



## Scale-Up

### Designed to Scale

Robust processes ensure nanomaterials are designed to scale from grams in the lab to metric tons for manufacturing

### Flexible

Capable of scaling a material we designed for you in the lab or a formula you have developed

### Prototype Production

Small-scale production capability for in-house and customer qualification trials

We know our customer's goal is to commercialize their new product or system — and that reliable, cost-effective source of supply is critical to that process. For over a decade Cerion has been cost-effectively transitioning nanomaterials, often scaling between 1,000 to over 10,000 times what has been created in the lab. Core to our success is a deep bench of scientific, engineering and manufacturing talent — combined with years of investment developing proprietary scale-up and commercialization processes that work seamlessly within our manufacturing environment.

## Design for Manufacturing

Our preparations for scale-up start while we are designing your nanomaterial in the lab, by leveraging "Design for Manufacturing" (DFM) principles. Our proprietary approach leverages DFM best practices to ensure that nanomaterials made in the lab today, will seamlessly and cost-effectively transition to manufacturing tomorrow. The methodology includes a wholistic approach to address all critical business, technical, engineering, regulatory, supply chain and logistics that ultimately inform the final cost of the nanomaterial. Using this approach, manufactured price simulations can be performed early on, and the pathway for scale-up is well-defined prior to the nanomaterial leaving the lab on its way towards manufacturing.

## Preparing for Scale-Up

The process of transitioning a nanomaterial from the lab to manufacturing follows a carefully choreographed process designed at Cerion to ensure cost-effective materials can be manufactured at whatever scale our customer requires. When a nanomaterial made in the lab has been qualified by our customer, the material transitions to Cerion's development labs. During this stage the synthetic approach and customer's specific formula are replicated, stress tested and optimized.

This involves:

1. Deliberate and thorough testing of the chemical and process sensitivities of the synthetic method and formula used to make a customer's material. We determine breaking points and safe usage limits of the future manufacturing process to improve reliability and repeatability in the manufacturing plant.
2. Improving the nanomaterial's economics. We evaluate different methods to improve upon factors that impact cost — including chemical yield, volumetric yield, takt time and energy inputs.

Quality assurance requirements are set for all raw materials, as well as defining all necessary in-line and post-manufacturing quality control parameters. The final step during the development process is to increase from lab-scale to small-scale production, typically on the order 10 to 20x what has been made in the lab.

## Transition to the Manufacturing Plant

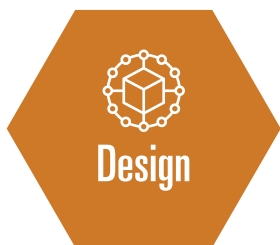
As a nanomaterial transitions out of Cerion's development labs, it moves to our manufacturing environment. During this stage, the production of the material is scaled to one of our pilot manufacturing systems. Once the material formula has been manufactured, passed all quality control parameters and accredited — it can then be progressively moved to one of our larger scale manufacturing systems.

# WE GET IT.

Developing in-house advanced expertise in nanomaterials is expensive and time intensive. That shouldn't stop you from utilizing them to improve your products.

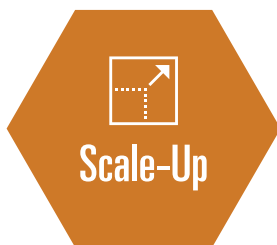
## Cerion Nanomaterials Can Help

As a global leader in designing, scaling and manufacturing custom nanomaterials for industry, Cerion provides the expertise and materials you require, while your team stays focused on advancing the development and delivery of your products and systems.



### Design

Precision design and customization of both nanoparticle size and technical attributes



### Scale-Up

Robust processes to scale materials from prototype to low and high-volume production rates



### Manufacturing

Industry-leading, cost-effective manufacturing systems and production capacities

## Our Material Expertise

Cerion has a breadth of experience across a range of material systems. These include material classes such as metals, metal oxides and ceramics:

- Barium
- Boron
- Ceria
- Cobalt
- Copper
- Gold
- Iron
- Nickel
- Niobium
- Palladium
- Platinum
- Silica
- Silver
- Titania
- Tungsten
- Yttrium
- Zinc
- Zirconia
- And more...

## Synthesis Methods

We are proficient in precipitation, hydro/solvo thermal, high energy milling, conventional spray drying and high temperature combustion.

## Dedicated In-House Analytical Team

We have our own fully-staffed analytical department along with a full suite of state-of-the-art equipment for the characterization of nanomaterials.

## Customers

Experts in product & system development seeking to leverage nanomaterials to enhance performance






## Cerion

Experts in providing nanomaterials to support customer requirements — from research through manufacturing

Ready to learn more? Visit [www.cerionnano.com](http://www.cerionnano.com)

### Contact Us

-  959 Panorama Trail South, Suite 160  
Rochester, NY 14625
-  [sales@cerionnano.com](mailto:sales@cerionnano.com)
-  +1.585.294.4958