



Materials Performance & Characterization

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Editorial Objectives

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The journal publishes high-quality, original articles, including full papers, review papers, and technical notes, on both theoretical and practical aspects of the processing, structure, properties, and performance of materials used in mechanical, transportation, aerospace, energy systems, and medical devices. These materials include metals and alloys, glass and ceramics, polymers, composite materials, textiles, and nanomaterials. The journal covers topics related to the integrity of materials which encompasses mechanical testing, fatigue and fracture, corrosion, wear, and erosion, as well as the integrity of components and systems such as rolling element bearings, piping and pressure vessels, fasteners, space technology, and nanotechnology. The journal publishes articles on both qualitative and quantitative methods used to characterize materials including all forms of microscopy, chemical analysis, and nondestructive evaluation.

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Overview

Special Issue on Duplex and Multiplex Coatings

Dynamic development of surface engineering in the last few years has been driven by increasing demands from the industry regarding service life and reliability of tooling, as well as components that sometimes work in adverse conditions. Meeting these demands is possible through a design of the microstructure of the surface layer of structural materials by way of application of appropriate methods of surface engineering that are aimed at the formation of new types of coatings, including duplex and multiplex types.

The expectations of the industry with respect to new types of coatings are focused on their better strength and tribological properties (e.g., higher heat resistance, greater mechanical strength, and enhanced resistance to frictional wear at elevated temperatures). They are also focused on demand for strictly defined functionality in the given application by way of combining, for example, good tribological and mechanical properties with good corrosion resistance or heat resistance.

The papers in this special issue are dedicated to duplex and multiplex coatings formed on the surface of structural materials in order to enhance their service life.

A pioneer of the duplex and multiplex technologies in surface engineering was Professor Tom Bell (1941–2008), a world-renowned specialist in the field of heat treatment and surface treatment technology, co-founder of the International Federation for Heat Treatment and Surface Engineering, as well as founder of the journal, *International Heat Treatment and Surface Engineering*, promoting the processes of transfer of innovative technologies to the industry. Tom Bell was the first to recognize the possibilities of surface engineering, applicable to the extension of service life and reliability of tooling and machine components. He brought about an order into both terminology and knowledge in this field and drew attention to the effect of process synergy that stems from mutual influence of the particular surface engineering methods utilized in the same technological process.

Currently, the far-reaching direction of investigations in surface engineering is the combination of thermo-chemical treatment with electrolytical treatment or PVD in order to obtain surface layers of the duplex or multiplex type; the service properties of which, attained thanks to the synergy effect of both (or more) processes, are unachievable when single processes are used.

This special issue contains eleven papers dealing with duplex and multiplex type layers through processes of nitriding, nitrocarburizing, boriding, chromizing, and diffusion titanizing, combined with other technologies, for example, electrolytical treatment or PVD. Duplex type layers developed for biomedical applications merit special attention.

Producing this special issue required significant efforts from authors, reviewers, editors, and the entire publication team. These efforts are gratefully acknowledged. The guest editors of this issue would especially like to thank Dr. Richard Neu and Dr. George Totten for their guidance and support in compiling this issue.

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IN APPRECIATION

The high quality of the papers that appear in this publication is a tribute not only to the obvious efforts of the authors represented but to the unheralded, though essential, efforts of their reviewers. It is to the reviewers dedication to upholding the high standards of their profession that this note pays tribute. On behalf of ASTM International and the authors as well, we acknowledge with appreciation their important contribution to the success of this journal.



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