Report: Ceramic Coatings

Preface- ISBU Association and Ceramics

As you may realize, our organization has been one of the most visible promoters for the insulative use of Ceramic coatings and cenospheres. Due to our visibility we have received much data, comments and input from both consumers and researchers alike.

We have absolutely no financial benefit from any of this in any way. It is simply a passion of the Eco-insulation concept and non-toxic cenospheres just as is our passion for the ISBU technology concept.

In 2006 our founder was introduced to the technology and use of “ceramic coatings” and cenosphere technology while conducting his research on shipping container construction. His interest was instant, simple and very understandable. Ceramic coatings are extremely compatible with steel, they are safe, sustainable and non-toxic.

As our founder noted, “one day quite by accident, I was at a shipping facility with two side-by-side shipping containers and this technology grabbed my attention”. In front of him at a container manufacturer were two identical shipping containers but one with normal paint and the other coated with ceramic paint. “I could feel the difference immediately”, he said. “One was extremely hot to touch, the other was just warm. Then when I walked inside, one was a virtual oven but the coated container was just normal temperature”. “I needed no more introduction to this incredible ceramic technology”, said Mr. Naef, “I only wanted to know how to use it properly”.

To avoid any controversy our organization has not accepted any funds or sponsorship from these companies. Additionally we have also rejected anyone in the ceramic coating or cenosphere industry who has wanted to join the ISBU Association as a corporate member or to sponsor any of our research. We want to keep far away from any potential controversy. We believe our research and opinions are about as pure and unbiased as you can get.

We believe in it's potential, economy, safety and environmental benefits. It's that simple.

Preface- Ceramic coatings and Cenospheres

This is not intended to be a scientific exposé on ceramic coatings but a simple, factual and easy to understand report on the technical aspects of the cenosphere and ceramic coating products and ceramic coatings industry.

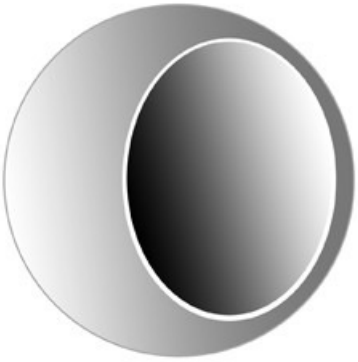
A “ceramic coating”, as referred to in this report, is a coating comprised of cenospheres or ceramic nano particles which are suspended in a liquid and painted onto a surface. The liquid can be virtually any type of paint, epoxy, coating or other material that is liquid and can be dried. This can also include high heat powder coatings.

As you read the Glossary and definitions below we want you to closely observe that ceramics are now very technical and possess strong thermal and insulating properties which has made our space age and electronic inventions possible; for example the highly efficient superconductors and micro-electronic technology for computers, solar cells and aerospace.

Glossary-

Ceramic materials: One or more of earths natural elements or minerals can be called ceramic. Ceramics are an array of chemicals and elements once known mainly in the manufacture of artwork, pottery, décor, cookware and floor tiles; ceramics are now also commonly used in electronics, superconductors, aerospace, solar cells, catalytic converters, micro-electronic thermal barriers and micro-electronic insulations. Ceramics generally possess very powerful “non conductive” and insulative properties. Examples of some common ceramics are silicate glass, irons, carbides, aluminum, pure oxides, titanium, clay, and zirconium.

Cenospheres: a cenosphere (ceramic sphere) is a hollow microscopic ball made of smooth silica-aluminum and other minor ceramic elements. Ceno (hollow); Sphere (round).



The microscopic balls are hollow, thin walled, filled with air or other inert gases, and they are absolutely non-toxic in any way.

(see enlarged cutaway diagram at left)

The actual physical makeup of this unique cenosphere is basically that of smooth, hollow purified silica sand and very durable.

Other names for Cenospheres are: micro balloons, micro spheres, nano spheres, ceramic spheres, micro beads.

The total diameter of the cenosphere is the thickness of a hair or even smaller. The grade of a cenosphere most often used for high quality and smooth coatings is more like fine dust and not granular like sand. These microscopic hollow beads still insulate well even in thin layers.

Why are they called ceramic? There are many types and grades of cenospheres. Depending upon the type of cenosphere you choose it can be made of many elements and percentages of silica, aluminum, iron, titanium, zirconium, etc. Different cenospheres have different properties, specifications and uses. Using the correct cenosphere in a ceramic coating is critical to its proper performance.

Colloidal: a liquid suspension of microscopic particles. A colloidal process has the unique ability to suspend minerals, metals and ceramics evenly in a liquid form. A common example would be colloidal silver. The size of such particles is much smaller than cenospheres. They are only 1-4 μm size rather than the 20-150 μm used in high quality cenosphere formulas.

This colloidal suspension principle is often referred to by some scientists as nano technology. The use of colloidal ceramics allow much thinner insulative coatings often used in aerospace and microelectronics. A coating for a home or roof does not need such thin coatings.

Emissivity: the ability of an object or surface to emit or deflect Infrared (IR) energy. Their emissivity can have a value from 0 (shiny mirror) to 1.0 (blackbody). Most surfaces have emissivity values close to 0.95.

Absorption and deflection are a simple way to think of emissivity. A shiny mirror deflects heat and energy and is rated Low-e. Black bodied, asphalt and concrete absorb energy and heat and therefore are rated High-e. Ceramic coatings are Low-e materials and create Low-e surfaces.

Glass micro-spheres: a very different process of manufacturing and possess very different ceramic properties. These are man-made and more expensive than cenospheres. A glass microsphere has the same insulative abilities but may not be as effective in UV and IR deflection due to its lack of multiple ceramics.

Insulation: Dictionary reference
1. the state of being isolated or detached; 2. a material that reduces or prevents the transmission of heat or sound or electricity [syn: insulating material] 3. the act of protecting something by surrounding it with material that reduces or prevents the transmission of sound or heat or electricity. Source: WordNet by Princeton University

Certain formulas of ceramics are well known and commonly used in aerospace and high tech manufacturing.

Nano technology: meaning extremely small, or the smallest possible. Nano particles are referring to super micro sized particles only observable with a high power microscope.

As relating to Ceramic Coatings, nano can mean ultra small cenospheres, which is probably a hyped misuse of the word nano, or nano may refer to colloidal ceramic solutions which would be a more accurate use of the word nano.

Most true nano technology regarding Ceramic coatings is done with fine powders and the colloidal compounds for high heat ceramics not necessary for home or roof coatings. The cost of the nano particles is considerably higher than using cenospheres. (see Colloidal)

Understanding The Technology
The purpose of this bulletin is not to debate whether or not Ceramic Coatings are a valid technology, but rather realizing they absolutely are and how can they best be used effectively.

A very proven technology

The principle reason many people feel the Ceramic Coating technology is a scam is simply lack of education or understanding. Any intelligent person must realize that this technology is being used “commonly” on the buildings and equipment of the largest corporations globally. Without thinking too deeply one must quickly realize the CEO's and management of these do not pay thousands and millions of dollars on such technology without absolute proof and confidence it is real.

Additionally, container loads of cenospheres are very commonly used daily in virtually every technology and manufacturing industry on the planet because of their unique thermal abilities and nontoxic characteristics. To any slightly intelligent person it isn't a question of whether the Ceramic coating and microscopic barrier functions, but a question of how can it be better utilized and what are it's true limitations.

The “microscopic barrier” process

What was the theory that first created the interest in “cenosphere technology” by scientists and electronic researches?

From what we understand, there were four main areas of interest.

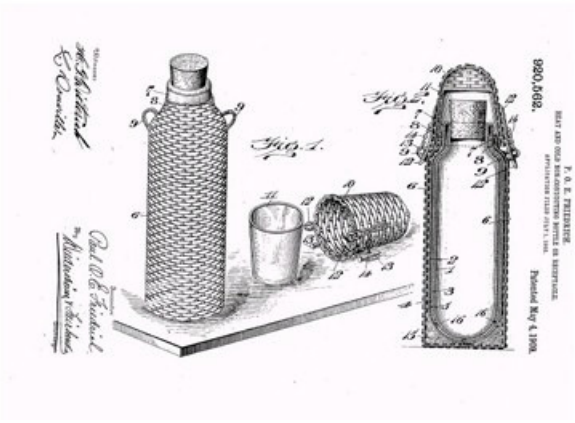
1) Microscopic Insulation, both heat and electrical
2) Microscopic UV deflection
3) Microscopic Infrared deflection
4) Microscopic Fillers & Binders; non-toxic, neutral Ph,

Cenospheres are the key ingredient in Ceramic coatings. Cenospheres are derived “fly ash” in a multi filtration process, then filtered again to separate the specific grades and qualities of cenospheres used in coatings and high tech.

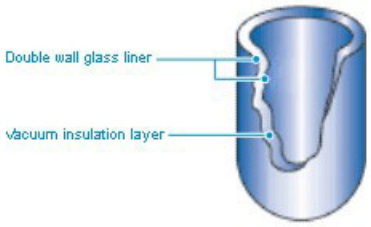
Fly ash is used principally in asphalt, cement and road construction. Cenospheres, its hollow and more sophisticated cousin is used in high tech manufacturing, aerospace and other technologies. Although fly ash has been used in construction and cement manufacturing since the '30s and '40s, there is not much known of cenospheres until the mid '70s when they became of great interest by aerospace and high tech researchers.

Their interest then was:
- Insulative properties
- Extreme hardness
- Durability in high heat
- Emissivity

Such combinations in this substance offered the scientists many high tech options. The principal of why cenospheres are insulative is quite simple. We have all used a Thermos© at some time in our lives and this amazing glass lined invention kept our drinks either super hot or cold for many hours. It is far more efficient than the cheaper styrofoam lined models.



The 1907 invention continues today with the same efficiency utilizing the scientific principle of hollow layers of glass which reduce the conductivity of heat/cold exchange and thus create the extremely efficient insulation process. ...not thick layers of fiberglass or foams but very thin layers of hollow glass.



Thermos principle

Cenosphere principle

The principle of Cenospheres and Ceramic coatings are similar but with other advantages. Besides the hollow glass principle, the cenospheres themselves are made of insulative ceramics that are insulative even without the hollow void principle used by the thermos.

Highly insulative, UV resistant, IR resistant ceramics with a hollow core.... Thick or thin, these principles function well in heating or cooling everything from foods to microelectronics.

Who discovered the cenosphere technology and why has there been so much controversy?

Cenospheres have been known for many decades but only after NASA began to investigate ceramics in the 1970's were their unique properties fully discovered. Back in those days ceramics were not being investigated for deterring sunlight but for insulating the space shuttles from the high heat developed upon re-entry to earth. But either way, ceramics were discovered and utilized because of the “heat deflection” and “insulative properties”. These properties cannot and are not disputed by any scientist or any educated technician.

So why so much controversy regarding the use of ceramic paints as a thermal barrier on and in homes, offices and industrial facilities?

We have been investigating and compiling information on ceramic coatings for almost three years and here is what we have concluded:

Cenospheres and ceramic coatings absolutely do have scientifically proven insulative, reflective and thermal properties and benefits. Cenospheres are used in many manufacturing and high tech application globally, not just for Ceramic paints or coatings.

The damage has been that most of the manufacturers of “ceramic paints” have been overstating their performance and without documentation, thus opening this excellent “proven” technology to much doubt and criticism.

A few incidents of well meaning entrepreneurs using “glass cenospheres” in their formula rather than “ceramic cenospheres” and the UV and infrared deflection and ultimate result is much different.

Additional problems arise in using the wrong sizes of Cenosphere.

Since mid 2008 we believe virtually all the fraudulent companies are out of business and the hype and claims of most of the legitimate Ceramic paint manufacturers are quite toned down.

We prefer to accept laboratory comparison facts.

Are ceramic coatings an insulation?
Absolutely! But since IBC and other building codes are rated in R-value it is difficult to conduct studies that will comply. R-values are rating thermal resistance related to thickness and not necessarily thermal and insulative efficiency.

Unfortunately the only approved R-value testing methods are according to ASTM (American Society of Testing and Materials) guidelines and to begin a test your insulative material must be a minimum 1" thick. We hope that standard will change soon.

No matter how you look at it ceramic coatings are deflecting heat and reducing "heat transfer" between two objects. To the world of science and also to a consumer that is insulation. But to those stuck on R-value and conventional building codes as they are now there is no way to compare.

We are very thankful that microelectronics, superconductors and the new solar cell technology does not require R-factor to use microscopic ceramic insulation in the new chips. If so we would have no PC's, cell phones or other space age technology.

Can a micro thin layer of ceramic actually insulate?
Ceramics can, and do. The micro electronics industry use even thinner layers of ceramics and ceramic materials to insulate and stop conduction. Ceramic paint coatings are many times thicker than the ceramic insulation in the electronic industry.

Micro layers of ceramics insulate....!!

Why is the formula and size of Cenospheres so important?
That is one of the biggest questions we continue to have. Aren't all cenospheres the same? Actually there are many types of cenospheres and many grades of cenospheres. These are the critical points in developing a successful formula: You must have various sizes and a broad size range to be effective. The failure of some brands has been due to the lack of size range. That means the formula must contain various sizes to plate, compress and fill in gaps.

What are the actual benefits and properties of Ceramic coatings?
The "actual" benefits and properties of Ceramic coatings, "not hype" are as follows:

-Four ceramics claim: The four (4) ceramics claim is actually valid with most ceramic coating manufacturers who use high quality cenospheres.

-Low-e rating: Meaning it has a very low emissivity rating and significantly deflects heat from a surface and does not absorb. Therefore accounts for the fact it functions either outdoors or indoors.

Example of emissivity: Steel and concrete have high-e ratings while ceramic coatings and aluminum have low-e ratings.

-Mold resistant: Cenospheres do not support mold growth and also assist the paint in becoming a little more naturally water resistant.

-Non conductive: Cenospheres and its ceramics resist both heat transfer and electrical transfer and are therefore used in many industries as insulators. Electronic micro-chip manufacturers use micro thin layers of ceramics as their insulators. Non-corrosive.

-Sound proofing: Due to the non-conductive hollow structure, cenospheres are very efficient at reducing sound transmission even with the thin coating.

-Thermal insulative: Because the ceramic coating is Low-e, non-conductive and UV resistant a two layer coating can safely achieve reduction in heat loss. That is easily tested and proven with a heat gun.

-Fire Retardant: Yes & No. Cenospheres themselves are absolutely fire proof. However, the paint or coating you use may not be.