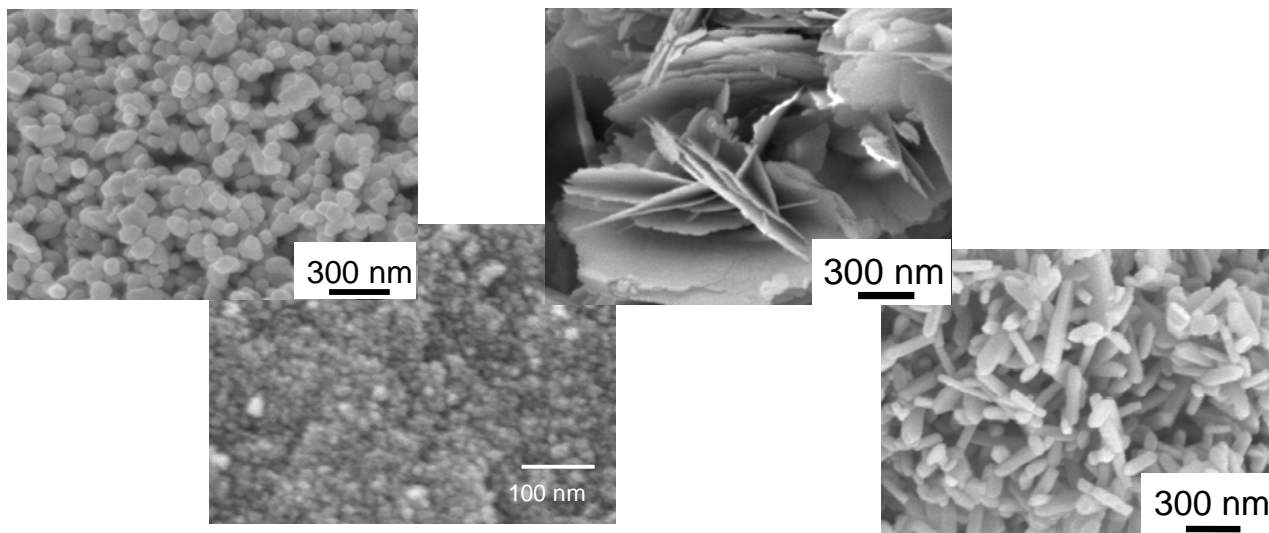


## NANOSIZED POWDERS WITH TAILORED MORPHOLOGY

- APPLICATIONS:**
- ◆ Catalyst supports/carriers
  - ◆ Polishing, CMP
  - ◆ Powders for sintering
  - ◆ Composite reinforcements/fillers (metals, plastics, ceramics)
  - ◆ Pigments
  - ◆ Refractories, membranes, filters, solar cells, piezoelectric devices



Hydrothermal method is very useful to produce advanced nano-powders with controlled sizes and morphologies. Examples of nanosized powders with equiaxed morphology, narrow particle size distributions, and varying median sizes are shown on the photographs above (ZnO left top photo, ZnAl<sub>2</sub>O<sub>4</sub> lower left photo). The nano-powders can also have non-equiaxed morphologies, i.e. be in form of platelets, nano-sheets (right-top photo,  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>), or needles (lower right photo,  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>). Various sizes and morphologies can be achieved for the same phase. Sawyer's nanosized powders have high purity, high BET surface areas, controlled aspect ratios of individual particles, and varying agglomeration levels. Moreover, dopants can easily be introduced into the lattice or their surfaces can be functionalized.

### Properties of Sawyer's nano-powders synthesized hydrothermally\*

Property	Corundum ( $\alpha$ -Al <sub>2</sub> O <sub>3</sub> )	Zinc Oxide (ZnO)	Zinc Aluminate Spinel (ZnAl <sub>2</sub> O <sub>4</sub> )	Custom Oxide Powders
Crystal form	100% $\alpha$ -Al <sub>2</sub> O <sub>3</sub>	100% ZnO	100% ZnAl <sub>2</sub> O <sub>4</sub> spinel	Per users specification, mixed phases possible
Powder morphology	Equiaxed, needles, nano-sheets	Equiaxed	Equiaxed	Per users specification (equiaxed, platelets, whiskers, etc.)
Median particle size (nm)	10-250	90-120	5-15	Per users specification
Aspect ratio (-)	1-200	1	1	Per users specification
BET surface area (m <sup>2</sup> /g)	9-40	9-11	150-300	Per users specification
Chemical purity (%)	95-99.8+	99.9+	99.9+	Typically 99.9+

\*Powders with other sizes, morphologies, purity levels, and dopants may be available upon request.  
 Dispersions may be available upon request

US Patents Pending