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Globalization of Materials R&D: Time for a National Strategy—*Summary*

NATIONAL MATERIALS ADVISORY BOARD

Background

Materials Science and Engineering (MSE) R&D is spreading globally at an accelerating rate, in line with broader globalization trends. As a result, the relative U.S. position in a number of MSE subfields is in a state of flux. To understand better this trend and its implications for the U.S. economy and national security, the Department of Defense (DOD) asked the NRC to assess the status and impacts of the global spread of MSE R&D. This report presents a discussion of drivers affecting U.S. companies' decisions about location of MSE R&D, an analysis of impacts on the U.S. economy and national security, and recommendations to ensure continued U.S. access to critical MSE R&D.

Findings

U.S. MSE R&D is an international activity with a diverse set of partners. The global spread of MSE R&D is narrowing U.S. technological leadership. Nevertheless, the impact of this trend on the U.S. economy has been limited so far, and future impacts are likely to differ across materials subfields. The United States can gain from MSE R&D globalization if it fosters increased productivity, efficiency, and a capacity for innovation.

The results of MSE R&D continue to enhance U.S. national security and homeland defense. The global proliferation of this R&D, however, means that the lead in critical technologies now enjoyed by U.S. defense and intelligence efforts will be seriously eroded without mitigating action.

It is the task of public policy to minimize the risks and maximize the benefits of MSE R&D globalization by facilitating continued access to the products of that R&D. A positive impact can be achieved if both the U.S. government and private sector effectively integrate foreign or joint R&D into domestic R&D programs. A critical element of this effort is the ability of the United States to attract top researchers to both support this exploitation and help continue a strong domestic R&D effort. Maintaining access to as well as generating cutting-edge science and technology is essential if the nation is to sustain economic leadership and a strong national defense capability.

Recommendations

Maintaining access to MSE R&D will require active management. The federal government should create a well-defined and coordinated national strategy to manage the

development of and access to strategic MSE knowledge and technology in a global framework. The strategy should facilitate a coordinated approach across defense and intelligence agencies to addressing critical MSE questions; define priorities and develop an MSE R&D roadmap; include a comprehensive range of stakeholders and decision makers; and solicit independent advice from academia, industry, and other experts.

Development of a national strategy will also require a better understanding of current trends in MSE R&D. Better data and new analytical tools will be required. DOD should also strengthen its existing technology forecasting and monitoring activities and expand its efforts to identify critical technology worldwide in order to monitor, assess, and promote access to global developments in MSE R&D. In addition, an expedited benchmarking study should be conducted to assess the relative global position of the United States in MSE R&D.

A thorough understanding of what knowledge is needed for national security purposes is also essential. Current DOD systems for establishing the materials needs for the 21st century warrior and other essential priorities should be strengthened. This effort will benefit from the highest level of coordination and cooperation within DOD and between the relevant federal agencies; ongoing assessment of existing critical technology lists; and definition of longer-term goals for MSE R&D.

It is important that U.S. regulatory regimes do not unreasonably impede the participation of U.S. researchers in international R&D activities or of foreign researcher's in domestic research. It is in the long-term interest of the United States to participate in international partnerships in MSE R&D**.** It is also necessary to ask whether there are technologies to which the nation must secure access but does not need to control, and what the effects would be on the nation's export control regime. Access to cutting-edge knowledge can be achieved more effectively if the United States becomes the most active player in global MSE R&D. A systematic review of the rationale for and impacts of U.S. government regulation of the transfer of knowledge and innovation across borders within the framework of global MSE R&D should be carried out.

Finally, the U.S. educational system, including K-12 math and science education, will have to evolve and adapt in order to produce MSE professionals to meet national needs. In addition, maintaining U.S. expertise and leadership in MSE R&D will require a robust national research infrastructure.

The challenge presented by the globalization of MSE R&D is, multidimensional, significant, and intrinsically interconnected across many federal agencies. A national strategy to ensure U.S. leadership in and access to advances in global MSE R&D should be established and implemented as a national priority.

For Further Information

Copies of *Globalization of Materials R&D: Time for a National Strategy* can be obtained from the National Academy Press, 2101 Constitution Avenue, N.W., Washington, DC 20418, 201-334-3313, <http://books.nap.edu/>.

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