

# ADVANCING MATERIALS RESEARCH AND DEVELOPMENT

## *Argonne's Materials Engineering Research Facility*



**Argonne's Materials Engineering Research Facility (MERF) develops scalable synthesis, creates quality control methods and assess emerging technologies to aid process intensification for materials manufacturing.**

### HELPING BRIDGE THE GAP BETWEEN MATERIALS DISCOVERY TO TECHNOLOGY COMMERCIALIZATION

- Developing scalable manufacturing processes for advanced materials that are challenging to make.
- Producing kilogram quantities of experimental materials and distributing for industrial evaluation, prototyping and further R&D in new areas.
- Decreasing discovery to market time with accelerated development and delivery of new technologies.
- Enabling commercial evaluation of new materials with large-scale samples and cost modeling to estimate production costs.
- Evaluating emerging manufacturing technologies that can decrease production time, lower production cost and improve material quality and performance.

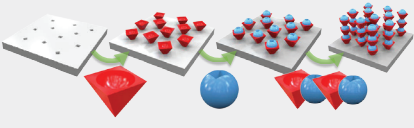
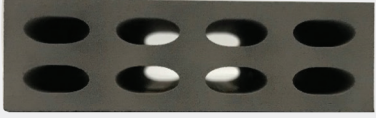
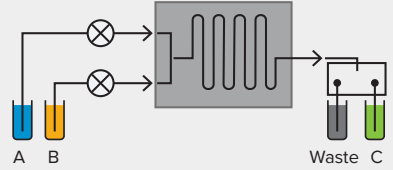
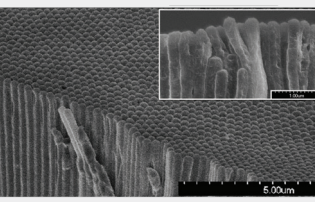
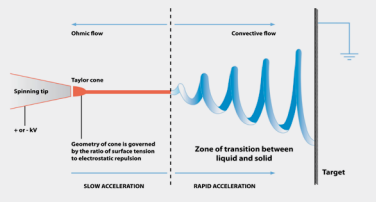
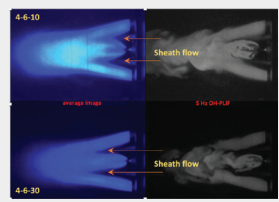
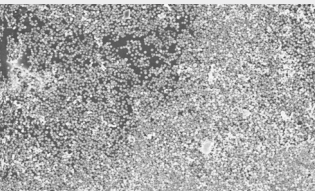
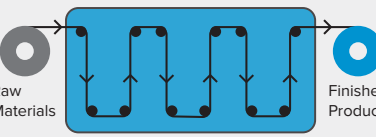
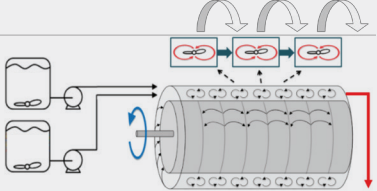
The MERF is a 26,000 sq. ft. research facility that employs 20 researchers, engineers and support staff with the majority having extensive industrial experience. Using state-of-the-art equipment and instrumentation, MERF researchers apply advanced synthesis and processing protocols to develop scalable and economically viable manufacturing processes for newly invented experimental materials. MERF staff focus on advanced materials for energy storage and conversion, water purification and catalysis with the circular economy in mind.

#### **MERF's experience and facilities assist innovators and industry in rapidly bringing new materials and technology to market by:**

- Combining in situ measurements, real-time analysis, AI, and modeling to accelerate innovation and scale-up for complex materials.
- Generating insights into materials synthesis through feedback to discovery science.
- Enhancing the scientific basis for the next generation of American manufacturing technologies.



## ADVANCED MATERIALS SYNTHESIS AND ADVANCED MANUFACTURING CAPABILITES

<p><b>ATOMIC LAYER DEPOSITION</b></p> 	<p><b>BINDER JET</b></p> 	<p><b>CONTINUOUS FLOW</b></p> 
<p><b>ELECTRODEPOSITION</b></p> 	<p><b>ELECTROSPINNING</b></p>  <p><small>Joanna Gafford - The New Zealand Institute for Plant and Food Research Ltd</small></p>	<p><b>FLAME SPRAY</b></p> 
<p><b>HYDROTHERMAL</b></p> 	<p><b>ROLL TO ROLL</b></p> 	<p><b>TAYLOR VORTEX</b></p> 



Pictured top to bottom: Bench Labs, Pilot Labs, and Highbay Space located within the MERF.

- **Continuous Flow Synthesis:** Microfluidic, channels-in-glass and tubular reactors, automated systems for rapid process research, development and optimization.
- **Flame Spray Pyrolysis:** Advanced synthesis systems with sophisticated in situ monitoring, analysis and characterization capability.
- **Hydro/Solvothermal Synthesis:** Advanced reactor system operated under high temperature and pressure for extremely efficient synthesis of highly crystalline materials.
- **Electrospinning Synthesis:** Scalable techniques for production of composite nanofibers with uniform diameters and morphologies.
- **Taylor Vortex Synthesis:** Synthesis platform that utilizes hydrodynamic intensity and dimensions of Taylor vortex for superior mass and heat transfer resulting in high degree of material uniformity.
- **Advanced CSTR Synthesis:** State-of-the-art industrial system for semi-continuous synthesis targeted to large quantities of various materials.
- **State-of-the-art reactors and filter reactors:** Capable of up to 50L production batches.

### CONTACT

**Gregory Krumdick**  
 Division Director  
 Applied Materials Division  
 Phone: 630-252-3952  
 Email: gkrumdick@anl.gov

**Kris Pupek**  
 Group Leader, Process R&D and Scale-Up  
 Applied Materials Division  
 Phone: 630-252-1547  
 Email: kpupek@anl.gov