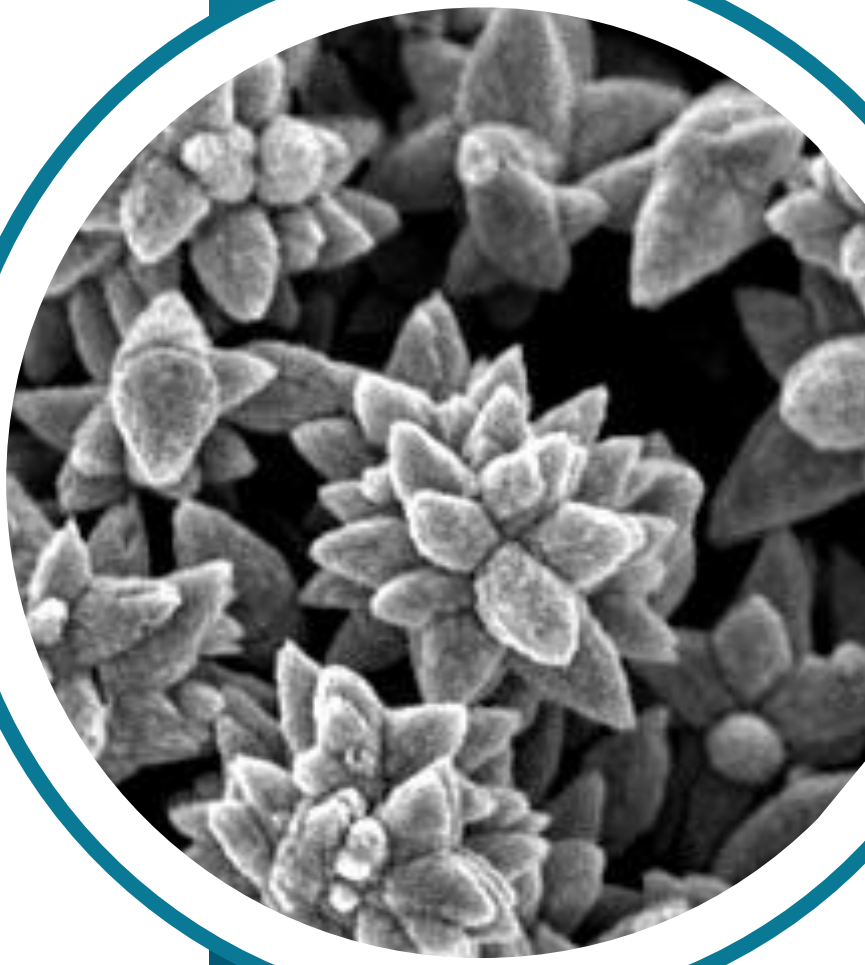
ACCELERATED MATERIALS

# MATERIALS CATALOGUE



www.acceleratedmaterials.co

Materials Catalogue 20251028

# Overview

At Accelerated Materials (AM), we empower innovation by enabling the scalable production of advanced nanomaterials through cutting-edge technology. Our platform combines continuous-flow reactors, AI-driven automation, and materials expertise to deliver unparalleled precision, flexibility, and efficiency in nanomaterials manufacturing.

**Providing Materials Solutions**

This brochure introduces a curated selection of high-performance materials synthesized using our proprietary, room-temperature, solvent- and water-based processes. These methods offer tailorable particle size, morphology, and crystallinity, ensuring exceptional control over quality, consistency, and functionality.

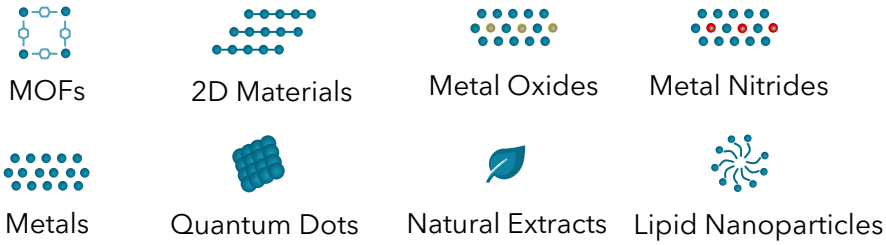
We partner with manufacturers through licensing agreements to tailor and produce the unique materials presented in this catalogue. We also partner with end users to ensure reliable and consistent supply through our manufacturing network.

Each material in this catalogue, from metal-organic frameworks (MOFs) like CuBDC to industrial workhorses like ZnO and $ZrO_2$, showcases the versatility of our platform to address needs across industries such as:

- Energy storage and electronic devices
- Pharmaceuticals and nutraceuticals
- Catalysis, coatings, and membranes
- Environmental remediation and advanced manufacturing

Whether you're producing 1 kg or scaling up to 100 kg per day, Accelerated Materials provides a complete pathway from lab to market – through equipment, software, services, and licensing options tailored to your growth.

**Compositions**




**Shapes**


**Sizes**

## Delivering Solutions with the K-Series Reactors

The first commercial system for instant scaling from 1 to 100 kg/day

lab → pilot → factory

K1 K10 K100

**Working with** ACCELERATED MATERIALS

### 1 Discovery

*Develop and De-risk*

Work with our dedicated technical center in Singapore to:

- Define specifications
- Produce samples (g-kg)
- Evaluate process and performance
- Train users
- Purchase a K1/K10
- R&D agreement

### 2 Pilot

*Scale and Assess*

Work with our technical centre, contract partners, or at your site to:

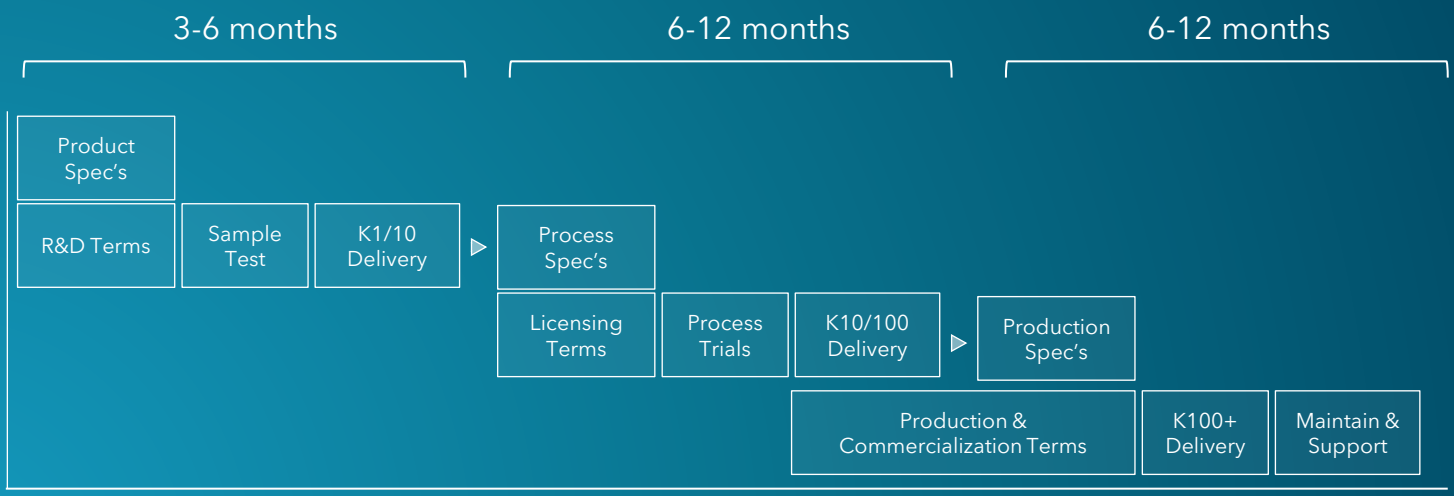
- Produce samples from kilos to tonnes
- Confirm quality
- Train production and laboratory staff
- Purchase a K10/K100
- Licensing agreement

### 3 Manufacture

*Manufacture and Maintain*

Produce materials at your site or with contract partners:

- Produce samples from kilos to tonnes
- Maintain production quality and material performance
- Train production and laboratory staff
- Purchase a K100+
- Production agreement



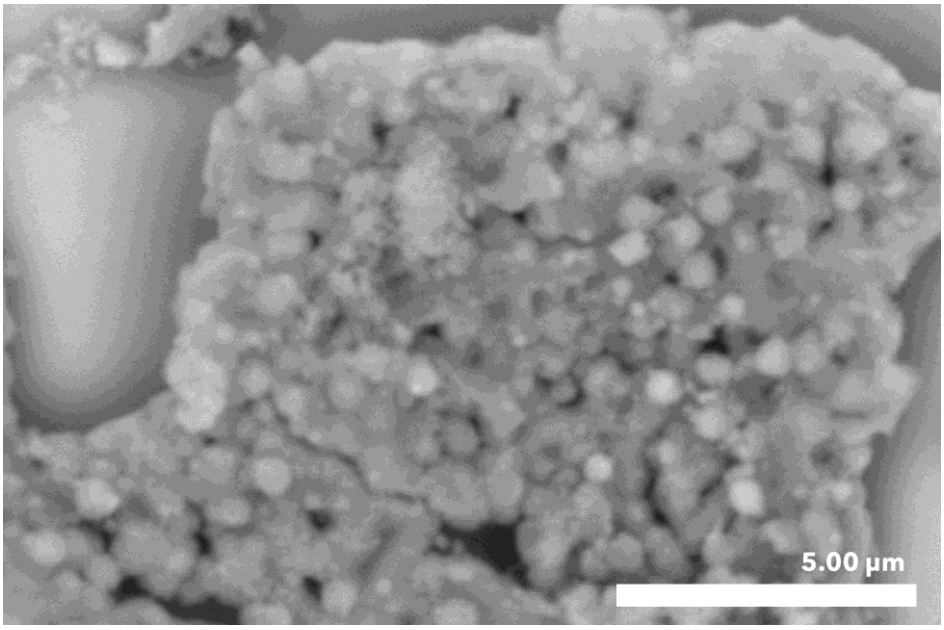
# Aluminum Nitride | AlN

Aluminum nitride (AlN) nanoparticles are advanced ceramic materials distinguished by their rare ability to combine high thermal conductivity with excellent electrical insulation. These ultra-fine particles, which typically exhibit a hexagonal wurtzite crystal structure and a wide bandgap of approximately 6.2 eV, serve as critical components in thermal management systems where dissipating heat without conducting electricity is paramount. Consequently, they are extensively utilized as fillers in thermal interface materials, pastes, and potting compounds to efficiently cool high-power devices such as LEDs, CPUs, and power modules. Beyond thermal regulation, their unique piezoelectric properties and transparency to ultraviolet light enable their application in Surface Acoustic Wave (SAW) sensors, deep-UV photodetectors, and as reinforcing agents in metal matrix composites to enhance mechanical strength and wear resistance.

AM offers the ability to continuously synthesize nano-particle AlN precursors with tailorable particle size in a continuous, room-temperature, giving unprecedented control over particle properties with high operating efficiency. After precursor synthesis, calcination in an inert environment yields crystalline AlN of high quality.

| Property | Value |
|---|---|
| CAS | 24304-00-5 |
| Morphology | Sphere, rod primary particles |
| Formula | AlN |
| Crystal Phase | Wurtzite |
| Particle Sizes Offered | From 200 to 1 µm |
| Application(s) | Ceramics, thermal interfaces |

The provided specifications are intended for guidance




Representative scanning electron microscopy image of AlN synthesized by AM

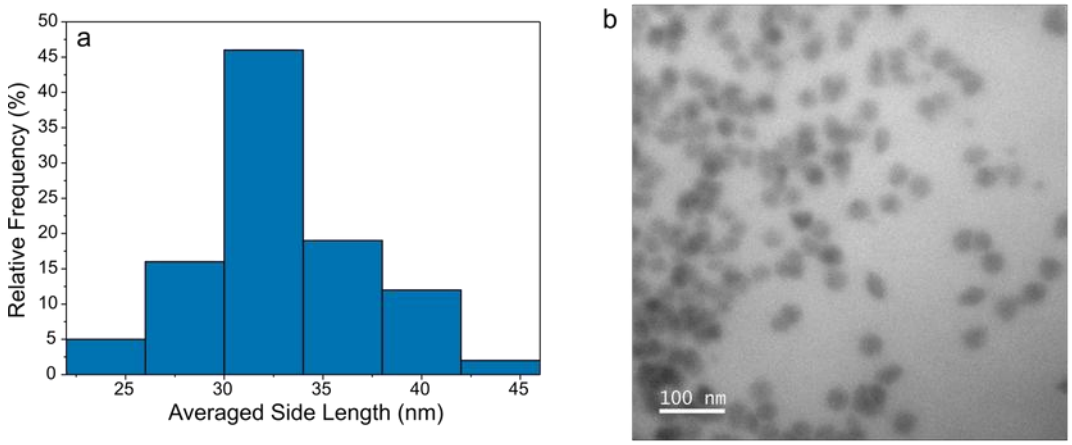
# Copper Benzene Dicarboxylic Acid | CuBDC

Metal-organic frameworks (MOFs) are a class of porous materials composed of metal ions or clusters coordinated to organic ligands, forming a crystalline structure. MOFs are renowned for their exception- ally high surface area, tunable pore sizes, and structural diversity, which make them ideal for various applications. They are used in gas storage and separation (e.g., CO2 capture), catalysis, drug delivery, and as components in sensors and electronic devices.
Copper Benzene Dicarboxylic Acid is a unique, 2-dimensional metal organic framework with potential applications in membrane separation, adsorbents and energy storage.

AM offers the ability to continuously synthesis nano-particle CuBDC with tailorable particle size in a continuous, room-temperature, solvent-based process, giving unprecedented control over particle properties with high operating efficiency.

| Property | Value |
|---|---|
| CAS # | 34262-89-0 |
| Morphology | Sheet |
| Formula | $C_8H_4CuO_4$ |
| Crystal phase | Monoclinic |
| Particle size, nm | 33 (length) 2-4 nm (thickness) |
| Application(s) | Membranes, adsorbents, electrodes |

The provided specifications are intended for guidance




Particle size distribution (a) and transmission electron microscopy image (b) of CuBDC synthesized by AM

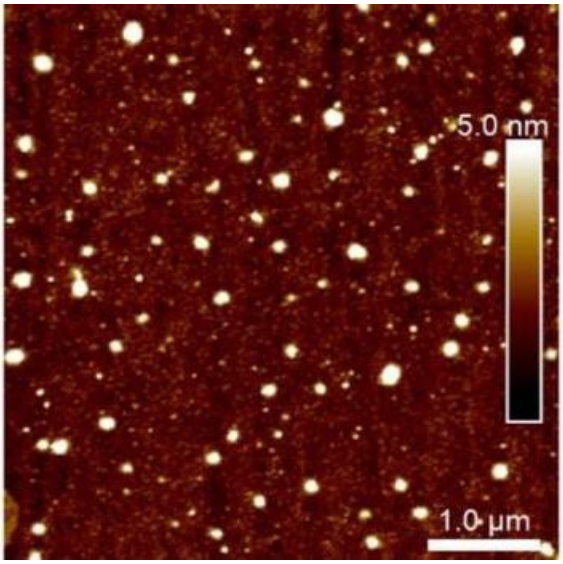
# Curcumin | $C_{21}H_{20}O_6$

Curcumin is a natural polyphenolic compound found in the spice turmeric (Curcuma longa). It is well- known for its bright yellow color and is widely used as a food coloring and flavoring agent. Beyond its culinary uses, curcumin has garnered significant attention for its potential health benefits due to its anti- inflammatory, antioxidant, and anticancer properties. It is studied for its therapeutic potential in treating various conditions, including arthritis, cardiovascular diseases, and neurodegenerative disorders. However, curcumin has low bioavailability, which has led to the development of various formulations to enhance its absorption and efficacy in the body.

AM offers the ability to continuously synthesis nano-particle curcumin with tailorable particle size in a room-temperature, antisolvent process, giving manufacturers high performance products with low operating costs.

| Property | Value |
|---|---|
| CAS # | 458-37-7 |
| Morphology | Sphere |
| Formula | $C_{21}H_{20}O_6$ |
| Crystal phase | Amorphous |
| Particle size, nm | 230 |
| Application(s) | Nutrient supplements, topical treatments |

The provided specifications are intended for guidance




Atomic force miroscope image of nano curcumin synthesized by AM

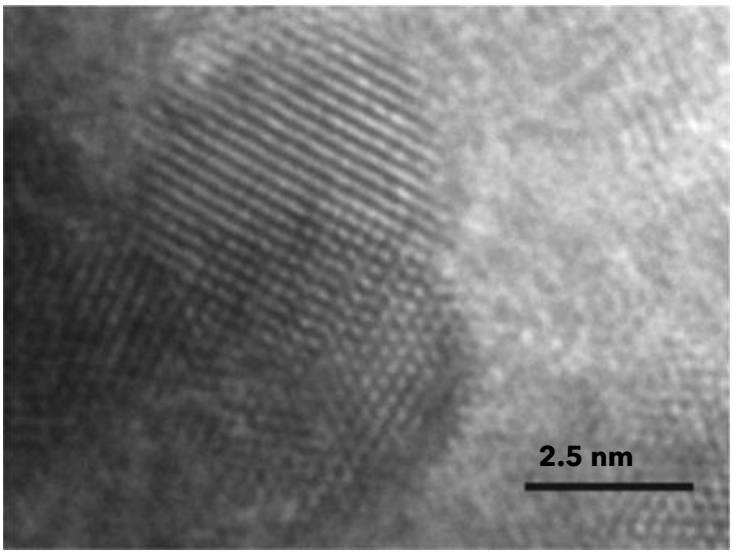
# Hydrotalcite | $Mg_6Al_2(OH)_{16}CO_3 \cdot 4H_2O$

Hydrotalcite is a layered double hydroxide mineral composed primarily of magnesium and aluminum hydroxides. It is known for its unique structure, which allows it to act as an anion exchanger. In it's nano- particle form, hydrotalcite has increased surface area and edge sites, which create higher activity. Hydrotalcite is widely used in industrial applications, including as a stabilizer in polymers like PVC, as an antacid in pharmaceuticals, and as a precursor for catalysts in chemical reactions. Its ability to absorb and release various anions makes it valuable in environmental remediation and as an additive to improve the thermal stability of materials.

AM offers the ability to continuously synthesis nano-particle hydrotalcite with tailorable particle size, aspect ratio and crystallinity in a room-temperature, water-based process, giving manufacturers high performance products with low operating costs.

| Property | Value |
|---|---|
| CAS # | 11097-59-9 |
| Morphology | Flake |
| Formula | $Mg_6Al_2(OH)_{16}CO_3 \cdot 4H_2O$ |
| Crystal phase | Monoclinic |
| Particle size, nm | 5-28 |
| Application(s) | Adsorbents, fire-retardants, catalysis and more |

The provided specifications are intended for guidance




Transmission electron microscope images of nano hydrotalcite synthesized by AM

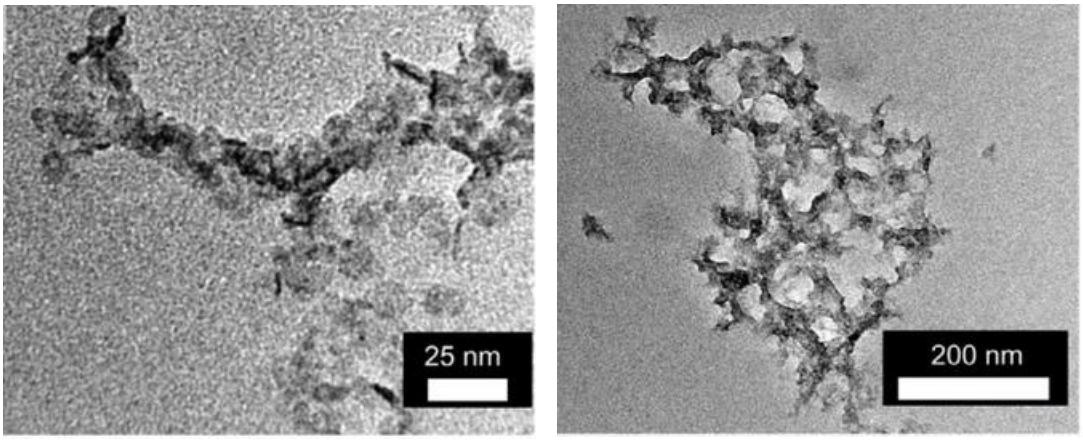
# Nickel Cobalt Hydroxide (NiCoOH)

Nickel-Cobalt Hydroxide is a mixed-metal hydroxide compound known for its role in energy storage technologies. It is primarily used as a precursor material in the production of battery electrodes, particularly in lithium-ion and nickel-metal hydride batteries. The material provides high specific capacity and improved cycling stability, making it a crucial component for enhancing the performance of rechargeable batteries. For more information on enhancements in performance see: https://doi.org/10.1002/ ente.202200633

AM offers the ability to continuously synthesis nano-particle Nickel Cobalt Hydroxide with tailorable particle size, aspect ratio and crystallinity in a room-temperature, water-based process, giving manufacturers high performance products with low operating costs.

| Property | Value |
|---|---|
| CAS # | 61179-08-6 |
| Morphology | Flake |
| Formula | $NiCo(OH)_4$ |
| Crystal phase | α-NiCo-hydroxide |
| Particle size, nm | 12 |
| Purity, % | 98+ |
| Application | Supercapacitors |
| Function | Charge-storage |
| Specific capacity, F g-1 | 4700 |
| Stability, # of cycles | > 20000 |

The provided specifications are intended for guidance




Transmission electron microscope images of nano-hydrotalcite synthesized by AM

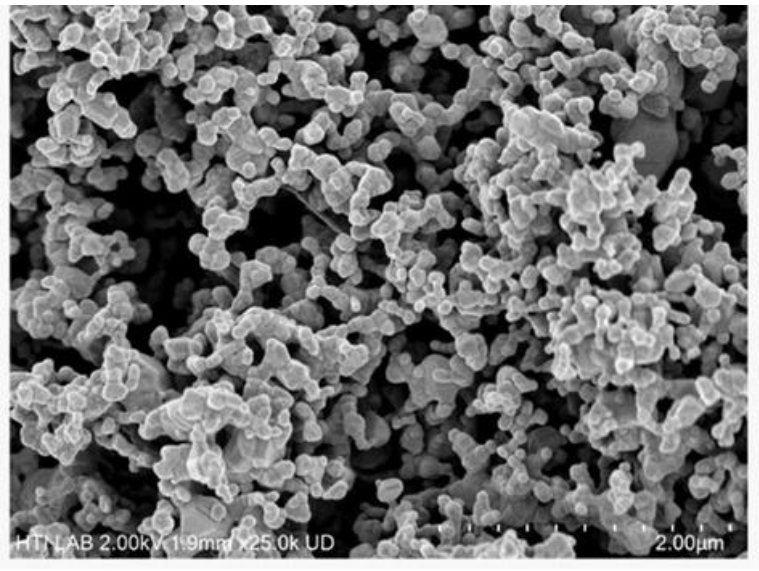
# Silver (Ag)

Silver nanopowder consists of nanoparticles of silver, typically ranging in size from 1 to 100 nanometers. Due to its high surface area and unique properties at the nanoscale, silver nanopowder exhibits excel- lent electrical conductivity, thermal conductivity, and antimicrobial activity. These properties make it valuable in various applications, including electronics for conductive inks and pastes, in medical devices and coatings for its antimicrobial effects, and in catalysis.

AM offers the ability to continuously synthesis nano-particle silver with tailorable particle size in a continuous, room-temperature process. AM's process lets manufacturers reduce waste, increase quality and improve product performance for a variety of applications.

| Property | Value |
|---|---|
| CAS # | 7440-22-4 |
| Morphology | Sphere |
| Formula | Ag |
| Crystal phase | Cubic |
| Particle size, nm | 5–150 |
| Application(s) | Conductive inks/pastes, antimicrobials |

The provided specifications are intended for guidance




Scanning electron microscope image of silver nanopowder synthesized by AM

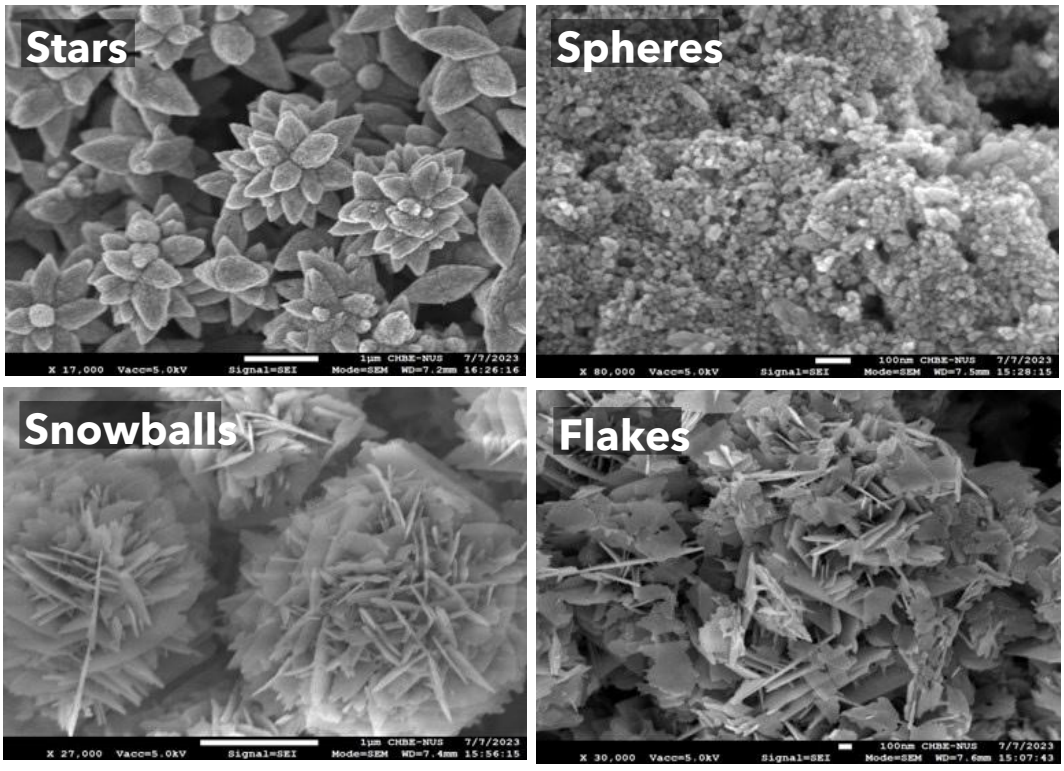
# Zinc Oxide | ZnO

Zinc oxide (ZnO) is a versatile inorganic compound known for its wide range of applications. The wide range of morphologies, crystallinities and sizes that ZnO can form lend it broad versatility in many applications. It appears as a white powder and is used in various industries, including cosmetics, where it provides UV protection and skin soothing properties; electronics, for its semiconducting and piezoelectric characteristics; and as an additive in products like rubber, paints, and ceramics. ZnO also exhibits antimicrobial properties, making it valuable in medical and personal care products. Its unique combination of properties makes it essential in both industrial and consumer applications.

AM provides processes for making a range of particle sizes and shapes, as seen below, each of which excel at different applications.

| Property | Values | | | |
|---|---|---|---|---|
| Morphology | Spheres | Flakes | Stars | Snowballs |
| CAS | 1314-13-2 | 1314-13-2 | 1314-13-2 | 1314-13-2 |
| # Formula | ZnO | ZnO | ZnO | ZnO |
| Crystal phase | Zincite | Zincite | Zincite | Zincite |
| Particle size, nm | 30 | 150 | 1500 | 1500 |
| Purity,% | 98+ | 97+ | 99+ | 97+ |
| Heavy metals content, ppm | <5 | <10 | <10 | <5 |
| Application | Optics & Electronics | Antimicrobials | Absorbents | Cosmetics |

The provided specifications are intended for guidance




Scanning electron microscope images of nano ZnO synthesized by AM

# Zirconium Dioxide | ZrO2

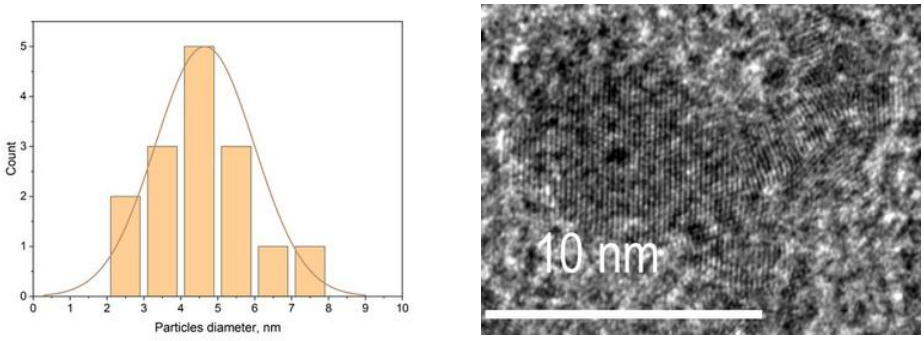
Zirconium(IV) dioxide, also known as zirconia (ZrO), is a white crystalline oxide of zirconium. It is highly valued for its high refractive index, high melting point, thermal stability, and strong resistance to corrosion. Zirconia is commonly used in ceramics, where it provides toughness and durability, and in dental applications for making crowns and bridges due to its biocompatibility and natural tooth-like appearance. It is also used as a refractory material and in oxygen sensors and fuel cells due to its ability to conduct oxygen ions.

Nano-sized and amorphous zirconium dioxide ($ZrO_2$) offers several key advantages due to its unique structural characteristics. The lack of long-range order in amorphous ZrO2 leads to a higher density of surface defects and a larger specific surface area compared to its crystalline counterparts, enhancing its reactivity and catalytic properties. Furthermore, the absence of grain boundaries in the amorphous phase can improve its mechanical properties like toughness and hardness, while at the nanoscale, quantum size effects can lead to novel optical and electronic behaviors. These combined benefits make nano and amorphous ZrO2 highly desirable for applications in catalysis, sensing, high-performance coatings, and advanced electronic devices.

AM provides a unique process for room-temperature, continuous synthesis of <10 nm ZrO2, which offers significant benefits over hydrothermal, batch processes, which are the industry norm. AM has also developed a unique, surfactant-free formulation to create a stable dispersions of the fine nanoparticles.

| Property | Value |
|---|---|
| CAS # | 1314-23-4 |
| Morphology | Sphere |
| Formula | ZrO2 |
| Crystal phase | Cubic / Amorphous |
| Particle size, nm | <10 nm |
| Application(s) | CMP Slurries, optical coatings, catalysis |

The provided specifications are intended for guidance




Particle size distribution (left) and transmission electron microscope image (right) of ZrO2 nanoparticles synthesized by AM