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PREFACE

Preface for the Special Issue of Green Smart Manufacturing

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In the last few decades, significant efforts have been directed towards the Green and Smart Manufacturing. Societies have urged manufacturing industries to take greater responsibilities in lowering environmental burdens. Thus, Green Manufacturing researchers have investigated the solution to reduce energy consumption, improve manufacturing efficiency, and decrease environmental wastes in processes, machines, and factories. Sometimes the overall process chain is analyzed at a higher level, and interactions between process chains are controlled as well as the optimization of a single manufacturing process. One of the key abilities for Green Manufacturing is to assess and predict the environmental influences of individual components or processes composing the manufacturing system.

At the same time, Smart Manufacturing has been spotlighted to optimize manufacturing systems with enhanced flexibility. Smart Manufacturing, broadly speaking together with the 4th Industrial Revolution, refers to fully integrated, collaborative manufacturing systems mainly for real-time response to rapidly changing markets. By connecting manufacturing processes, machines, factories, and people, Smart Manufacturing shows great potentials in improving overall manufacturing performance and enhancing the flexibility of the system. Furthermore, it is highly relevant to Green Manufacturing, as it can manage the environmental damage not only during the manufacturing process but also over the whole product lifecycle. The data obtained from the process and the decision-making system are widely utilized for sustainability by minimizing energy consumption/wastes and improving the efficiency of manufacturing activities.

However, unlike the Industrial Revolution in the past, Smart Manufacturing is enabled by the implementation and integration of various technologies. To collect and utilize the data in manufacturing, huge numbers of sensors are usually embedded with network communication systems. Collaborative robots are commonly adopted in automated processes. For real-time response, processing and analysis of big data are essential, and artificial intelligence (AI) is actively investigated in many leading companies. Based on processed data, cyber physical system (CPS) reflects the physical world to manage the current manufacturing system, and further to forecast the manufacturing performances in the dynamic market. For effective and efficient Smart Manufacturing, it is necessary to encourage synergy between these technologies through the appropriate utilization.

Recently, Green Smart Manufacturing is strongly driven by governments, and there has been a significant increase both in research activities and industrial applications. Policies such as German Industry 4.0, Remaking America and Made in China 2025 provide supporting evidence that many manufacturing countries have a strong willingness toward Green Smart Manufacturing. However, though a lot of research and case studies, it is still not straightforward to plan and design Green Smart Manufacturing in a single specific form. Configurations and characteristics of Green Smart Manufacturing may vary referring to different industries, and performances of the manufacturing system need to be carefully assessed concerning overall efforts and time for installing and operating the system.

Thus, it is required to overview novel technologies and practical case studies to circulate and further develop research ideas. This special issue will provide a timely appropriate snapshot of the latest research and case studies

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on Green Smart Manufacturing. Specifically, the following topics will be covered:

- Artificial intelligence (AI) and big data analysis in green manufacturing
- Digital twin, cyber physical system (CPS), mixed reality (MR) applications
- Appropriate sensors, monitoring systems, and prognostics and health management (PHM)
- Network communication systems, network security and 5G applications
- Green applications of additive manufacturing, collaborative robotics and soft robotics
- Case studies of smart factory for energy saving or reduction in environmental impact

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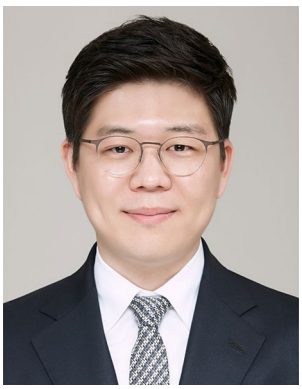

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