Nanotechnology overview: Opportunities and challenges

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Interpretive Summary: Currently nanotechnology represents a huge R&D investment worldwide. The global funding of nanotechnologies is estimated to be about $7 billion in 2011 and increases at about 20% per year since then. A symposium was held in the American Chemical Society (ACS) national meeting in Denver in 2015 to share the latest information on nanotechnology, including research, product development, manufacturing, and commercialization. Leading researchers (in academia, industry and government labs) and representatives of major funding and regulatory agencies were invited to provide their perspectives and updates. These speakers were then invited to submit chapters to an ACS book on “Nanotechnology: Delivering the Promise.” Additional authors were recruited to strengthen the coverage of specific technical areas. Their chapters showed impressive progress in all aspects of nanotechnology with a huge (and growing) number of publications and numerous products in the marketplace. However, there were also some cautionary voices on the health, safety and environmental issues. The present article serves as an overview of the book and provides a summary of all the chapters.

Technical Abstract: Nanotechnology can be defined as the science of manipulating matter at the nanometer scale in order to discover new properties and possibly produce new products. For the past 30 years, a considerable amount of scientific interest and R&D funding devoted to nanotechnology has led to rapid developments in all areas of science and engineering, including chemistry, materials, energy, medicine, biotechnology, agriculture, food, electronic devices, and consumer products. In the U.S. alone, the federal government has spent $20 billion in nanotechnology research in the past 13 years. Already some products have appeared in the marketplace and more will certainly come in the future. A possible concern is the health, safety, and environmental impact of some of these products. Many of the opportunities and challenges of nanotechnology are described in the following chapters. This article serves as an overview and aims to summarize the key information reported in those chapters.
Nanotechnology, demonstrably is one of the most exciting technology developed in the past 50 years. This atomic scale and cutting-edge field that is expected to touch all the existing technologies and impact the way things will be done, designed and manufactured in the future. Nanotech: Key challenges. While nanotech holds lot of promise, there are some challenges this industry face. They include: The theory to application development cycle is very costly and requires very precise tools.