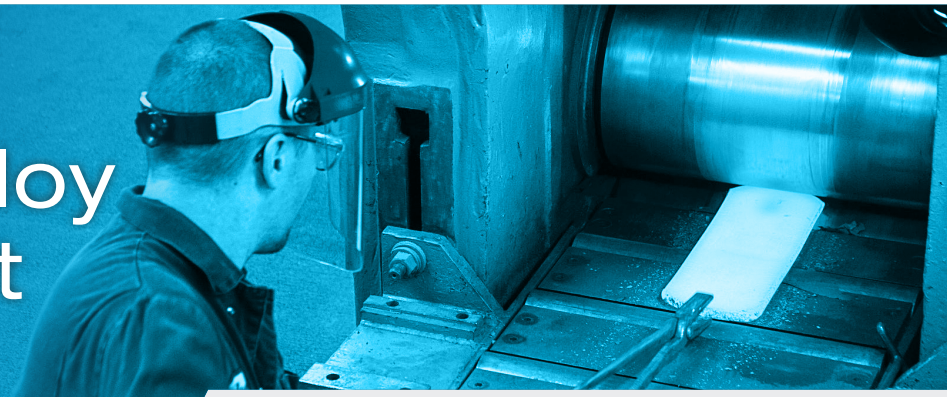
NETL's

Advanced Alloy Development Capabilities



ALLOY FABRICATION CAPABILITIES

Melt Processing Capabilities

- Air Induction Melting: up to 300 lbs.
- Vacuum Induction Melting: 10, 50, and 300 lbs.
- Vacuum Arc Remelting, Electro Slag Remelting: 3- to 8-inch diameter ingots, 50-500 lbs.
- Button Melting: 50-500 grams

Heat Treatment & Fabrication Capabilities

- Heat-treatment furnaces: 1650°C, inert atmospheres and controlled cooling
- Press Forge: 500 Tons
- Hot and Cold Roll mills: 2 and 4 high configurations

David Alman–*Associate Director*
Materials Engineering & Manufacturing Directorate
david.alman@netl.doe.gov

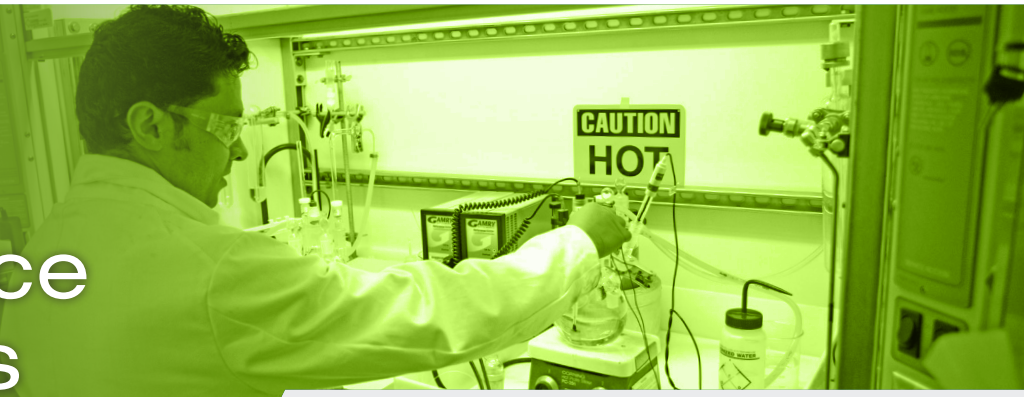
Marisa Arnold-Stuart–*Supervisor, Structural Materials Team*
Materials Engineering & Manufacturing Directorate
marisa.arnold@netl.doe.gov

www.netl.doe.gov

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

NETL's

Materials Performance Capabilities



Laboratory Capabilities to Simulate Real World Environments

Severe Environment Corrosion/Erosion Research Facility (SECERF)

Modular facility that allows researchers to examine the performance of materials under a wide variety of corrosion and hot-corrosion conditions, such as "fire-side" power generation conditions.

- Provides the basic infrastructure for conducting experiments at varying temperatures, in pure or mixed-gas environments, and in pure- or mixed- gas/liquid environments
- Available gases: CO, CO_2, CH_4, H_2, H_2S, SO_2, HCl, O_2, N_2, Ar, He, air, H_2O vapor
- Gas flow rates: 5-4000 mL/min
- A programmable gas delivery system with mass flow controllers, monitors, and interlock system allows for safe 24/7 unattended operations
- Temperature Range: Furnaces – Ambient to 1600°C; Hostile Atmosphere Erosion testing apparatus – Ambient to 900°C

David Alman–*Associate Director*
Materials Engineering & Manufacturing Directorate
david.alman@netl.doe.gov

Marisa Arnold-Stuart–*Supervisor, Structural Materials Team*
Materials Engineering & Manufacturing Directorate
marisa.arnold@netl.doe.gov

Corrosion & Oxidation Laboratories

Capabilities include systems for steam exposures, supercritical CO_2 exposures, and high pressure/high temperature immersion tests involving saturated CO_2 or mixed gas involving Air, Ar, N_2, CO_2, O_2, SO_2, H_2S, CH_4, NH_3.

- Ultra-super-critical (USC) Steam Autoclave: Dual rated to 4500 psig at 760°C and to 5000 psig at 746°C
- Supercritical CO_2 Autoclave: Rated – 4000 psig at 800°C
- Autoclaves for immersion testing in saturated CO_2 or mixed gas involving Air, Ar, N_2, CO_2, O_2, SO_2, H_2S, CH_4, NH_3: Standing Stirred Autoclaves (5000 psig, 250°C), Flow-Through Unit (5000 psig, 500°C)
- Available static and cyclic oxidation testing for 24/7 exposures to: air, O_2, N_2, Ar, He, CO_2, H_2O, and N_2/4% H_2, at ambient and elevated temperatures
- Electronic potentiostats/galvanostats for conducting electrochemical experiments
- Capabilities to perform electrochemical experiments at high-pressures and temperatures (4500 psig, 250°C) in in saturated CO_2 or mixed gas involving Air, Ar, N_2, CO_2, O_2, SO_2, H_2S, CH_4, NH_3

Fracture Mechanics & Creep Capabilities

- **Mechanical Testing:** tension, compression, low and high cycle fatigue, fatigue crack growth rate testing using electro-mechanical and servo-hydraulic Universal Testing Machines (5,500 to 220,000 lbs.) with high temperature capability and with fully instrumented computer control and data acquisition.
- **Creep Testing:** creep frames for stress-rupture and creep-rupture tests and stress relaxation tests. Testing can be done in Air, Ar,,CO_2,or N_2. Maximum load capacity of 10,000 lbs. and a maximum temperature capability of 1200°C.

www.netl.doe.gov

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY