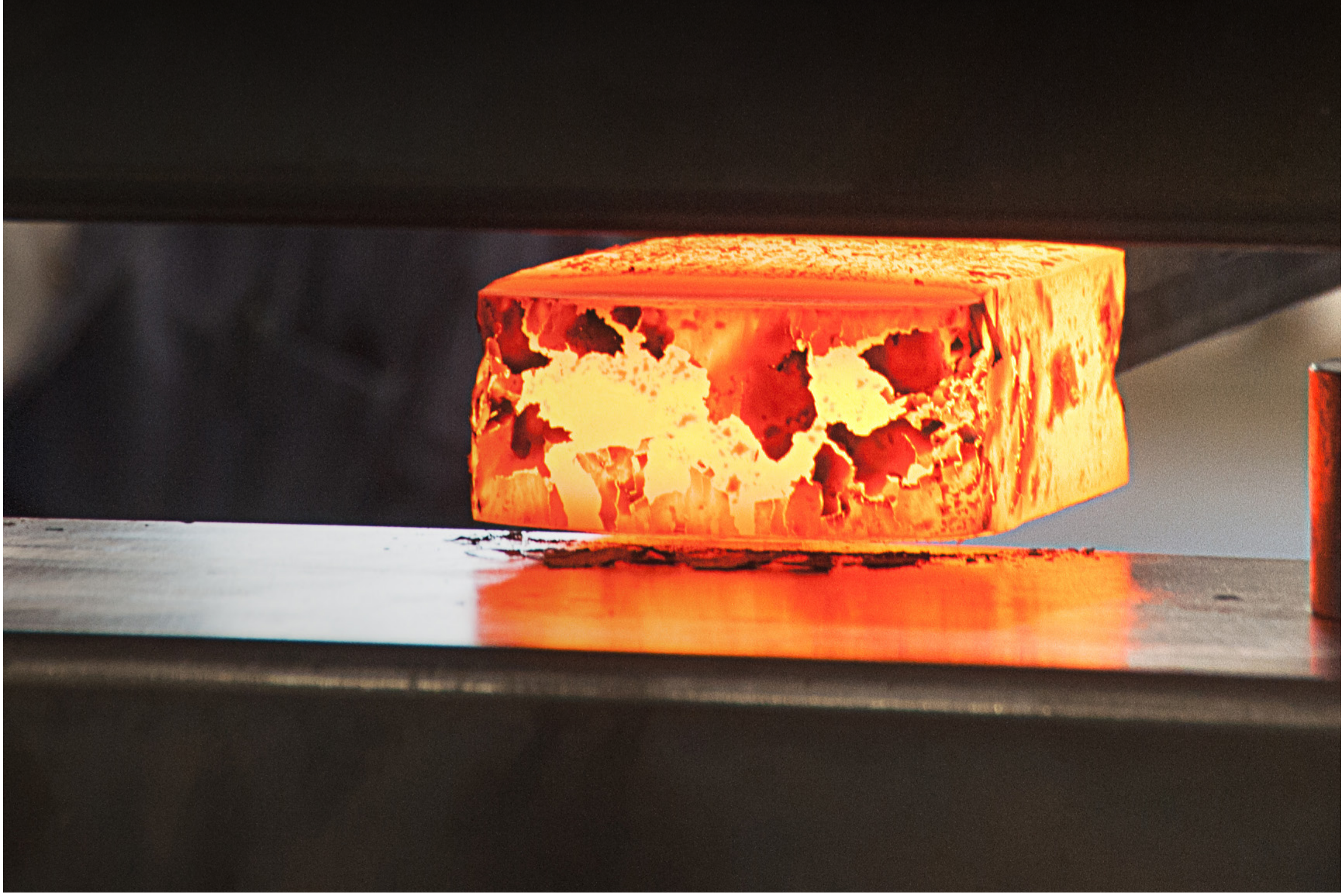
ADVANCED ENERGY MATERIALS



NETL

NATIONAL ENERGY TECHNOLOGY LABORATORY

The Advanced Energy Materials program within the Crosscutting Research Portfolio[1] focuses on material discovery and development that will lower the cost and improve the performance of fossil-based power-generation systems.

Materials of interest are those that enable components and equipment to perform in the high-temperature, high-pressure, corrosive environments of an advanced energy system with specific emphasis on durability, availability and cost both within, and across, each of the following four primary platforms:

- Computational Materials Design
- Advanced Structural Materials
- Functional Materials for Process Performance
- Advanced Manufacturing

[1]For FY 2019, this technology program area is funded by two budget lines under Crosscutting Research – Advanced Ultra-Supercritical Materials and Crosscutting Materials.

ADVANCED ENERGY MATERIALS

COMPUTATIONAL MATERIALS DESIGN — Utilizes computational materials modeling to enable rapid design and simulation of new and novel alloys. Computational methods are also used to provide validated models capable of simulating and predicting long-term performance and failure mechanisms of the newly developed materials.

ADVANCED STRUCTURAL MATERIALS — Provides advanced materials that enable deployment of transformational technologies that are capable of operating in harsh environments. Both improved alloys and coatings are developed that meet the criteria for high-temperature corrosive environments that are key to achieving higher efficiencies and reducing environmental emissions.

FUNCTIONAL MATERIALS FOR PROCESS PERFORMANCE — Develops advanced functional materials that enable the deployment of process technologies. These materials must be capable of operating in the harsh environments associated with these modern technologies including coatings, sorbents and catalysts.

ADVANCED MANUFACTURING — Leading-edge industry methodologies provide processes for fabricating and assembling components. Advanced manufacturing decreases component cost through new designs and malleable material concepts.

- Utilizes multi-scale computational methods to predict alloy behavior in a variety of relevant environments.
- Develops techniques for the virtual and rapid design of materials using advanced manufacturing.
- Facilitates process intensification for lowering cost and reducing material requirements.
- Accelerates the selection and qualification for service of materials.

EXTREME ENVIRONMENT MATERIALS

NETL also leads a national laboratory consortium, Extreme Environment Materials (ExtremEmat), dedicated to changing the paradigm on how materials are conceived and developed. The consortium, using the unique capabilities of several of the Energy Department's National Laboratories, is designing a new generation of computational and experimental validation toolsets aimed at accelerating the discovery, scale-up and manufacture of advanced energy materials capable of long-life and affordable, harsh environment operation.

MATERIALS RESEARCH HAS THE FOLLOWING IMPACT ON ENERGY DEVELOPMENT AND PROCESSES:

- Utilizes multi-scale computational methods to predict alloy behavior in a variety of relevant environments.
- Develops techniques for the virtual and rapid design of materials using advanced manufacturing.
- Facilitates process intensification for lowering cost and reducing material requirements.
- Accelerates the selection and qualification for service of materials.
- Strengthens the nation's supply chain for high-temperature materials.

Contact

Briggs M. White
Technology Manager
Crosscutting Research Program
briggs.white@netl.doe.gov

Robert Schrecengost
Director
Division of Advanced Energy Systems
robert.schrecengost@hq.doe.gov