



Pacific Northwest
NATIONAL LABORATORY

Accelerated Materials Discovery and Development with High-throughput Experimentation

EQUIPMENT SUPPORTS PNNL'S ENERGY STORAGE MATERIALS INITIATIVE

PNNL's high-throughput experimentation systems (HTESs) include two state-of-the-art modular robotic platforms, with one operated in a nitrogen purge box for general experiments and another in an argon glove box for highly sensitive experiments. Both systems are completely configurable and can accommodate multi-well microarray substrates (e.g., 2- to 96-well microplates).

The automated systems are equipped with analytical balance (0.1 mg readability), solid dispensers (1 mg to 25 g), liquid handlers including the positive displacement pipetting for viscous liquids/slurries (10 μ l to 10 ml), capping/uncapping station, on-deck magnetic stirrer with heating/cooling (-20°C to 180°C) function, vortex mixer, centrifuge, and eight individual optimization sampling reactors (up to 400 psi/27.5 bar).

The HTESs are also equipped with compatible high-throughput property characterizations, including basic physical property measurement such as solubility, conductivity, viscosity, etc., and electrochemical measurements.



(a) Completed HTES (b) Inside view of the system.



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ENERGY STORAGE
MATERIALS INITIATIVE
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ADVANTAGES

Combined with the intelligent software, the HTES platform enables automated combinatorial materials synthesis, high-throughput screening, and optimizations for large-scale data generation that will significantly accelerate the material discovery and predictive material design through advanced data analytics. Some key advantages are shown below.

-  **Time / Efficiency**
 - » More experiments
 - » Lower labor costs
-  **Bird's-Eye View**
 - » Test thousands of formulations for the optimal conditions
-  **Reliable Datasets**
 - » Experiment design and Minitab
 - » Eliminate systematic errors



ABOUT PNNL

Pacific Northwest National Laboratory advances the frontiers of knowledge, taking on some of the world's greatest science and technology challenges. Distinctive strengths in chemistry, Earth sciences, biology and data science are central to our scientific discovery mission, laying a foundation for innovations that advance sustainable energy through decarbonization and energy storage, and enhancing national security through nuclear materials and threat analyses. PNNL collaborates with academia in its fundamental research and with industry to transition technologies to market.

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