

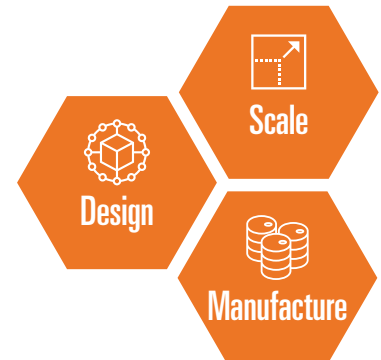


WE GET IT.

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.



Achieving Performance Requirements

Inorganic nanomaterials have unique and advantageous properties that can be leveraged across a range of products and applications. Our expertise in nanomaterial design and scale-up allows customers to easily access and apply the inherent advantages that nanomaterials add to their products, such as:

- High Refractive Index
- Anti-Reflective
- Antimicrobial
- Scratch-Resistant
- Self-Cleaning

Successful Integration into Display Products

Cerion has been working with display developers to design, scale and manufacture optimized nanomaterials with the main objective of improving the performance of their optical coatings. This has allowed our customers to bring high-performing, differentiated products to market that helps sets them apart from their competition.

Our specialty is designing solutions that are compatible with your product and process, allowing you to seamlessly integrate the nanomaterial and preserve its performance. Our process includes working closely with your team to understand your product requirements, manufacturing conditions and desired end-state of the nanoparticle for integration. For incorporation into display products, this often requires optimization of the nanomaterial, including:

- Particle Size
- Particle Size Distribution
- Surface Charge
- Surface Functionalization
- Solvent System

Our Capabilities in Optimizing ZrO₂ and TiO₂ Nanomaterials for Your Product or System

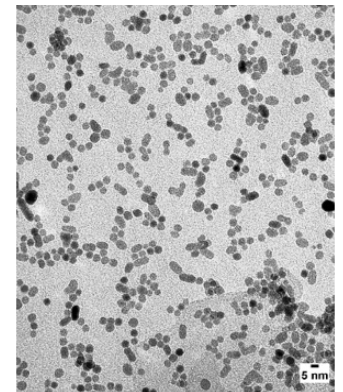
Cerion scientists and engineers have decades of experience working with an expansive list of nanomaterials, allowing our customers to rely on us no matter how much nanomaterial expertise they have coming into our collaboration.

Our wide range of capabilities, including multiple synthetic processes, allow us to cost-effectively produce a variety of nanomaterials, and then design and optimize to develop a material that meets both your technical and performance requirements (and that can seamlessly integrate into your product or system!).

Below are the specifications of two of the most commonly utilized nanomaterials for displays, ZrO₂ and TiO₂. These represent the base material - prior to any custom design or optimization taking place.

ZrO₂

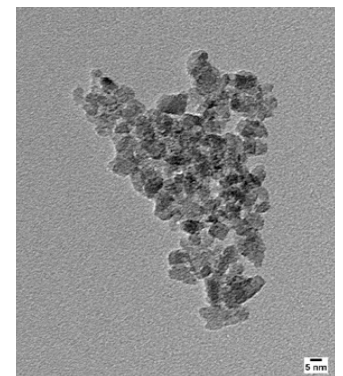
Particle Size:	< 5nm	
Wt%:	20 – 60 %	
pH:	2 – 4	
Refractive Index:	1.6 – 1.8	
Solvent Systems:	<ul style="list-style-type: none"> • Aqueous • PGMEA • Ethyl acetate • MEK • Substituted norbornene • 1, 2 Propanediol 	<ul style="list-style-type: none"> • Epoxy resins • Toluene • CHCl₃ • Ethanol • N-butyl acetate • Desired customer solvent system



<5nm ZrO₂ in PGMEA @ 42wt%

TiO₂

Particle Size:	5 – 25nm	
Wt%:	10 – 25 %	
pH:	2 – 4 OR 9 – 12	
Refractive Index:	1.7– 1.9	
Solvent Systems:	<ul style="list-style-type: none"> • Aqueous • PGMEA • Toluene • Isopar L 	<ul style="list-style-type: none"> • Heptane • 1, 2 Propanediol • Desired customer solvent system




6.5nm TiO₂ in water @ 15wt%


Custom Nanoparticle Solutions for Your Product or System

For more than a decade, Cerion has been a leader in the science of designing, scaling and manufacturing metal, metal oxide and ceramic nanomaterials for global companies developing products or systems.

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