Nano Technology
Thermal Insulation Coating with Nano Ceramics

MJ GOLD S.A. Switzerland
Exclusive distributor – Europe, Middle East & Australia
Introduction

Can you imagine the world in the year 2050 that is no longer dependent on oil or fossil fuels for our energy needs? A reduction of national energy use by a factor of over 50%? Homes and businesses that have little to no carbon footprint?

All of this is possible and has been outlined in a book called “Re-inventing Fire” written by Amory Lovins from the Rocky Mountain Institute. This can be done with today’s technology.

Sustainability is no longer an overpriced way of making our world Green.

Because of new technology it is now cheaper, more productive and now has a higher return on investment than ever before. It is estimated that in the next 15 years the building and retrofitting of all forms of residential, industrial and commercial construction in a sustainable way will be significant.

One of the key elements in all aspects of sustainability using the whole systems approach to construction and renovation is the use of many different forms of insulation.
In the 1980s, the space shuttles in the NASA program were having difficulty re-entering the atmosphere without the nose of the space shuttles burning up. Engineers in conjunction with NASA developed a multiceramic coating that enabled the shuttle the reenter the atmosphere without burning off the nose of the shuttle even though the temperatures reached 2000 degrees centigrade.

This technology has been incorporated into our products so that we can obtain “Multicermics”.

**Applications range from :**
- Civil Engineering, Building & Construction
- Industry
- Oil & Gas pipelines
- Chiller Pipes & Steam Pipes
- Airconditioning Ducts
- Cryogenic
- Shipping

Numerous other applications and uses
MULTICERAMICS™ coating is a unique, liquid insulation designed to insulate and protect against energy loss from hot and cold temperature variance and can be applied to virtually any surface type.

Multiceramics has been developed using the latest technologies in blended ceramic materials and is composed of nano inorganic ceramic spheres that are non toxic, whilst being environmentally friendly.
What is a nano ceramic sphere

The nano ceramic spheres have an internal vacuum similar to that of a thermos.

Their molecular properties allow products containing them to block heat loss during the cold months and to avoid the absorption and accumulation of unwanted heat inside in the warmer months.
The diagram, to the left, shows how the ceramic spheres interact when applied to a substrate. The ceramic spheres in the Multicermics coating slow heat or cold transmission, giving it its insulating characteristics & qualities.

The ceramic spheres, the principle component of the Multicermics product, reduce heat transfer using a very thin coating beyond most common insulations in today’s market.

Multicermics can save as much as 40% of energy costs for heating and/or cooling for residential, commercial and industrial buildings.

The unique size, types and shapes of the ceramic spheres permits the product to settle very tightly together and not allow air to interact between the ceramic spheres, producing a "Micro packing" effect. This technology far surpasses the abilities of older, obsolete coating products.
MULTICERAMICS TECHNOLOGY

MULTICERAMICS™ is a one part insulation coating composed of high performance nano technology with tough elastomeric acrylics, and waterborne resin additives in a formulation of a special blend of multi-ceramics that block better than 95% of the sun's radiant heat, visual light, ultra violet and infrared rays.

MULTICERAMICS™ is a permanently flexible, "breathing" membrane that stops water penetration, is absolutely water proof, will not rehydrate and prevents corrosion and surface deterioration.

The Multiceramics technology gives the product line not only reflective attributes but also non-conductive properties to reduce hot or cold energy transfer.

The unique size, types and shapes of the ceramic spheres permits the product to settle very tightly together and not allow air to interact between the ceramics, producing a "Micro packing" effect. This technology far surpasses the abilities of older, obsolete coating products.
MultiCeramics™ technology provides corrosion protection and "MicroPacking" that reduces surfaces maintenance many times the normal life span of any application, it saves energy, provides longer life to properties and surfaces. Unlike the traditional materials such as fibreglass or foams, it poses no health hazards and offers greater comfort by outperforming all others under most conditions.
Chemically Different

MultiCeramics™ unique performance characteristics are based on a polymer chemistry that is amorphous, rather than crystalline, in nature. Crystalline liquids dry to a bed of thousands of tiny individual crystals, which can separate under maintenance traffic, temperature variations, or normal building flexion. Amorphous chemistries process a random molecular structure, drying to a fibrous, continuous film, with 25 times the elasticity of fiberglass felt.

Dimensional Stability

When bent, MultiCeramics™ returns to its precise linear dimensions within a ± tolerance. It remains 99% dimensionally stable throughout its useful life. This linear flexing without cracking or dimensional changes facilitates MultiCeramics™ installation around cooler bases, exhaust chimneys and up parapets, and assures a continuous self-flashing, weather resistant seal over the entire roof’s surface.
Fire Resistant

MultiCeramics™ offers an additional benefit to commercial and residential users in dry or fire-prone areas. While no lightweight roofing material is fireproof, MultiCeramics™ has no flash point. Should an outside flame be applied directly to the roof's surface, the material itself will deteriorate, but will not ignite.

Embrittling-Resistant

After years in the sun, or of enduring climatic extremes, petroleum-based roofing matter can become brittle, and crack. MultiCeramics™ has been formulated specifically to withstand the searing heat of the Arizona deserts while retaining inherent structural flexibility. To date, industrial and residential applications have undergone in excess to 105,120 hours of continuous exposure to the desert climate, including day/night temperature variations of 60 degrees (16° C) without failure and without embrittling.
Water Proof NOT "Moisture Proof"

MultiCeramics™ continuous-filament, single-ply fluid provides one of the most efficient long-life moisture barriers available in the industry today, with a moisture-vapor transmission rate of just 0.94 perms per mil.

No Added Plasticizers or Flame Retardants

The flexible, non-combustive qualities of MultiCeramics™ are inherent in the product's chemical formulation and remain properties of the cured film throughout its life. Some competitive coatings contain plasticizers and flame retardant additives, which leak out over time causing the coating to become brittle and crack, permitting moisture to penetrate substrate materials.

MultiCeramics™ was designed to reduce labor costs by:

1) Permitting application by unskilled labor
2) Long lasting
3) Its ability to be applied over virtually any material
4) Its inherent ease of maintenance & repairs.
APPLICATION & THERMODYNAMICS:

MULTICERAMICS liquid insulation can be applied on virtually any surface, including existing pipe insulation. The primary function of MC is to reduce heat transfer. Here is a brief outline of the four main thermodynamic heat transfer properties:

- Conduction is heat transfer through direct contact due to temperature gradient
- Convection is heat transfer from hot air or liquid as it flows over a substrate
- Radiant energy is heat transfer from electromagnetic waves (including those of visible light)
- Infrared or IR is heat transfer from light or any other heat source

A MULTICERAMICS application simultaneously addresses all four thermodynamic heat transfer properties of CCRI. The MULTICERAMICS composition is a matrix of microscopic, multi-ceramics in a carbon-neutral polymer.

One of the core applications for MULTICERAMICS liquid insulation is to control condensation caused by temperature changes and variances in ship hulls, bulkheads, overheads, pipes, refrigerated equipment and other surfaces which tend to develop moisture related problems.
MULTICERAMICS is a flexible insulation which is also regularly applied to barges, push boats, tugs, fishing fleets, pleasure crafts, drilling rigs and platforms, offshore machinery, piping, pipelines, boilers, water separators and other applications.

KEY ATTRIBUTES

- R19 Equivalent protection with a coat thickness of approx. 0.007” (inches) (180 micron) \( (R19 = 6 \frac{1}{4}” \text{ fibreglass} = 15.87 \text{mm}) \)
- No Color Fading and “Cool Touch” Technology
- Sound blockage – “STC”
- Outperforms Energy Star Best Practices Guidelines for energy savings
- Surpasses California Cool Roof (Title 24) program requirements
- Both interior and exterior application benefits
- USDA approved
- Water proof (Not just water resistant)

- Blocks 95% of infrared heat
- Resists mold & mildew
- 25 Years residential life expectancy
- Class "A" Rated "0" flame spread (ASTM_E84-09)
- Passed 5000 hours salt spray tests (ASTM D1654-08)
- K value (0,021) \( (W/mK) \) (EN12667:2002 & ASTM C177 )
In accordance with the Material Safety Data Sheet (MSDS) standards and guidelines, the entire Multiceramics product line has been approved for shipment & transport via any commercial airline or utilising the United States Postal Service.

Multiceramics products are formulated based on water-based, polymer technology and the products contain none of the following:

- No Solvents
- No V.O.C.s
- No Known Carcinogens
- No Lead
- No Mercury
- No Formaldehyde
- No Neurotoxins
- No Other Known Hazardous Materials
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of coats needed to achieve optimal thermal insulation</td>
<td>Two</td>
</tr>
<tr>
<td>2</td>
<td>Full cure time at 70°F</td>
<td>1 to 2 days</td>
</tr>
<tr>
<td>3</td>
<td>Square feet coverage per gallon for optimal thermal insulation</td>
<td>100 to 120</td>
</tr>
<tr>
<td>4</td>
<td>If there is rain or condensation, must wait another 72 to recoat</td>
<td>No, after 2 - 6 hrs</td>
</tr>
<tr>
<td>5</td>
<td>Number of years before reapplication needed</td>
<td>10 to 20</td>
</tr>
<tr>
<td>6</td>
<td>May be submerged in water or have continuous exposure to moisture</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Contains VOCs</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Needs protective gear to install</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>Contains carcinogens</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Thickness need to apply to existing cold pipes (-100°F -250°F)</td>
<td>50 to 90 Mill</td>
</tr>
<tr>
<td>11</td>
<td>K-value (EN 12667:2002) $\lambda = 0,1943 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$</td>
<td>0.021</td>
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<tr>
<td>12</td>
<td>Zero flame spread</td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>Fungal and mold resistant</td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>Stops condensation</td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>Type of products</td>
<td>Paintable Coating</td>
</tr>
<tr>
<td>16</td>
<td>Water permeable</td>
<td>Yes</td>
</tr>
<tr>
<td>17</td>
<td>Can be applied to pipes with existing insulation</td>
<td>Yes</td>
</tr>
<tr>
<td>18</td>
<td>Application thicker than 4 mils will cause problems with curing or crack</td>
<td>No</td>
</tr>
<tr>
<td>19</td>
<td>Washable</td>
<td>Yes</td>
</tr>
<tr>
<td>20</td>
<td>Nanotechnology</td>
<td>Yes</td>
</tr>
<tr>
<td>21</td>
<td>Apply to interior or exterior substrates</td>
<td>Yes</td>
</tr>
<tr>
<td>22</td>
<td>Has rust encapsulating products</td>
<td>Yes</td>
</tr>
<tr>
<td>23</td>
<td>Micropacking</td>
<td>Yes</td>
</tr>
<tr>
<td>24</td>
<td>Storage requirements</td>
<td>40 F. to 100 F.</td>
</tr>
<tr>
<td>25</td>
<td>If coating freezes can it be thaw out and use</td>
<td>Yes</td>
</tr>
<tr>
<td>26</td>
<td>Weight per gallon</td>
<td>6lbs</td>
</tr>
<tr>
<td>27</td>
<td>Odorless</td>
<td>Yes</td>
</tr>
<tr>
<td>28</td>
<td>Tested ASTM C177</td>
<td>Yes</td>
</tr>
<tr>
<td>certificato CSI N. 0035/DC/TTS/08</td>
<td>POLIURETANO A SPRUZZO RANGHETTISOL RSM-35/40 Posato in opera</td>
<td>POLISTIRENE O POLISTIROLO ESTRUSO</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------</td>
<td>---------------------------------</td>
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<tr>
<td>COEFFICIENTE DI TRASMISSIONE DEL CALORE $K=\Delta S$</td>
<td>$\lambda = 0,022$ $d = 35/40$ Kg/mc</td>
<td>$\lambda = 0,035$ $d = 30-35$</td>
</tr>
<tr>
<td>$0,66$</td>
<td>cm 2,2</td>
<td>cm 3,5</td>
</tr>
<tr>
<td>$0,50$</td>
<td>cm 3,3</td>
<td>cm 5,3</td>
</tr>
<tr>
<td>$0,40$</td>
<td>cm 4,4</td>
<td>cm 7,0</td>
</tr>
<tr>
<td>$0,33$</td>
<td>cm 5,5</td>
<td>cm 8,8</td>
</tr>
<tr>
<td>$0,28$</td>
<td>cm 6,7</td>
<td>cm 10,6</td>
</tr>
<tr>
<td>$0,25$</td>
<td>cm 7,9</td>
<td>cm 12,5</td>
</tr>
<tr>
<td>$0,22$</td>
<td>cm 8,8</td>
<td>cm 14,0</td>
</tr>
<tr>
<td>$0,20$</td>
<td>cm 10,0</td>
<td>cm 15,9</td>
</tr>
<tr>
<td>$0,18$</td>
<td>cm 11,0</td>
<td>cm 17,5</td>
</tr>
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</table>
The nano ceramic coating appears compact & dense when the container is first opened.

Must be mixed well before use. We recommend the use of an electric mixer with 200-300 rpm for approx. 2-3 minutes.

It is **strictly forbidden** to mix or add products within the Multiceramics thermal coating protection (DO NOT ADD WATER OR SOLVENTS).

Multiceramics can be tinted to most colors from a standard paint chart.

If Multiceramics is not used for more than half an hour, you will need to stir carefully before applying.
We recommend 2 coats of Multiceramics thermal coating. Film Thickness: MULTICERAMICS™ should be applied at 12 mils wet (0.300mm) / 7 mils dry. (0.170mm)

Dry Time: One hour to touch at 70F (21°C) Fully cures in 5 days. Can also be force dried. Lead and chromate free.

Multiceramics is an excellent insulating barrier. By applying 2 coats will provide an R19 insulating barrier. Multiple layers can provide up to an R60 insulating rating. It all depends on the customer’s requirements.

We recommend using a natural bristle brush, which fit better to paint with nano ceramic compared to the nylon bristles.
In addition to the brush, you can also use a roller - ½ or ¾ to obtain a homogeneous surface. Can also be applied with a spray gun.
Applications & Uses

Historical buildings - Restoration
Building Construction & thermal protection in severe hot climates
Building Constructions – Residential & Industrial

Upgrading Thermal protection categories for building complexes with MULTICERAMICS
Thermal Insulation & Protection for Industrial Use
Multicermamics keeps heat in the pipes and therefore there is a significant reduction in the amount of energy needed to heat the steam leading to considerable energy savings.

Steam pipes at temperatures of 370° F, after applying a thin coat at a thickness of 40 mils the temperatures were reduced to 245° F (118° C).
Hospital Internal pipes had no insulation and had a reported high energy consumption before being insulated with MULTICERAMICS Technology.

Thermal Insulation for the comfort of the passengers with MULTICERAMICS Technology.
Airconditioning systems & ducts

Humidity created around the airconditioning system duct work.

After applying Multiceramics = Immediate elimination of condensation
Airconditioning system with the piping constantly exposed to weathering, sunlight and UV rays. Problem - Continuous maintenance on piping insulation. With the use of Multicermics the problem has been resolved along with a reduction in energy consumption and a decrease in operating temperatures.
Welcome to the world of Nanotechnology

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