

# NnF Ceram<sup>®</sup>-Al<sub>2</sub>O<sub>3</sub>

SoleMio Trading

<https://www.solemiotrading.cz>



## MATERIAL FEATURES AND COMPOSITION

NnF CERAM<sup>®</sup> - Al<sub>2</sub>O<sub>3</sub> is an alumina nanofiber ceramic powder (Al<sub>2</sub>O<sub>3</sub>, or aluminum trioxide), completely formed by an aluminum trioxide ceramic base with minimal amounts of organic traces and impurities.

The nanofibrous alumina material is basically produced in gamma - orientation glass crystalline phase modification -, but the production can be modified to obtain other phases such as alpha alumina.

Aluminum Oxide Nanofibers are elongated nanostructures ranging from 80nm to 100 microns with diameters in the 10-16 nm range.

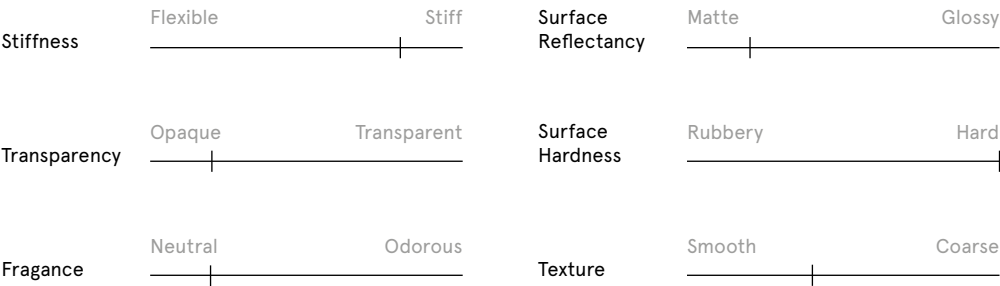
## AVAILABILITY

TRL 9 - Actual system proven in operational environment  
Commercially available in large amount

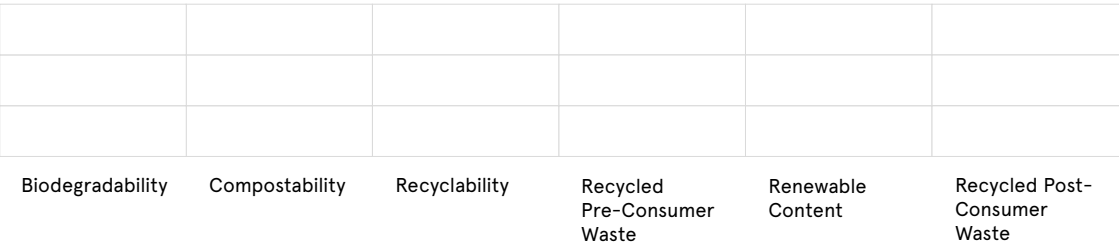
A decorative graphic at the bottom of the page consisting of seven vertical bars of increasing height from left to right, rendered in a light gray color. The bars are positioned on a dark teal background.

TRL9

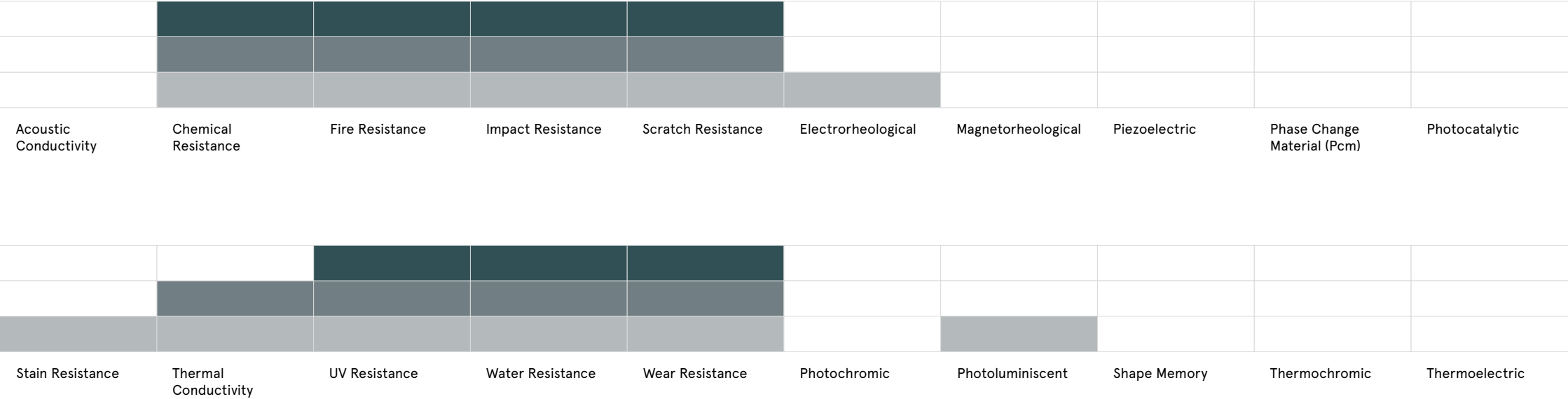
PHYSICAL QUALITIES



SUSTAINABILITY PROPERTIES\*



PERFORMANCE PROPERTIES



SMART PROPERTIES\*

UNDERSTANDING

\*Please see the Glossary at the end of this booklet for more explanation on the terminology.

CERTIFICATES & TESTS

Not available yet.  
All information has been provided by the companies and/or material suppliers that delivered the EM&Ts samples.

SUPPLY

Raw Material	
Processed Material	×
System / Product	

SHAPE



















Powder

MANUFACTURING PROCESSES

Alumina nano-particles are prepared by different methods such as arc plasma, hydrothermal, sol-gel, and precipitation by treating aluminum dross (waste generated from aluminum melting process which, contains aluminum metal, aluminum oxide, and aluminum oxy-nitride) using plasma arc melting process.

TRANSFORMATION PROCESSES

 Additive Manufacturing	 Die Cutting	 Lamination	 Textile Processing
 Blow Molding	 Extrusion	 Metal Working Tools	 Thermoforming Compression Molding
 Casting	 Injection Molding	 Printing	 Welding
 Cold Pressing / Deep Drawing	 Lab Growing	 Rotomolding	 Wood Working Tools



SHAPING

## APPLICATION FIELDS

AlO<sub>3</sub> nanofibers reinforce polymer, cement, and metal matrices by creating a 3D nanomesh within the matrix and strengthening against both compressive and pulling forces. Nanofibers act as a coating toughener and hardener. They can be applied to the electronics industry as they are an excellent dielectric; as additive components (such as glues, sealants, binder for thermoplastics). Among others, nanofibers can also be used as adsorbent, desiccant, and for reinforcing ceramics and composites.



## CASE STUDY

Not developed.

## COMPARISON & INNOVATION

Alumina nanofibers have distinct properties and some keypoint advantages over other similar types of nanofiber. For example, carbon nanotubes, nano silicas, and nanoclays display are affordable in price and industrial volumes, available in dark colors, and they offer stiffness at the expense of elasticity.



## APPLYING

## SUSTAINABILITY PROPERTIES

### Biodegradability

Ability to be broken down into carbon dioxide, water, and biomass by the natural action of microorganisms (aerobic and/ or anaerobic). It is misleading to merely claim biodegradability without any standard specification. If a material or product is advertised to be biodegradable, further information about the timeframe, the level of biodegradation, and the required surrounding conditions should be provided, too.

### Composting

Ability to go through the process by which materials biodegrade through the action of naturally occurring microorganisms and do so to a large extent within a specified timeframe. The associated biological processes will yield CO2, water, inorganic compounds, and biomass which leaves no visible contaminants or toxic residues. The products can be classified in “Home compostable ” or “Industrial compostable”, having each of them specific temperatures, conditions and timeframes defined by international regulations.

### Recyclability

The capacity of a product to be reduced all the way back to its basic materials, reprocessing those materials, and using them to make new products, components or materials. Recycling refers to materials that are processed in practice (as opposed to materials for which recycling is technically feasible), this varies from one region to the other invoking the regulations and technologies of each country.

### Recycled pre-consumer waste

Pre-consumer waste refers to waste produced by manufacturers or industries before released for consumer use. Pre-consumer waste refers also to the reintroduction of manufacturing discards back into the manufacturing process, in this case it is often not considered “recycling” in the traditional sense. Pre-consumer waste is produced in large quantities, while this is easier to collect and sort, high amounts of pre-consumer waste are non-recovered.

### Renewable content

Materials that are replenished at a rate equal to or greater than the rate of depletion and must be produced using regenerative practices or, in a transition phase, using sustainable practices.

### Recycled post-consumer waste

Post-consumer waste is the waste produced at the end of a consumer-product lifecycle. Post-consumer waste has served its intended purpose, passed through the hands of a final consumer, and has been discarded for disposal or recovery. It usually refers to the household waste we generate every day, and does not include manufacturing or converting wastes. Depending on the type of waste, governmental legislation and the action taken by the consumer, post-consumer waste is recycled, sent to landfill or incinerated.

## SMART PROPERTIES

### Electrorheological

Change in the rheological properties (viscosity and viscoelasticity) of a material caused by an electrical stimulus.

### Magnetorheological

Change in rheological properties (viscosity and viscoelasticity) of a material caused by a magnetic field.

### Piezoelectric

Phenomenon exhibited by certain materials, which when applying mechanical stress, generate electrical energy. The effect can also be inverse, that is, they can present small deformations when an electrical current is applied.

### Phase Change Material (PCM)

Materials considered latent heat storage units: They are capable of absorbing or releasing a large amount of thermal energy when they undergo a phase change (from solid to liquid, from liquid to gas, or vice versa).

# GLOSSARY

### Photocatalytic

A substance that increases the speed of a chemical reaction by the effect of light or other forms of radiant energy.

remembers a single shape, when heated) and which can be educated to achieve a double shape memory effect (in which the material memorises two shapes in a hot and cold state).

### Photochromic

Reversible color change induced by the indication of sunlight or UV. The color disappears when the fountain ceases.

### Thermochromic

Reversible or irreversible color change induced by temperature changes.

### Photoluminescent

Is the emission of cold light caused by the absorption of electromagnetic radiation (visible light, UV, X and cathode rays). There are two types of luminescence: fluorescence (emits light only during absorption of radiation) and phosphorescence (stores absorbed radiation, so that it continues to emit light for a time after the stimulus subsides).

### Thermoelectric

Property that supposes a change of voltage in response to a variation of temperature and vice versa.

### Shape Memory

The material with this property recovers its initial shape after being permanently deformed (plastically) when heated above a characteristic transition temperature of the material. In addition, while regaining its form, in some cases it is able to perform work. The characteristics of these materials, depending on the temperature, contemplate superelasticity (which grants large elastic deformations in a specific range of temperatures), simple shape memory effect (in which the material

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## GLOSSARY



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and projects from  
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## NANOMATERIALS EM&TS

Entirely carbon-based materials, nano-scaled structures or composite blends whose properties are altered by surface and/or substrate doping thereof. NANO TECH: Matter controlled at molecular level, which is smaller than a micrometres, normally on scales of 1 to 100 nanometres.

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