

Scale-Up R&D Bridges Gap between Laboratory and Battery Industry

The gap between small-scale laboratory research and high-volume manufacturing, known as “scale-up,” is one of the most significant hurdles in transitioning new battery materials and technologies to the market. Scale-up R&D involves taking a laboratory-developed process and modifying it to enable economical commercial-scale production.

The Challenge

Scaling up chemistry is not a simple linear process. When a laboratory process is modified for high-volume production, factors like time, temperature, concentration and mixing velocity can all change.

The Solution

Argonne established its Advanced Battery Materials Synthesis and Manufacturing R&D Program and is building the Materials Engineering Facility to focus specifically on the scale-up of promising, new battery materials. By developing effective scale-up processes and proving that larger batches of materials work as intended, Argonne hopes to make bench-scale innovations more attractive to battery manufacturers.

The Results

Earlier this year, Argonne researchers completed the program’s first successful scale-up with the development of an improved, scalable process for the synthesis of a redox shuttle, a chemical mechanism used to keep lithium-ion batteries from overcharging. The research team continues work to develop scale-up processes for additional electrolyte materials including solvents and passivation additives.



“We’ve got a few problems with the process scale-up.”



Initial discovery amounts of battery materials are small compared to the kilo-scale amounts needed for validation of new battery technologies. Argonne’s scale-up research is enabling the development of manufacturing processes for producing advanced battery materials in sufficient quantity for industrial testing.

“Processes used to make materials in the lab are typically not suitable for large-scale production,” said Gregory Krumdick, principal systems engineer at Argonne. “Our program will be the link to connect the bench-scale research with the battery manufacturing industry.”