<<有色冶金炉窑仿真与优化>>

图书基本信息

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前言

Due to the tremendous variety of nonferrous metals and .their processes of extraction, the furnaces and kilns used for nonferrous metallurgical engineering（FKNME） vary largely in terms of structure, heating mechanism and functionality .The incomplete statistics show that currently there are over one hundred types of FKNME around the world. Despite this wide variety, however, these FKNME share a few characteristics in common: first of all, most FKNME are heavilyenergyconsuming, with low energy utilization effectiveness usually ranging from15% to 50%. The energy needed to extract nonferrous metals is approximated 2:5to 25 times that for ferrous metals. China is facing an even bigger challenge in this area. The mean energy consumption rates in China are much higher than that of the most advanced indices in the world. Secondly, FKNME usually generate moretoxic emissions such as sulfur dioxide, fluoride, chloride, arsenide,etc. Thirdly, theperformance of the FKNME is often influenced by many factors, the effects ofwhich are usually non-linear and considerable hysteresis can be found. These difficulties account for the relatively lower process controllability and lowerautomatization level of the FKNME.It is clear, from the three common characteristics described above, that the FKNME practices are challenging for the industry and therefore deserve mores trenuous investigation. For the purpose of effectively upgrading FKNME technologies and improving performance, it is imperative that the following is suesbe addressed and resolved. Firstly, the output should be maximized by improving the efficiencies of both thermal and production processes. Secondly, the quality control of the production should be more stringent so as to minimize contaminations in the products and the losses of the useful elements. Thirdly, a longer service life of the FKNME can be achieved by reducing the consumption of the refractory and other construction materials. The fourth and the fifth issues are respectively the reduction of the energy consumption and the pollution emissions. The last two issues are highly correlated.

内容概要

Simulation and Optimization of Furnaces and Kilns for Nonferrous Metallurgical Engineering is based on advanced theories and research methods for fluid flow, mass and heat transfer, and fuel combustion. It introduces a hologram simulation and optimization methods for fluid field, temperature field, concentration field, and electro-magnetic field in various kinds of furnaces and kilns. Practical examples and a detailed introduction to methods for simulation and optimization of complex systems are included as well. These new methods have brought significant economic benefits to the industries involved.　The book is intended for researchers and technical experts in metallurgical engineering, materials engineering, power and thermal energy engineering, chemical engineering, and mechanical engineering.

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书籍目录

章节摘录

插图：AI means the abilities of some machines to execute some complex functions concerned on human intelligencesuch as judgment and decision-making, image identifying, learning and understanding etc. AI, which based on a symbol system and information processing, is an important branch of computer science. The main research fields include: natural language processing, logic deduction and automated theorem proving, intelligent data retrieval system, robot and its visual system, automated programming, expert system and so on.In 1965, Chinese American scientist K.S. Fu first proposed applying heuristicrules of AI theory to learning control systems （Fu, 1965）. In 1971, after studying the relationship between intelligence technology and learning control, he put forward the concept of intelligent control （Fu, 1971）, and pointed out that intelligent control is the cross of control theory and AI technology （that is the "binary elements theory" of intelligent control）, which combines AI theory and technology with control theory and technology. In unknown environment, humanintelligence is simulated so that system control can be realized effectively. In 1977, after proposing that intelligent control is the cross of control theory, operation research and AI technology （that is the "three elements theory" of intelligent control）, G.N. Saridis proposed hierarchically intelligent control （Saridis, 1977）, namely, the structure of intelligent control can be divided in tothree hierarchies from top to bottom: organization, coordination and control, the precision of control increases in turn, while intelligence degree decreases in turn. Since then, the research and application of intelligent control attracted more and more attention from many countries. Especially, fuzzy logic control, neural network control and expert control, as three typical intelligent control methods, have absolute superiority to traditional control methods, and can control effectively complex systems with the characteristics of nonlinear, multiple variables, long time delay, strong coupling and so on, therefore, they have been widely applied in engineering. At present, combining the abilities such as parallel learning, remembering and associating of neural network with fuzzy reasoning technology to form a self learning fuzzy controller （Zhang and Li, 1995）, combining expert system theory and technology with fuzzy logic technology to form an expert fuzzy control and decision making system have been become the important trends in the field of intelligent decision making and control （Wang, 1994）.

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