

Preface

Machining is a widely used process for producing intricate shapes on components and artifacts and for providing precise tolerances that are required for the manufacture of parts at the micro- and nanoscale. Modern machining requires the use of minimum quantities of lubricants, dry machining capability, high cutting speeds, and long tool lives. However, existing tool materials have proven to be substandard compared to newly developed nanostructured thin film coated cutting tools. There is also a growing need for specially developed cutting tools for machining high strength and hardness nanocrystalline metals and alloys.

In January 2000, President William J. Clinton talked about the exciting promise of nanotechnology and later announced an ambitious national nanotechnology initiative (NNI) that was enacted in 2001, and reauthorized by President George W. Bush in 2006, with an initial budget of \$497 million to promote nanoscale research that would benefit society. The initiative has created a new industry focused on providing nanostructured coatings and materials. The purpose of this book is to present information and knowledge on the rapidly developing field of machining with nanomaterials. The book is written in the spirit of scientific endeavor outlined by Richard Feynman, who stated in 1960 that one of the greatest challenges to scientists in the field of miniaturization is the manufacture of objects using techniques such as turning and milling. The second edition of this book presents information on machining fundamentals, machining stability and chatter, developments in tool coatings, machining common engineering materials with coated tools, dry machining, creating nanostructured metals using coated cutting tools, multi-optimization of cutting conditions using coated tools, machining with recoated cutting tools, modeling and machining biomaterials, and machining with nanostructured abrasive diamond.

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