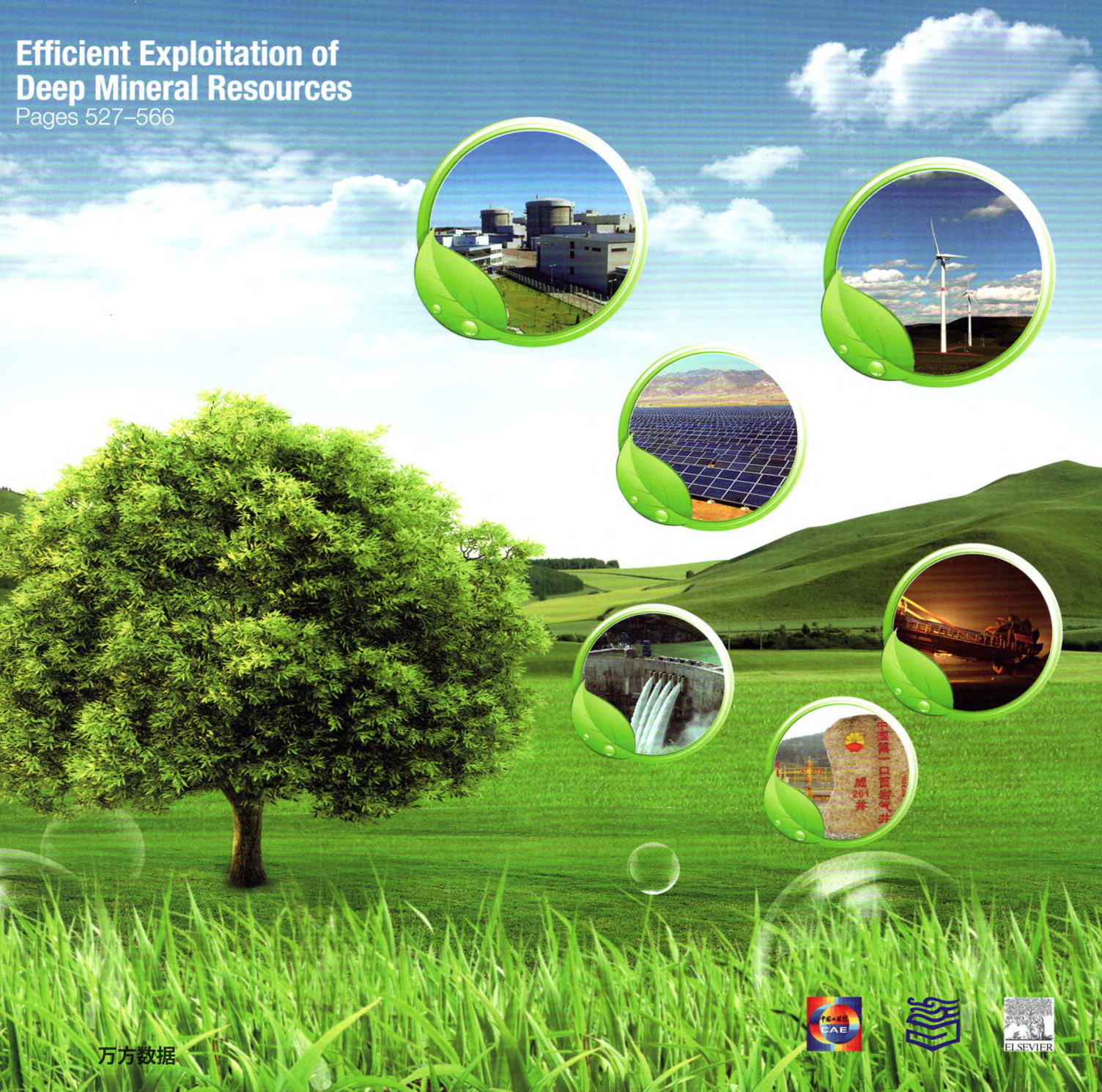
QK1732218

Engineering

August 2017

Clean Energy
Pages 439–526

Efficient Exploitation of Deep Mineral Resources
Pages 527–566



万方数据

Engineering

Contents

Volume 3 • Issue 4 • August 2017

Editorial

431 Clean Energy: Opportunities and Challenges
Yuzhuo Zhang

432 Challenges in the Mining and Utilization of Deep Mineral Resources
Meifeng Cai et al.

News & Highlights

434 Third Global Grand Challenges Summit for Engineering
Maggie Bartolomeo

Topic Insights

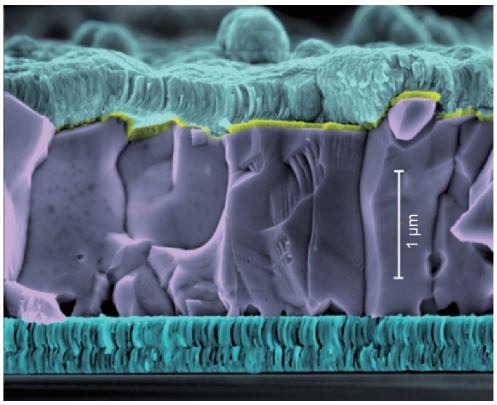
436 Contemporary Research in Energy Science and Engineering
Chris Greig

Research

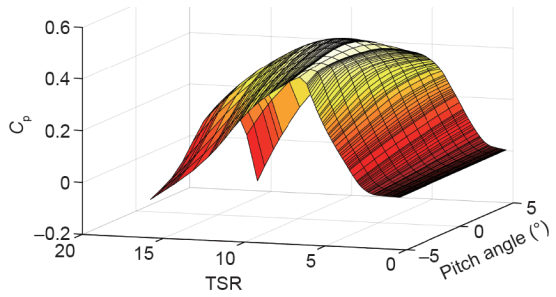
Clean Energy—Review

439 The Recent Technological Development of Intelligent Mining in China
Jinhua Wang et al.

445 Advances in Cost-Efficient Thin-Film Photovoltaics Based on Cu(In,Ga)Se_2
Michael Powalla et al.



Page 447



Page 496

452 Review on Alkali Element Doping in Cu(In,Ga)Se_2 Thin Films and Solar Cells
Yun Sun et al.

460 An Internet of Energy Things Based on Wireless LPWAN
Yonghua Song et al.

467 Particle Size and Crystal Phase Effects in Fischer-Tropsch Catalysts
Jin-Xun Liu et al.

477 CCS Research Development and Deployment in a Clean Energy Future: Lessons from Australia over the Past Two Decades
Peter J. Cook

485 Development of CO_2 Selective Poly(Ethylene Oxide)-Based Membranes: From Laboratory to Pilot Plant Scale
Torsten Brinkmann et al.

494 On Advanced Control Methods toward Power Capture and Load Mitigation in Wind Turbines
Yuan Yuan et al.

504 Flow-Induced Instabilities in Pump-Turbines in China
Zhigang Zuo et al.

Clean Energy—Article

512 An Empirical Study on China's Energy Supply-and-Demand Model Considering Carbon Emission Peak Constraints in 2030
Jinhang Chen

万方数据

Contents

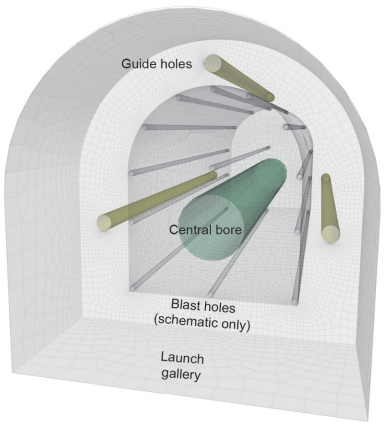
518 Computational Tools for the Integrated Design of Advanced Nuclear Reactors
Nicholas W. Touran et al.

Efficient Exploitation of Deep Mineral Resources—Review

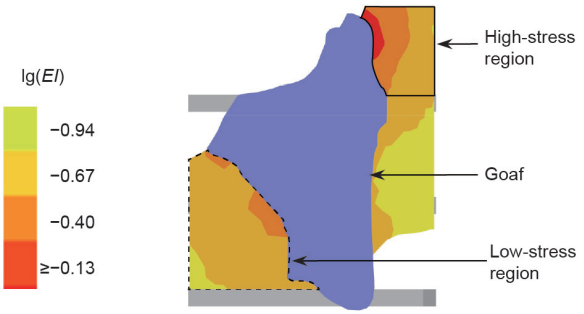
527 Some Challenges of Deep Mining
Charles Fairhurst

538 Monitoring, Warning, and Control of Rockburst in Deep Metal Mines
Xia-Ting Feng et al.

546 Opportunities and Challenges in Deep Mining: A Brief Review
Pathegama G. Ranjith et al.



Page 535



Page 544

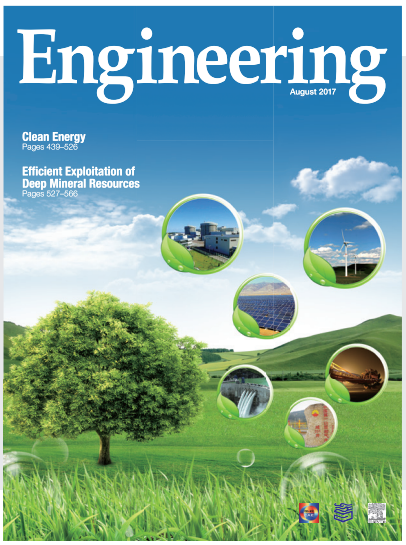
Efficient Exploitation of Deep Mineral Resources—Article

552 The Use of Data Mining Techniques in Rockburst Risk Assessment
Luis Ribeiro e Sousa et al.

559 Key Technology Research on the Efficient Exploitation and Comprehensive Utilization of Resources in the Deep Jinchuan Nickel Deposit
Zhiqiang Yang

Green Chemical Engineering—Review

567 Insights into the Organotemplate-Free Synthesis of Zeolite Catalysts
Yeqing Wang et al.



ON THE COVER

Energy is vital to any modern economy because it underpins human wellbeing and economic productivity. In recent years, a great deal of engineering research has focused on designing low-carbon, or "clean," energy systems. A clean energy future will grant the rising global population access to reliable, affordable, and sustainable energy services without contributing to climate change. Transitioning our fuel mix away from coal and oil and toward natural gas and renewable energy will take time, as the energy industry progresses through a period of profound change. Effective government policies and considerable technological progress are being made in the transition from fossil fuels to ecologically sustainable energy systems, such that many studies support future energy systems based on 100% renewable energy.

万方数据

Engineering

Contents

Volume 3 • Issue 4 • August 2017

Editorial

469 清洁能源——机遇与挑战
张玉卓

470 深部矿产资源开采与利用中的挑战
蔡美峰 等

News & Highlights

472 第三届全球重大挑战峰会
Maggie Bartolomeo

Topic Insights

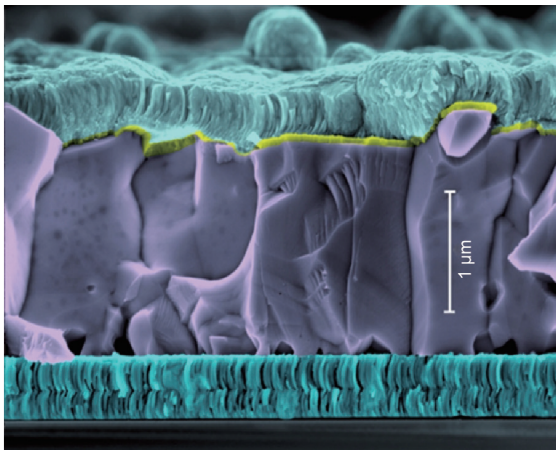
475 能源科学与工程研究评论
Chris Greig

Research

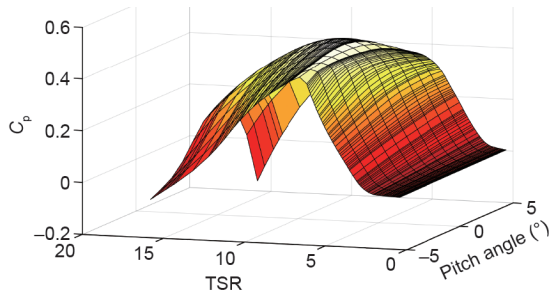
Clean Energy—Review

478 我国煤矿智能化采煤技术的最新发展
王金华 等

484 基于 Cu(In,Ga)Se_2 低成本薄膜的光伏技术的进展
Michael Powalla et al.



Page 486



Page 541

492 碱金属掺杂对 CIGS 薄膜及电池器件的影响
孙云 等

500 基于广域低功耗网络的能源物联网
宋永华 等

509 费托合成催化剂的尺寸与晶相效应
Jin-Xun Liu et al.

519 碳捕集和封存技术研究开发及未来清洁能源行业部署——澳大利亚在过去 20 年中的经验教训
Peter J. Cook

530 对二氧化碳具有选择性的聚环氧乙烷基薄膜的发展——从实验室到中试规模
Torsten Brinkmann et al.

539 风机捕集能量和降低负荷使用的先进控制方法
Yuan Yuan et al.

551 中国水泵水轮机流动不稳定性研究
左志钢 等

Clean Energy—Article

560 基于碳排放达峰约束的 2030 年中国能源供需模型及实证研究
陈进行

566 用于先进核反应堆综合设计的计算工具
Nicholas W. Touran et al.

万方数据

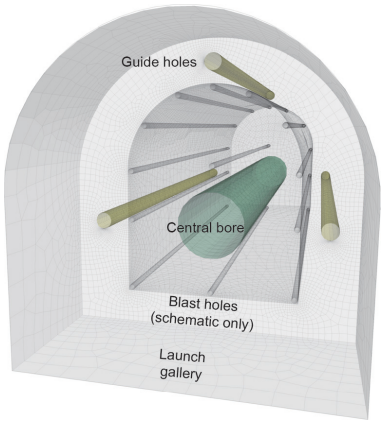
Contents

Efficient Exploitation of Deep Mineral Resources—Review

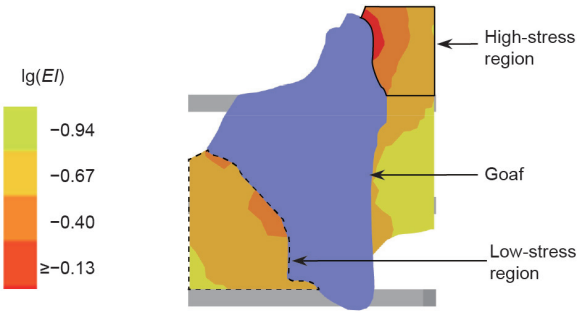
576 深部开采的一些挑战
Charles Fairhurst

588 深部金属矿山岩爆监测、预警和控制
冯夏庭 等

597 简评深部采矿的机遇与挑战
Pathegama G. Ranjith et al.



Page 584



Page 595

Efficient Exploitation of Deep Mineral Resources—Article

603 数字采矿技术在岩爆风险评估中的应用
Luis Ribeiro e Sousa et al.

610 金川镍矿床深部资源高效开发与综合利用的关键技术研究
杨志强

Green Chemical Engineering—Review

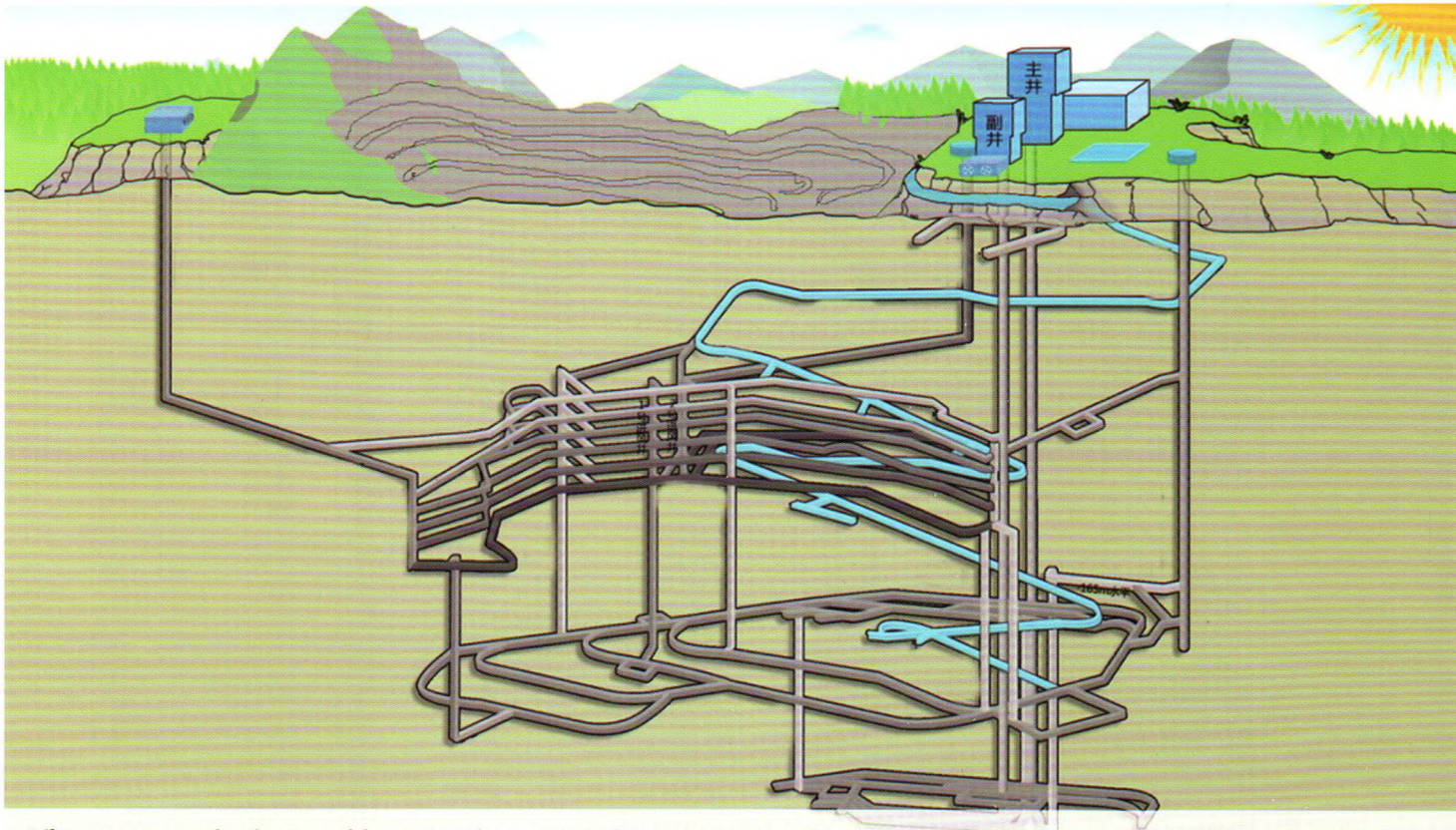
618 洞察无有机模板合成沸石分子筛催化材料
王叶青 等

封面说明

能源对任何现代经济制度都至关重要，因为它支撑着人类福祉和经济生产力。近年来，大量的工程研究集中在低碳、清洁能源系统的设计上。未来清洁能源将在不造成气候变化的前提下，为不断增长的全球人口提供可靠、可负担得起和可持续的能源服务。随着能源工业在一个深刻变革时期的发展，燃料结构将逐渐从煤炭和石油转向天然气和可再生能源。在从化石燃料过渡到生态可持续能源系统的时期，有效的政府政策正在实施，并取得了巨大的技术进步，如许多研究支持基于 100% 可再生能源的未来能源系统。

万方数据

Engineering Science and Technology Create a Better Future



Efficient mining and utilization of deep mineral resources is the most pressing problem facing the exploitation of mineral resources in China. Deep mining involves a series of technical problems caused by high stress, high well temperature, high osmotic pressure, the deterioration of geological and mining conditions, and so forth. To maximize safety and efficiency in the exploitation and utilization of mineral resources, we must build a new selection mode and technical system that is more efficient, less expensive, safer, and more environmentally friendly.

Engineering is intended to provide a high-level platform where academic achievements of great importance in engineering science and technology can be disseminated and shared.

ISSN 2095-8099 工程 (英文)
CN 10-1244/N
Distribution code Q1849
国内发行代号 80-744
Available online http://www.engineering.org.cn

万方数据