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September 30, 2014

Cyrus Wadia
Assistant Director
Clean Energy and Materials R&D
Office of Science and Technology Policy
Eisenhower Executive Office Building
1650 Pennsylvania Ave NW
Washington, D.C. 20504

Dear Dr. Wadia:

Thank you for the opportunity to submit written comments on critical and strategic materials supply chains and their importance to American competitiveness, prosperity and national security. The American Physical Society (APS) and Materials Research Society (MRS) commend the Office of Science and Technology Policy and the National Science and Technology Council for devoting their time and efforts to this important issue.

In 2011, APS and MRS authored a joint report titled "Energy Critical Elements: Securing Materials for Emerging Technologies," which surveyed the current landscape of energy critical elements (ECEs) and identified three areas – information, research and development (R&D), and recycling – where specific actions by the U.S. government would help ensure ECE availability. This response from APS and MRS will focus on the report's recommendations in these three areas and the need for further investments in critical minerals programs. As we conduct research in support of innovative technologies, it is important to address our ability to obtain the materials utilized in those technologies to meet eventual demand of a commercialized product.

APS and MRS note the importance of having comprehensive, reliable and up-to-date information on critical minerals across the entire supply chain. Accurate information on all aspects of the life cycle of critical minerals is necessary for the U.S. government and private industry to make informed decisions.

Access to accurate information regarding the locations and amounts of developable critical minerals, global demand for these minerals, and a forecasting ability to help project changes in supply and demand are necessary to develop and maintain reliable mineral supply chains. Currently, the U.S. Geological Survey's (USGS) Mineral Resources Program (MRP) is the sole federal source of unbiased science and information on non-fuel mineral potential, production, and consumption, as well as how

mineral resources interact with the environment. The information provided by MRP is used globally to determine the accessibility of various stores of minerals.

Despite its status, MRP has seen federal support for its activities decline in real terms by 30 percent during the last decade. Diminishing budgets make keeping up-to-date information on critical minerals challenging and developing a forecasting program within USGS an impossibility. Insufficient data on critical minerals leaves the nation subject to otherwise avoidable supply disruptions and exposes industries and academic researchers dependent on critical minerals to unnecessary risk. Strengthening our investment in minerals information programs at USGS and providing sufficient funding to establish a national minerals forecasting capability are necessary to enable leaders in government and industry to make informed decisions.

In addition to increased support for minerals information programs, a federal R&D program focused on specific areas throughout the critical minerals supply chain would enable the U.S. to both expand the availability and reduce its dependence on critical minerals, ECEs in particular. Because critical minerals tend to exist in very low percentages and have not been the primary target of domestic mineral exploration in the past, there is limited knowledge of what geological characteristics indicate the likelihood of critical minerals deposits. Investments in basic research at universities and the USGS on geological models of critical minerals deposits, ore-forming systems, and the basic geochemistry of critical minerals are needed.

Another R&D area important to increasing critical minerals availability is diversifying supply, one of the four research thrusts at the Critical Materials Institute (CMI). Continued investment in research aimed at transformational processes – for example, developing new methods of recovery of critical minerals as by-products of primary metals – can increase processing efficiency, eliminate bottlenecks in supply chains and reduce costs.

R&D can also help reduce our dependence on critical minerals. For example, substitutional chemistry – which looks to replace critical minerals with more abundant elements with higher projected availability – is another research focus at CMI and is essential for reducing our dependence on critical minerals. Because critical minerals have particular properties or combinations of properties that make them uniquely suitable for their applications, simple one-for-one substitutions with other materials often cannot be made. Instead, several materials may be needed to substitute for a critical mineral. These complications can cause the development of substitute materials to take years to achieve commercial readiness. Therefore, sustained federal support for research focused on developing substitute materials is necessary to transition from technologies currently dependent on critical minerals to new alternatives.

Recycling is another area that could enable a reduction of dependence on critical minerals. Recycling critical minerals across the entire supply chain can generate a new supply stream that can reduce our dependence on imports and increase availability while also reducing the expenditure of energy used in extraction, separation and purification. Many products that utilize critical minerals have very limited recycling capability and, as a result, significant quantities of critical minerals are permanently discarded. Developing programs in partnership with industry aimed at designing products better suited to recycling, while also developing environmentally benign methods to extract critical minerals from end-of-life products, would help encourage the growth of a critical minerals recycling market. Additionally, implementing programs to improve rates of post-consumer collection of industrial and consumer products containing critical minerals can bolster critical mineral supply streams.

APS and MRS urge the Critical and Strategic Minerals Supply Chain Subcommittee to not only support the current federal programs dedicated to minerals resources information but advocate for strengthening their R&D efforts. Access to a consistent supply chain of critical minerals is essential to America's

economy, and investing in programs to research and monitor global resources is the foundation of a sound critical and strategic minerals policy.

Sincerely,

Malcolm R. Beasley
President of the American Physical Society

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President of the Materials Research Society