



Editorial

Smart Process Manufacturing Systems: Deep Integration of Artificial Intelligence and Process Manufacturing



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In recent years, smart process manufacturing has attracted increasing attention from both academia and industry around the world. Together with academia and industry, various governments have released their strategic plans for smart manufacturing, which has the key aim of realizing the upgrading and transformation of the process industry by means of knowledge-integrated planning, scheduling, and process optimization based on industrial internet

of things. However, in order to achieve intelligent, autonomous, and regulated control in process manufacturing systems, the industry must confront many problems—including multi-scale coupling, human–cyber–physical interaction, and multi-objective optimization with strong constraints—from the varying perspectives of intelligent perception, autonomous control, and smart decision-making.

On the other hand, the potential autonomous learning, knowledge extraction, and cognitive comprehension abilities of artificial intelligence have been demonstrated in various applications such as autonomous vehicles, image processing, online assistants, smart recommendation, and finance analysis, attracting increasing attention from governments, enterprises, and academic communities. Due to breakthroughs in these areas, it is both vital and urgent to investigate the characterization and cognition of behavior characteristics in the material transformation process, multi-objective

autonomous cooperative control of manufacturing processes, and cross-layered human–cyber–physical integrated intelligent decision-making in manufacturing systems. We expect to solve bottleneck problems in operating management, production operation, efficiency and security, and information integration, in order to achieve efficient, green, and smart process manufacturing along with high-quality development of the industry.

With strong support from the Chinese Academy of Engineering, it has been our great honor to invite academicians and renowned researchers from countries including Belgium, China, Germany, the United Kingdom, and the United States to report on new ideas, new theories, and new technologies related to the deep integration of artificial intelligence and process manufacturing. The topics in this issue include data analytics and machine learning for smart process manufacturing, the review of big data-driven materials design, data and knowledge-driven smart decision-making, multi-objective experimental design framework for online model identification, opportunities and challenges for artificial intelligence in green manufacturing, and smart process manufacturing for formulated products.

Finally, we express our sincere thanks to the authors, editorial office, and guest editors. Our goal for this permanent special issue is to report on recent progress related to the deep integration of artificial intelligence and process manufacturing to our readers. Furthermore, we hope that this special issue will help scholars at universities, research institutions, and enterprises to further understand the key concept of the deep integration of artificial intelligence and process manufacturing, in order to promote the smart process industry.