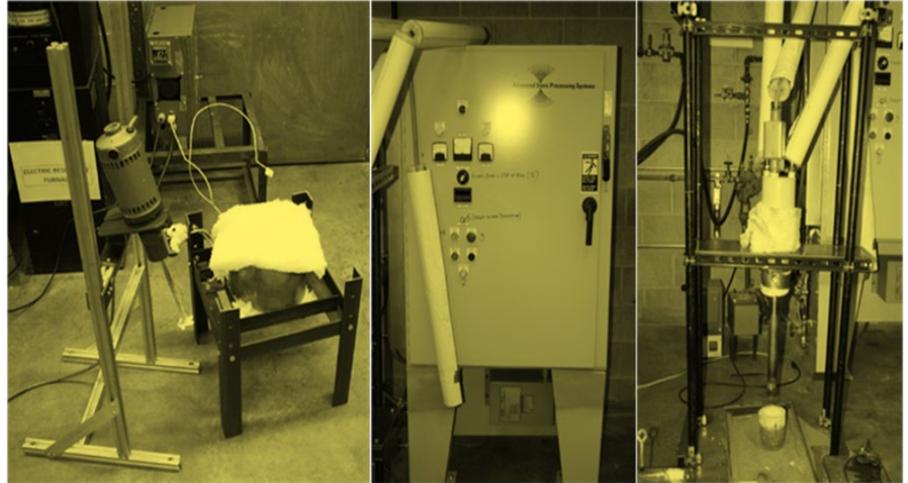


University of Wisconsin-Milwaukee Molten Metal and Composites Processing Facility

UW-Milwaukee has extensive facilities for experimental synthesis and processing of metals and metal matrix composites. Facilities for melting and casting nonferrous alloys, as well as powder metallurgy processing of metals are available in the UWM Center for Composite materials including melting furnaces (up to ~ 50 lbs of aluminum), ultrasonic processing equipment, heat treatment facilities, hot and cold presses, vacuum melting, pressure infiltration, centrifugal casting, sand, and permanent mold casting and squeeze casting. Facilities are also available for metallographic characterization and mechanical testing including friction and wear. Together with its partner, Eck Industries, UWM is capable of evaluating and scaling up benchtop cast material technologies to TRL 4/TRL 5. In addition, through other facilities available to the center at UWM, materials can be characterized and tested to aid in process, material and component prototyping.



Stir mixing and ultrasonic processing equipment for processing small batches of metal matrix nanocomposites at UW-Milwaukee

Selected Research Areas: Composites Processing

- Characterization of powders, whiskers, and fibers for composites
- Development of new solidification processes for synthesis of composites
- Near net-shaped casting of composites
- Characterization of physical, mechanical and tribological properties of composites
- Metal matrix composites including Al-C, Al-SiC, Al-Al₂O₃, Cu-C, Mg-C, Fe-Al₂O₃, aluminum fly ash composites
- Rapid manufacturing including Laser Engineered Net Shaping (LENS)
- Self-healing metals and composites

Selected Research Areas: Molten Metal Processing

- Modeling of pouring, feeding, and fluid flow
- Solidification modeling, prediction of solidification sequence and structure-properties
- Development of new solidification processes and novel casting techniques
- Characterization and measurement of physical and mechanical properties
- Environmental control, recycling, utilization of waste sand from foundries
- Ferrous castings
- Aluminum and Magnesium alloy castings

UWM Molten Metal and Composites Processing Facility Equipment, Partial List

Solidification Processing and Heat Treatment Equipment

- Vacuum Industries, Inc. vacuum furnace. Max. temp 2200 °C, 10^{-7} torr ultimate vacuum. Melts aluminum, copper, steel, titanium, and nickel
- MTI Benchtop Induction Furnace SP-15AB. Melts aluminum, magnesium, copper, and steel. Vacuum melting available.
- Pressureless infiltration electrical resistance furnace. Max. temp. 1000 °C. Chamber Size: 14" x 16" x 22" (W x H x D). Melts aluminum, magnesium, zinc, tin, lead.
- MTI VBF-1200X resistance furnace (Quantity 2). Max temp. 1250 °C. Fully adjustable ramp rates and holding times for heat treating and melting (10 lbs Al capacity)
- Sintering and heat treatment furnaces. Thermo Scientific ThermoLyne Model # FB1315M. 4" x 3.8" x 5" (W x H x D). Max. temp. 1100 °C.
- Vortex mixing. Hand and fixed stand particle mixing with vortex impeller
- Advanced Sonic Processing Systems ultrasound. Contacting/non-contacting ultrasonic mixing of liquid metals.
- Horizontal and vertical centrifugal casting equipment. 1210-2750 rpm for horizontal. 2520 rpm max for vertical centrifugal casting
- Automated Squeeze casting equipment. Steel permanent molds. 5,000 psi hydraulic ram and 100 Ton ram
- Low pressure infiltration equipment (1" OD quartz chamber). Melt under a vacuum and introduce inert gas to sub atmospheric conditions for infiltration
- Waltz Furnace Company electric furnace. Max temp. 2000 °F. 13.5" x 7.5
- High pressure infiltration equipment. Max temp. 1000 °C. Vacuum to 300 psi pressure range with rapid introduction of gas
- Microwave melting equipment. Can melt low temperature metals, such as lead and tin. Small crucible 200 cc

Powder Metallurgy Equipment

- Szegvari Attritor mill. 0-800 rpm range
- Spex Industries High energy ball mill
- Retsch Cryomill
- Retsch PM100 Planetary Ball Mill
- Dies for hot and cold compaction, and extrusion
- Cutter II Automatic Wire Cutter. Rapidly and precisely cuts wire to a length specified
- Allen-Bradley Sonic Sifter. Sorts particles of varying size ranging from 2800-3 micrometers
- Labconco Nanoparticle safety hood. Filters 0.1 micron at 99.999% efficiency
- Resodyn LABRAM Acoustic Mixer with vacuum attachment

Materials Testing and Characterization

- Buehler IsoMet Low Speed Saw
- Ultrasonic cleaning equipment
- Buehler base with Vector Head automatic polisher. Multiple sample grinding and polishing. 8" polishing surface