Foreword

Nanotechnology, or more correctly, the application of nanoscale science and engineering to material science, has been the focus of a major global R&D investment over the past 20 years. In the United Sates alone, the public investment has been over $ 23 Billion since 2000, with an equal investment in the private sector. To help organize its efforts in this vital area, the U.S. created the National Nanotechnology Initiative (NNI) in 2000 to help coordinate the activities of 20 federal agencies engaged in one or more aspects of the national strategy to promote the technology. Developing the scientific knowledge needed to address questions and concerns about the possible environmental, health, and safety impact of this new technology was recognized as a critical need early in the program. The fact that developing the science needed to support safe and responsible development of nanotechnology was listed in the first US Nanotechnology Strategic plan was very exciting to the practitioners, especially the occupational health and safety community. Delivering on the expectations set with that first plan have been a challenge, but good progress is being made.

As a PhD chemist, an occupational health professional, and a Board Certified Industrial Hygienist, I am excited about the diversity and promise of the output of nanotechnology, yet I am aware of the difficult science needed to answer key questions about the possible implications on human health and the environment. Many of the traditional precepts of safety and health have to be reexamined, if not redesigned to examine the potential impact on human health that this new and promising form of material science represents. If we do not meet the challenge of understanding the possible hazards, evaluating and quantifying any potential risk and, most importantly, developing solutions to manage any risk and support responsible development of this amazing technology, it is possible that, ultimately, we may not realize the many great benefits to society that are currently being explored.

I have had the privilege of managing the Nanotechnology Research Center at the National Institute for Occupational Safety and Health, NIOSH, for the past 10 years. My duties at NIOSH, coupled with the 16 years I spent in the private sector, have given me a unique opportunity to interact with some of the best scientists in every aspect of the current challenge. I am honored to work with some of the best minds in occupational safety and health and to interact with the thought leaders in nanoscale science and engineering as I promote a message of practical yet effective methods to evaluate and manage potential risks of nanotechnology. The health and safety and scientific communities have been very receptive to taking a precautionary approach with the technology and materials while it is still evolving, recognizing that high-quality science is being conducted in a concurrent fashion to develop very detailed answers to key health and safety questions. One of most encouraging things I have seen throughout this challenge is that we have a highly significant number of interested and invested parties engaged in asking and addressing the health, safety, and environment questions out in advance of the technology. The old paradigm is reacting to incidents or disasters, and then formulating solutions

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after-the-fact. The former may well be one of the first broad-based proactive approach being taken to address key issues of a technology as it is being developed. This strategy would not be possible without the active participation, collaboration, and support of scientists engaged in the actual development of the technology. This is why I am so pleased to see the development of Nano-Safety: What we need to know to protect workers. Dr. Dominick Fazarro and colleagues has done a wonderful job of gathering up experts from a variety of technical areas to contribute their expert knowledge to this work. This reference takes a very pragmatic view of what is needed to educate students, researchers, faculty, and safety practitioners on the basic knowledge needed to approach this very complex issue.

I am very happy to see the variety of topics this book develops, including areas usually not seen in "traditional" safety reference, such as Ethics, Communication, Behavior, Reliability of Information, and evaluating competence of workers and safety professionals. I believe the reader will find this book to be a valuable addition to their resource library and, most importantly, a valuable tool for developing an effective strategy to keep students, researchers, faculty, engineers, line operators, and all other workers involved in the responsible development of nanotechnology health and safety.

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This Forward from the original publication is still pertinent. If anything, the guidance provided in this volume is more important than ever.

Walt Trybula, Editor