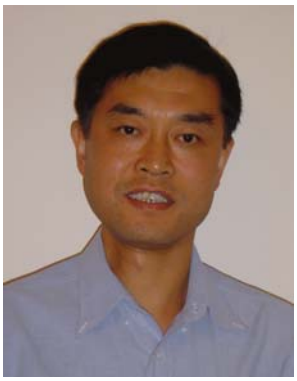

# Preface

All components and mechanical parts have surfaces that are either exposed to a particular environment or are in contact to other components. Corrosion, wear or the combined effects of these destructive failures normally occur on surfaces. "Bad" surface is also a favourite place for crack initiation, which results in the decrease of fatigue, tensile properties, and even toughness of materials. Although development of new materials can improve the surface properties, this may lead to the change of the properties of the substrate as well. For example, increasing carbon content significantly improves the wear resistance of steels, but toughness has to be sacrificed. Furthermore, increased cost is another major concern. In addition, for some components, such as gears, ductile substrate and hard surface are required. In this case surface treatment remains as the unique choice. Hence, surface modification, also termed as surface treatment, has been recognised as a major emergent manufacturing technology for improving the surface properties at minimum alteration of the substrate.

Surface treatment has hundreds years history, such as the most classic practice – painting. It is only in the recent years that surface engineering has been regarded as an individual discipline of applied science due to the considerable development of new surface treatment technologies and its wider applications. These technologies can be divided into four categories: (1) surface hardening, such as the conventional surface quenching of steels and the most recent surface nanocrystallization technology; (2) surface alloying, such as diffusion coating, high energy beam technologies and implantation techniques; (3) surface coating, including PVD, CVD, sputtering, sol-gel coating, hot-dipping, anodizing, electroplating, cladding, thermal

spray, cold spray, kinetic metallization, painting, and etc; (4) hybrid processes. Although individual technologies have advantages to solve one or more particular practical problems, they also associated with limitations. Hence selection of appropriate surface treatment methods for a particular problem is technologically and economically important in both scientific research and industrial applications.

The purpose of this special volume in surface engineering is to provide an overall view of the most popular modern surface treatment technologies for structural materials, therefore to enable material scientists and engineers to select suitable techniques for their research and manufacturing. It contains reports of cutting edge research results and reviews on the recent development of a particular technique. The topics cover thin film coating, laser surface technologies, surface nanotechnologies, anodizing, electroplating, electroless plating, thermal spray and cold spray.

The guest editors would like to thanks to all the authors for their significant contributions to this special volume.

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