



Critical Materials Institute
AN ENERGY INNOVATION HUB

FACTSHEET



What is the Energy Innovation Hub for Critical Materials?

Created by the U.S. Department of Energy, the Energy Innovation Hub is operated under the name the Critical Materials Institute. CMI is led by the DOE's Ames Laboratory, and managed by DOE's Advanced Manufacturing Office. It brings together the expertise of DOE national laboratories, universities, and industry partners to eliminate materials criticality as an impediment to the commercialization of clean energy technologies.

What are "critical" and "near critical" materials?

Certain substances provide essential capabilities, such as light emission or magnetism, and when the supply of one of these substances is at risk, it becomes a "critical" material. During its first five years, CMI focused on seven elements that DOE had identified as "critical" or "near critical" – neodymium, europium, terbium, dysprosium, yttrium, lithium and tellurium. Beginning in July 2018, CMI expanded the palette to include cobalt, gallium, indium, lithium, manganese, platinum group metals, tellurium, vanadium, and battery-quality graphite.

Why is the Critical Materials Institute important?

Although they are used in relatively small quantities, shortages of critical materials can impact entire industries and prevent the implementation of technologies that could provide cleaner energy or reduce energy demand. CMI is the nation's premier research, development and deployment institute for critical materials, their alloys and oxides. Driven by a "think-tank" philosophy, CMI is a team of multi-disciplinary, world-class researchers and technology developers, dedicated to finding innovative solutions and carving creative, transformational paths to eliminating the criticality of rare-earths and other materials. This is being achieved through the diversification of supplies, development of substitutes, and the improvement of usage efficiency, reuse and recycling.

CMI scientists are working to design separations agents to improve the production efficiency and economic viability of new rare-earth mines, thereby promoting the diversity of supply of critical rare earths. They are also working to improve the utilization of critical materials in manufacturing. They will develop and deliver transformative and environmentally benign technologies that increase the supplies of critical rare earths, enhancing efficient reuse and recycling of feedstocks that will further diversify the global supply chain of critical materials, and designing new chemical extractants that will transform the recovery of lithium from highly concentrated brines. Ultimately, CMI will invent and qualify new materials for use in existing products and help to redesign products to capitalize on these new materials.

Who are CMI Team Members?

Team members typically have research subcontracts with CMI or provide cost-share funds. Requirements include specific research project deliverables within the entity's areas of expertise, based on a scope of work and a negotiated budget. These include hundreds of researchers, mostly at four national laboratories and member universities. Member national laboratories are Ames Laboratory, Idaho National Laboratory, Lawrence Livermore National Laboratory and Oak Ridge National Laboratory. Member universities are Colorado School of Mines, Florida Industrial and Phosphate Research Institute, Iowa State University, Purdue, Rutgers, and U-C Davis. Current industrial Team members are Alger Alternative Energy (AAE), Arnold Magnetic Technologies, Cytac Solvay Group, Eck Industries, Inc., Electron Energy Corporation (EEC), GE, INFINIUM, Marshallton Research Laboratories, OLI Systems, Rio Tinto and United Technologies Research Center.

What are CMI's funding and timeline?

In January 2013, DOE announced the award of up to \$120 million to support CMI for five years; and work commenced in June of the same year. The Hub was eligible for one additional 5-year funding increment, which began July 2018.

Who leads the Critical Materials Institute?

The CMI director is at Ames Laboratory, a national resource in rare earth and other materials science and technology. Its Materials Preparation Center is the preferred source of certified, research-grade, high-purity rare earth samples to researchers around the world. The CMI deputy director is at Colorado School of Mines, which has the nation's leading programs in mineral economics and in mineral processing and extractive metallurgy.

How are projects performed within CMI?

CMI creates technology-level and project-level roadmaps, and works closely with relevant industrial partners across the materials supply chain, from mines to manufactured products, to focus world-leading research tools and talent on some of the most pressing challenges facing today's technology-focused economies. CMI forms interdisciplinary teams to carry out an array of projects with specific timelines and goals. Projects are reviewed at least annually. A list of projects is available online: <https://cmi.ameslab.gov/project-list>

What has CMI achieved so far?

During its first five years, CMI has published more than 230 refereed publications in leading scientific journals, made more than 90 invention disclosures, created two open-source software packages, won two R&D 100 Awards, prepared 50 patent applications and received six U.S. patents. Five licenses for CMI technologies have been executed. With focused teams and unique facilities, CMI has demonstrated that it can significantly accelerate the process of delivering technological solutions to the marketplace.

Where can I learn more?

To learn more about the Critical Materials Institute, go to: <https://cmi.ameslab.gov>

For DOE's Critical Materials Strategy, go to: http://energy.gov/sites/prod/files/DOE_CMS2011_FINAL_Full.pdf

