

湿法冶金新进展

New Advances in Hydrometallurgy

马荣骏 著

Author: Ma Rongjun

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内 容 提 要

本书收录了我国著名湿法冶金及环境工程专家马荣骏教授与合作者 40 多年来从事科研工作的部分成果。全书分四章,分别介绍了湿法冶金理论及工艺、溶剂萃取、离子交换及液膜分离、环境工程等四个方面的著述,共计 30 余篇论文。这些论文均有创新性与新颖性,不但颇具学术价值,而且在工业生产中发挥了重要作用,并获得了显著的效益。

该书是一本学术水平高、应用价值大的优秀科研成果专著。

书末附有作者发表的论文目录,以供读者需要时查阅。

本书可供从事湿法冶金、化工、环保的科研、设计、工厂技术工作者及大专院校师生参考使用。

作者简介

马荣骏, 1931年8月生, 原籍河北大城, 1955年毕业于东北工学院, 1955—1957年于原捷克斯洛伐克的Kosice工业大学攻读研究生。工作后曾长期担任研究室正副主任及研究所所长等职务。现任冶金工业部长沙矿冶研究院教授、博士研究生导师, 东北大学、中南工业大学及湘潭大学兼职教授, 并兼任中国稀土学会理事、湖南省稀土协会理事、中国有色金属学会冶金物理化学学术委员会副主任、湖南省有色金属学会理事、中国金属学会冶金环保学会理事、湖南省环境科学学会常务理事、湖南省环境工程分会副理事长。是我国著名湿法冶金和环境工程专家。

他从事过60多项科研工作, 有24项科研成果应用于工业生产。80年代以来有16项研究通过了省部级鉴定, 其中有12项获国家及省部级成果奖。研究工作及成果产生了显著的经济效益。

从50年代末到60年代对我国最大铀厂生产工艺中铀的净化及一些稀有金属工厂的铀、钍、稀土、锆铪、铌钽的提取分离等研究做出了多项有效的工作与贡献。70年代完成的酰胺型新萃取剂的研究及应用成果为国内外首创, 获科学大会奖。在国内首先进行了用压煮萃取法生产钼铌的研究, 该成果获冶金部及湖南省重大科技成果二等奖。研究成功了具有国际先进水平的萃取法生产仲钨酸铵的新工艺, 获湖南省重大科技成果一等奖及国家科技进步二等奖。80年代对国家“六五”及“七五”攻关项目热酸浸出铁矾法炼锌新工艺的研究获得成功, 得到三委一部的表扬, 填补了我国工业生产的空白, 已有六个冶炼厂采用这一新工艺, 每年为国家创造利税数亿元, 获得了中国有色金属工业总公司的重大科技成果奖。针对我国锌精矿含铟高的特点, 提出并完成了“非平衡萃取法”分离

钢铁的理论与工艺研究,得到了具有开创性及国际领先水平的成果(中国发明专利号16178),获得了广西科技进步二等奖。在我国首先提出并开辟了大洋锰结核的湿法冶金研究,不但为我国开展这一新领域的研究奠定了一定的基础,而对我国参予国际上开发海洋矿产资源也有一定的贡献。90年代完成了铅、银、钙三元锌电解新阳极材料及金精矿沸腾焙烧—氯化浸出提取金、银、铜的新工艺研究,经省级鉴定,认为居国内领先及达到国外同类工作的先进水平。进行了湿法炼锌中控制硅镁的研究,取得了具有国际领先水平的成果,获中国有色金属工业总公司科技进步二等奖。与兄弟单位协作完成的离子型稀土矿原地浸出新工艺,1995年通过了国家级的鉴定与验收,该成果居国际领先地位。

编著出版了七本学术专著:《钛的生产》,上海科技出版社出版(1958);《有机萃取在冶金中的应用》,上海科技出版社出版(1961);《溶剂萃取在湿法冶金中的应用》,冶金工业出版社出版(1979);《湿法炼铜新技术》,湖南科技出版社出版(1985);《离子交换在湿法冶金中的应用》,冶金工业出版社出版(1991);《工业废水的治理》,中南工业大学出版社出版(1991),该书获优秀学术专著一等奖;《湿法冶金新进展》,中南工业大学出版社出版(1996)。在国内外共发表论文140多篇,多被同行引用,产生了难以估计的经济及社会效益。被聘为中国冶金百科全书有色冶金卷的编委,主编了其中湿法冶金分支。

1978年获冶金部先进工作者称号,1989年被评为全国优秀环境科学工作者,1988及1992年二次被聘为国际湿法冶金会议学术委员会的委员。已培养出10多名硕士及博士研究生,1991年起享受政府特殊津贴,为中国的冶金事业做出了重要贡献。

A Brief Account of the Author Ma Rongjun

Ma Rongjun was born in August 1931. His ancestral home is at Dacheng in Hebei province. From 1955 to 1957 he studied as a graduate student at Kosice University of Technology in the former Czechoslovakia. After graduation he assumed the offices as deputy director, director, or director general at research institutes for ages. At present he holds the positions of professor at Changsha Research Institute of Mining and Metallurgy under Ministry of Metallurgical Industry, tutor for doctoral students, and part-time professor at Northeastern University, Central South University of Technology, and Xiangtan University. As a famous hydrometallurgy specialist and environmental engineering expert in China, Prof. Ma is concurrently director of Chinese Society of Rare Earths, director of Hunan Provincial Society of Rare Earths, deputy director of Academic Committee of physicochemistry of Metallurgical Process under Chinese Society of Non-ferrous Metals, director of Hunan Provincial Society of Nonferrous Metals, director of Subociety of Environmental Protection for Metallurgy, Chinese Society of Metals, managing director of Hunan Provincial Society of Environmental Science, and deputy director general of Hunan Provincial Branch of Environmental Engineering.

So far he has been engaged in the researches on over 60 projects, and scored 24 research results which have been put into commercial production. Since the 1980's, he has 16 research achievements passing ministerial-and provincial-level appraisals, for 12 of which he won the awards from the State, ministries or

provinces. His research work and results have created significant economic benefits.

From the late 1950's to 1960's, he has been effective in and contributive to the researches on uranium purification for China's largest uranium smeltery, and on separation and extraction of uranium, thorium, rare earths, zirconium/hafnium, and niobium/tantalum for a number of rare metals smelteries. Prof. Ma was the pioneer at home and abroad in the development and applications of new amide lixiviants in the 1970's, thus winning an award from national science meeting. He completed the pioneering research in China on the extraction of molybdenum and rhenium using autoclave digestion-solvent extraction process. Owing to this achievement he won the second award of major science and technology achievements from Ministry of Metallurgical Industry and Hunan province. Owing to his new technology reaching the advanced world standards for producing ammonium paratungstate using a solvent extraction technique, he won the first award of major science and technology achievements from Hunan province, and the second award of national science and technology development. In the 1980's Prof. Ma achieved a great success in the research on a new technology for zinc extraction using hot acid leach-jarosite process as one of the key projects during 6th and 7th five year plans, and thus was commended by three ministries and one commission. Filling a Chinese gap in this area, this research result has been adopted by 6 Chinese smelteries, creating tax and profits of several hundred million yuan per annum to the State. For this Prof. Ma won an award of major science and technology achievements from China Non-ferrous Metal Corporation. Taking into account the characteristics of Chinese

indium-rich zinc concentrates, he developed a theory and technology of "non-equilibrium extraction process" for indium/iron separation, achieving an original result coming up to advanced world level (Chinese patent CN16178). For this result he won the second award of science and technology development from Guangxi province. Prof. Ma proposed and started the research on hydrometallurgy of ocean manganese nodules as a pioneer in China, not only providing a basis for further research in China, but contributing to creating favourable conditions for China to participate in international cooperation research on ocean mineral resources. In the 1980's, Prof. Ma completed the research on a new ternary anode material containing lead, silver and calcium, and on a new technology of fluidized roasting-cyanide leaching process for extraction of gold, silver and copper. This achievement was considered to lead China and reach the advanced world level in accordance with the provincial-level appraisal. His research on the control of silicon and magnesium in the hydrometallurgy of zinc led the world, thus winning the second award of science and technology development from China Non-ferrous Metal Corporation. A new technology for leach of ionic rare earth ore, a project in cooperation with other fraternal units, passed the state-level appraisal and acceptance tests in 1995, and was considered to lead the world.

So far Prof. Ma has compiled and published seven learned monographs. They are: "Production of Titanium", Shanghai Science & Technology Press (1958), "Applications of Organic Extraction to Metallurgy", Shanghai Science & Technology Press (1961), "Applications of Solvent Extraction to Hydrometallurgy", Metallurgical Industry Press (1979), "New Technolo-

gy of Hydrometallurgy of Copper", Hunan Science & Technology Press (1985), "Applications of Ion Exchange Technology to Hydrometallurgy", Metallurgical Industry Press (1991), "Treatment of Industrial Wastewater", Central South University of Technology Press (1991), for which he won the first award of excellent learned monograph, "New Advance of Hydrometallurgy", Central South University of Technology Press (1996).

In addition Prof. Ma has published over 140 research papers in periodicals or other publications at home and abroad, most of which have been widely cited, creating invaluable tremendous economic and social results. Prof. Ma has been appointed the member of editorial board of Nonferrous Metallurgy volume of Chinese Encyclopedia of Metallurgy, editing "Hydrometallurgy" in this volume.

In 1978 he won the title of advanced worker, and in 1989 was chosen as a state-level outstanding environmentalist. In addition Prof. Ma was twice appointed the member of Academic Committee of International Meeting of Hydrometallurgy. To date he has trained over 10 graduate students with degrees of master and of doctor, greatly contributing to Chinese metallurgical industry.

前 言

由于现代资源、能源及环保等方面的情况及发展中的要求,在提取冶金中,湿法冶金得到了迅速的发展,尤其是一些新技术在湿法冶金中的出现及应用,更加拓宽了湿法冶金的应用范围及增大了它的作用,使其在冶金学科中占据了重要地位。

本书收纳了作者从事湿法冶金研究的部分成果。涉及的内容有湿法冶金的理论与工艺、溶剂萃取、离子交换、环境工程等湿法冶金领域中的新技术。书中有论文 30 余篇,其中有些论文曾被评 as 优秀论文,有些论文已作为技术成果,在生产中得到了应用,并获得了显著的效益。

书中的论文,基本按在刊物上发表的体例编排,有几篇用英文印出,为了便于国际交流未做改动。该书既有理论,也有实践,内容堪称丰富而新颖。出版本书的目的,是提供给从事湿法冶金工作的同行参考,使其在科研与生产中发挥更多的作用。

为了表明一些工作是作者与同事们共同完成的,在每篇论文中均列出了合作者的姓名。这样做,一是不埋没他们的作用,二是表示作者对他们在这本书中的贡献,致以谢意。在本书出版过程中,邱电云高级工程师、柳松博士、马伟博士及硕士研究生李扬同志等校对书稿付出了大量劳动,中南工业大学刘汉元教授及冶金部长沙矿冶研究院周日新高级工程师给予了热情的帮助,作者一并致以谢忱。

由于作者水平所限,书中错误难免,希望有关专家、学者及读者们多多指正。

马荣骏

1995 年 8 月于冶金工业部长沙矿冶研究院

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