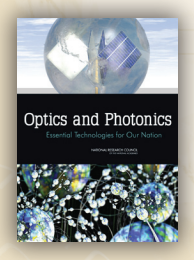
NATIONAL MATERIALS AND MANUFACTURING BOARD (NMMB)

In recognition of the increasing importance of materials science to innovations in engineering and manufacturing, the NMMB combines the charges of two preexisting boards: the National Materials Advisory Board and the Board on Manufacturing and Engineering Design. The NMMB builds on the achievements of its parent boards by providing objective, independent assessments of the current state of materials and manufacturing research—including at the atomic, molecular, and nano-scales—and the applications of new and existing materials in innovative ways, including pilot-scale and large-scale manufacturing, the design of new devices, and disposal.

Selected Recent Reports

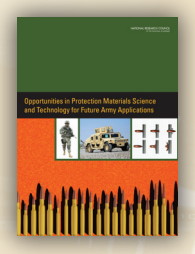


Optics and Photonics: Essential Technologies for our Nation (2012)

Optics and photonics technologies are ubiquitous: They are responsible for the displays on smart phones and computing devices, optical fiber that carries the information in the internet, advanced precision manufacturing, enhanced defense capabilities, and a plethora of medical diagnostics tools. The opportunities arising from optics and photonics offer the potential for even greater societal impact in the next few decades, including solar power generation and new efficient lighting that could transform the nation's energy landscape and new optical capabilities that will be essential to support the continued exponential growth of the Internet. As described in the report, it is critical for the United States to take advantage of these emerging optical technologies for creating new industries and generating job growth.

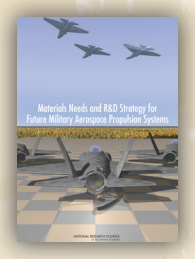
Application of Lightweighting Technology to Military Vehicles, Vessels, and Aircraft (2011)

This report assesses the current state of, and recommendations for, lightweighting design and development in land, sea, and air vehicles—primarily those developed or used by the military. In addition to reducing the weight of materials, the report outlines other, more systematic considerations, including innovative architectural design; lighter, more durable materials development; and research on preventing manufacturing defects and improving the multifunctionality of parts and devices. That is, a more comprehensive design and acquisition process could increase attributes such as the maneuverability, durability, range, payload capacity, performance, fuel consumption, and survivability while reducing excess weight.



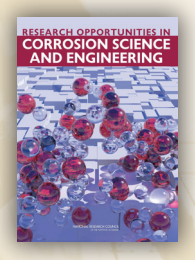
Opportunities in Protection Materials Science and Technology for Future Army Applications (2011)

Armor plays a significant role in the protection of warriors. Over the course of history, the introduction of new materials and improvements in the materials already used to construct armor have led to better protection and a reduction in the weight of the armor. But even with such advances in materials, the weight of the armor required to manage threats of ever-increasing destructive capability presents a huge challenge. This report explores the current theoretical and experimental understanding of the key issues surrounding protection materials, identifies the major challenges and technical gaps for developing the future generation of lightweight protection materials, and recommends a path forward for their development.

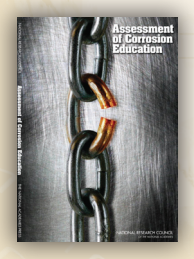


Materials Needs and Research and Development Strategy for Future Military Aerospace Propulsion Systems (2011)

Many of the significant advances in aircraft and rocket propulsion have been enabled by improved materials and materials manufacturing processes. To improve efficiency further, engine weight must be reduced while preserving thrust. This report examines whether current and planned U.S. efforts are sufficient to meet U.S. military needs while keeping the United States on the leading edge of propulsion technology. This report considers mechanisms for the timely insertion of materials in propulsion systems and how these mechanisms might be improved and describes research and development strategies to develop materials for future military aerospace propulsion systems.



Research Opportunities in Corrosion Science and Engineering (2011)
The field of corrosion science and engineering is on the threshold of important advances. Advances in lifetime prediction and technological solutions, as enabled by the convergence of experimental and computational length and timescales and powerful new modeling techniques, are allowing the development of rigorous, mechanistically based models from observations and physical laws. This report identifies grand challenges for the corrosion research community, highlights research opportunities in corrosion science and engineering, and posits a national strategy for corrosion research. It is a logical and necessary complement to the recently published report, *Assessment of Corrosion Education*, which emphasized that technical education must be supported by academic, industrial, and government research.



Assessment of Corrosion Education (2009)
The threat from the degradation of materials in the engineered products that drive our economy, keep our citizenry healthy, and keep us safe has been well documented over the years. Yet little effort appears to have been made to apply the nation's engineering community to developing a better understanding of corrosion and the mitigation of its effects. At this time, corrosion engineering is not a required course in many materials engineering curricula, and most bachelor-level graduates have an inadequate background in corrosion engineering principles and practices. To combat this problem, the book makes a number of short- and long-term recommendations to industry and government agencies, educational institutions, and communities to increase education and awareness and give the incoming workforce the knowledge they need.

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