时也为了促进中外科技与经济的广泛合作与交流,全院有 1/3 以上的专业科技人员在总结回顾近年来工作的基础上撰写出了科技论文。这些论文有理论、有实践、有一定的水平,是紧密联系我国生产建设的科技成果的反映,它涵盖了采矿、选矿、冶金、材料、设备、化工、自动化、环保等技术领域的试验研究、技术开发、产品生产的主要进程。论文内容丰富,具有很强的实用性和可读性。这些论文按专业范畴分类编排汇集成册,作为向建院 40 周年的贺礼,同时献给广大矿冶人、献给一切支持与关心北京矿冶研究总院发展的社会各界朋友。

本文集只汇入专为庆祝建院 40 周年而写的论文。对于 1962 年院第一届学术会议、1982 年第二届学术会议,以及除此以外的历届国内外、院内外学术会议和科技期刊上已发表的论文,本文集均未予收录。本文集分上下两册编辑出版。上册包括采矿工艺、采矿机械、矿山化工、选矿工艺、选矿设备及自动化、工艺矿物学、矿山复垦等专业论文 137 篇;下册包括冶金工艺与设备、金属材料、磁性材料、环境保护及分析检测等专业技术论文 147 篇。尽管本论文集收集的论文仅反映我院近年来的部分科技工作,但仍显示出相当一部分优秀的科技成果,其中包括国家发明奖、国家级科技进步奖和省部级科技进步奖多项,这些成果已成功地应用于生产实践,产生的经济效益和社会效益巨大。

非常感谢论文作者和编辑出版人员对本论文集的关照并付出辛勤的劳动。由于他们出色的工作得以使本论文集能在较短的时间内出版发行。鉴于我院科技人员和编辑人员水平有限,论文集难免有不妥之处,敬请国内外读者和同行专家指正。

北京矿冶研究总院院长

孙传尧

1996 年 5 月

NEW ADVANCES IN MINING AND METALLURGICAL SCIENCE AND ENGINEERING

—A Tome of Selected Papers Dedicated to the
40th Anniversary of the Founding of BGRIMM

PREFACE

Up to now 40 years have past away since Beijing General Research Institute of Mining and Metallurgy, BGRIMM was founded in 1956. A period of 40 years represents only a brief moment in the history of mankind but is a long section in a man's life journey. BGRIMM has been renamed seven times, leaving a long long stripe of thorny but brisk foot steps in its growing route.

Under the supervision of the higher authorities concerned, BGRIMM staff have been working carefully and conscientiously year by year, even day and night, caring neither hardship nor difficulties, striving for advancing mining and metallurgical science and technology across the motherland. While veteran experts and other professionals of earlier generations have left their posts on which they worked for dozens of years, younger generations of scientists and engineers come up successively. It is owing to the arduous efforts and struggle of several generations of BGRIMM people that thousands of scientific & technological achievements have been recorded which are diffused throughout Chinese land, inside and outside the Great Wall, up and down the Yellow River, constituting a valuable intellectual property of the nation. Also in the cause for promoting mining and metallurgical industry have the BGRIMM people well moulded themselves, creating the BGRIMM fact-seeking style and establishing deep friendship with the colleagues of a large number of enterprises and institutions in close co-operation. Especially since the reform and opening-up BGRIMM people have seized every minute to speed up all-round work, basically having laid a development mode integrating three essential functions, i. e. R&D, engineering design and product manufacture. As a result, the Institute BGRIMM has become an influential institution among the mining & metallurgical line both in and outside China, a large and comprehensive research and design institution oriented primarily at mining, metallurgical and materials science and engineering.

In order to celebrate the 40th anniversary of BGRIMM, exchange and reflect the new research fruits gained by the institute since the reform and opening-up policy implemented, depict BGRIMM style from one aspect, disseminate recent information on science and technology, promote the mining and metallurgical science and technology, as well as to further the research and economic cooperation and exchanges with domestic and overseas partners, over 1/3 profession-

als of the institute, based on reviewing and summarizing recent records, have written the papers included in this tome. They are up to a certain academic level, some being more theoretical, others practice targeted, all presenting a mirror of their achievements made in close relation to China's construction and production. The coverage involves major progresses in research and experiment, technological development, and product manufacture related to mining, mineral processing, extractive metallurgy, materials and equipment, chemical engineering, process automation, environment protection, etc. These papers of abundant content are endowed with practicality and readability. They are classified in line with specialities and compiled into a whole tome as a gift to the 40th anniversary of the institute, dedicated also to the broad miners and metallurgists, and the friends of all circles who have handed support and care for the growth of BGRIMM.

This tome takes in only the papers greeting the 40th birthday of the institute, not including those published in the proceedings of 1962 First Academic Conference and 1982 Second Academic Conference of the institute, and in other domestic and foreign conference proceedings and periodicals. It is divided into two volumes. The first volume includes 137 papers concerning mining technology and equipment, mine Chemicals, mineral processing technology and equipment, process mineralogy, mine rehabilitation, etc. The second one collects 147 papers related to metallurgical technology and equipment, metallic and magnetic materials, chemistry and chemical engineering, and environment engineering. Although they reflect only part of R&D work done by BGRIMM staff in recent years, the papers present a considerable portion of outstanding achievements in science and technology, covering a number of projects granted the National Invention Prize and the Prize for Progress in Science and Technology by the state, ministries or provincial authorities concerned. These achievements have been successfully put to production, yielding huge economic and social benefits.

The industrious work and care of the authors, editors and publishing staff for the tome is gratefully acknowledged. It is through their outstanding efforts that the two volumes of papers have come forth in such a relatively short period of time. In view of limited qualification of the scientists, engineers and editors of ours inappropriate points might be inevitable, on which comments from readers, colleagues and experts both in and outside China are heartily appreciated.

Sun Chuanyao
President, BGRIMM
May 1996, Beijing

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