ADVANCED THERMALLY ASSISTED SURFACE ENGINEERING PROCESSES

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by

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DEDICATION

To my father

Jatindra Mohan Chatterjee

Guiding spirit in the pursuit of intellectual excellence

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PREFACE

Surfaces are the bounding faces of solids. The interaction of component surface with the working environment results in wear & corrosion. Estimated loss due to wear & corrosion in USA is around \$500 billion. Engineered surfaces are the key to the reduction of losses due to wear and corrosion. In the USA, around 9524 establishments (including automotive, aircraft, power and construction industries) depend on engineered surfaces with support from 23,466 industries. Around 65 top academic institutions world-wide are engaged in surface engineering research and teaching.

There has been a paradigm shift in surface engineering from age-old electroplating to processes such as vapor phase deposition, diffusion, thermal spray & welding using advanced heat sources like plasma, laser, ion, electron, microwave, solar beams, pulsed arc, pulsed combustion, spark, friction and induction. Metal, ceramic, polymer and composite surfaces are modified by application of heat or thermally assisted coatings with dissimilar materials. In addition to conventional materials it is possible to develop newer coating materials by processes such as RSP (metallic glasses), plasma polymerization (polymers and copolymers) and thermal spray (graded deposits). The application range includes critical components from almost all major industries, such as automotive, power, steel, aerospace, nuclear, cement, petrochemical, chemical, construction, tools & dies and biomedical equipments. Quality control of the engineered surface assures improved and consistent performance. A wear prognostic approach has been found useful to assess, monitor and improve the life of components in aging equipments and machineries. An attempt has been made to cover all these and few more topics in this book.

There are surface engineering books on specific processes such as thermal spraying and vapor phase deposition or about specific heat sources such as plasma or laser. However, there are few, if any, covering the whole range of advanced surface engineering processes. The manufacturing (OEM) and maintenance (M&R) of modern equipments and machineries, such as jet engines, require a number of advanced surface engineering processes for reliable, consistent and improved performance in the most hostile environment. It is imperative that those who are engaged in these and other related areas should be conversant with the newer competitive surface engineering processes. The present book has been structured to provide assistance & guidance to the engineers, researchers and students in choosing the right process from the galaxy of newer surface engineering techniques using advanced heat sources.

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