

Cooling energy savings from high reflective coatings using Omyasphere, hollow microspheres

Milano, Italy | October 8th, 2025

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Agenda

1. Challenge and Solution
2. Microspheres / Lightweight Fillers Overview
3. Omyasphere 900 series: Hollow Glass Microspheres
4. Case Study: High Reflective Coating
5. Summary



Heat Build-up and Energy Consumption

In most countries, energy usage in the building sector represents almost **one-third of the total energy** consumption.

In many developed countries, the residential building sector accounts for **more than half of the electricity** consumption.

In warm areas, **air conditioning accounts for up to 60%** of residential energy use.

The demand for residential cooling, and consequently **the required energy, is expected to increase** significantly as a result of global warming phenomena.

Countries located in tropical or sub-tropical zones are already concerned with **increasing energy cost**, lately it's also becoming a pronounced issue in temperate zones.



How To Overcome The Heat Build-Up?

Over the past few years, **highly reflective coatings** have received increasing attention thanks to their contribution to the reduction of overall **heat transmission**, enhancing “comfort properties”.

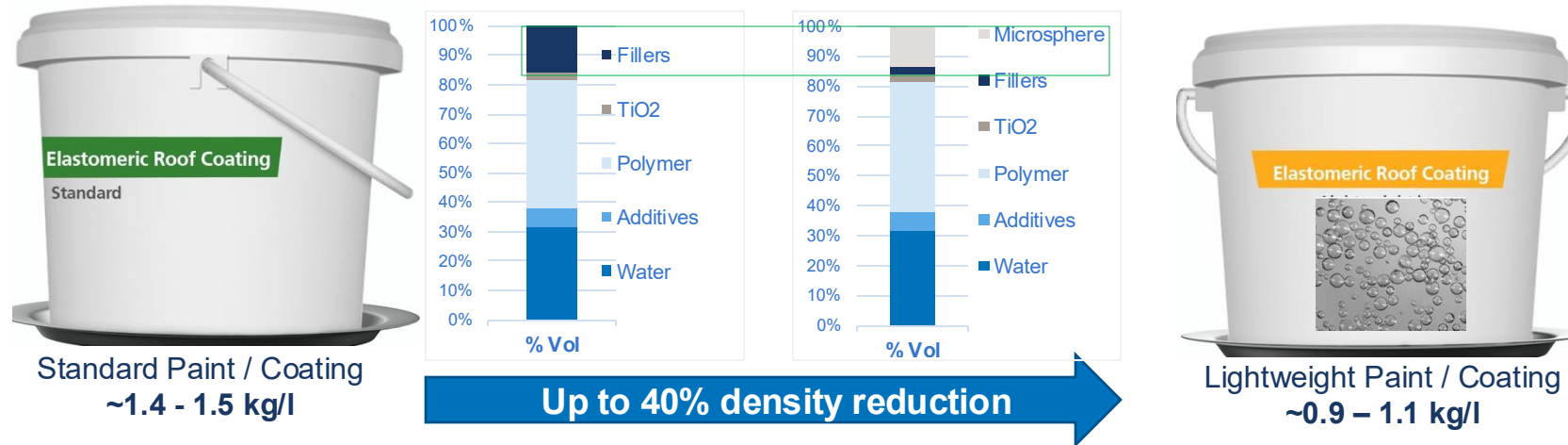
The working principle of reflective coatings is mainly based on **high solar reflectance** using **TiO₂** and **engineered mineral fillers (e.g. calcium carbonate)** with high purity, optical properties and tailored PSD.

Recently, the use of **lightweight fillers / microspheres** is increasing due to their positive impact in additional properties (e.g., **thermal conductivity, diffusivity, emissivity**), enhancing the insulating properties of the coating and leading to **cooling energy savings**.

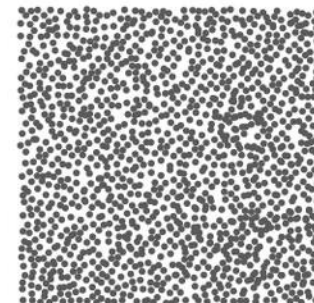
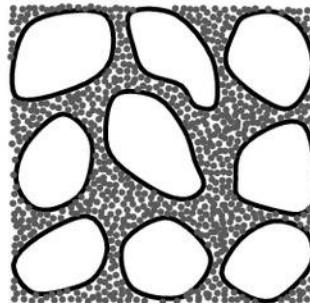
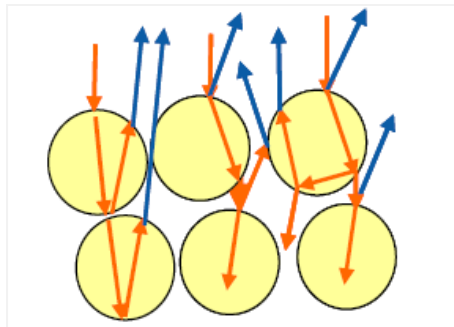
In addition to enhancing thermal insulating properties, lightweight fillers / microspheres can match current market needs calling for **weight reduction, higher elongation, reducing weathering** and extending **service life** and overall improving the **sustainability** of coatings.

Mechanism of Microspheres / Lightweight Fillers to Enhance Insulating Properties

Partial replacement (by volume) of mineral filler by Lightweight Fillers / Microspheres

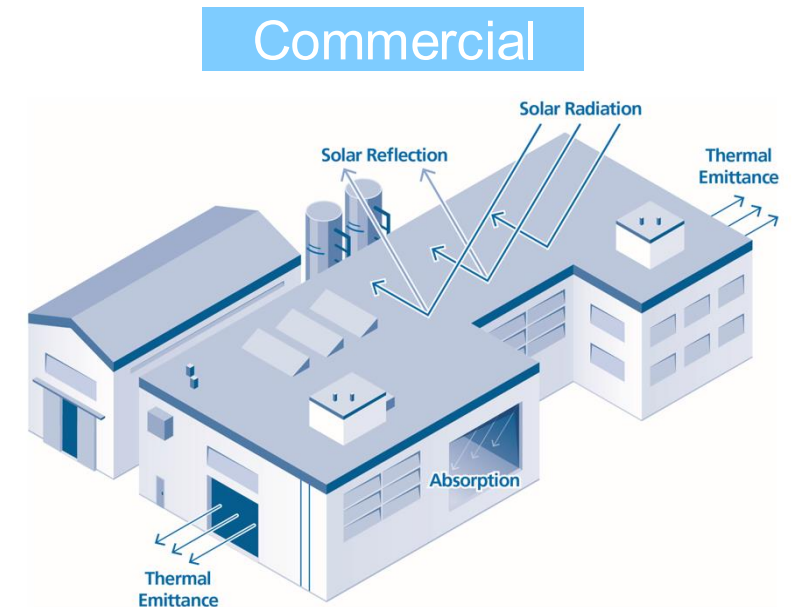
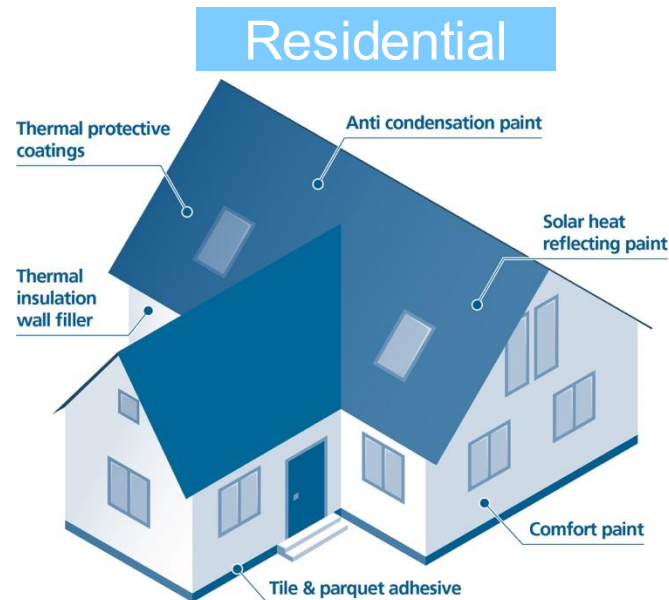


- **Hollow Microspheres** reduce the **thermal conductivity** and help to **reflect solar radiation**
- **Due to its low surface area**, higher raw materials efficiency, allowing for formulation optimization



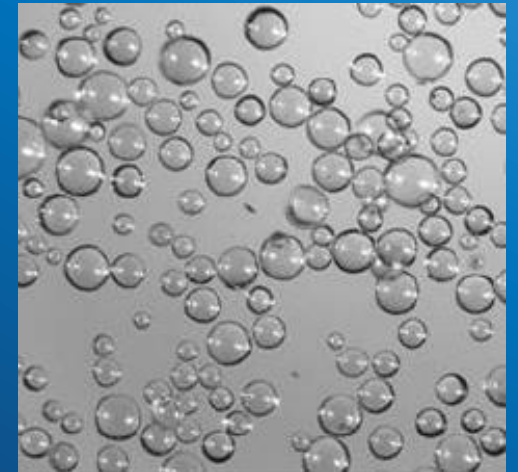
Where can Microspheres be Used for Improving Comfort Properties?

The use of lightweight fillers / microspheres improves overall comfort properties (solar reflectance, thermal conductivity, emittance, diffusivity, acoustic, anti-condensation)



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Microspheres / Lightweight Fillers Overview



Main Lightweight Fillers

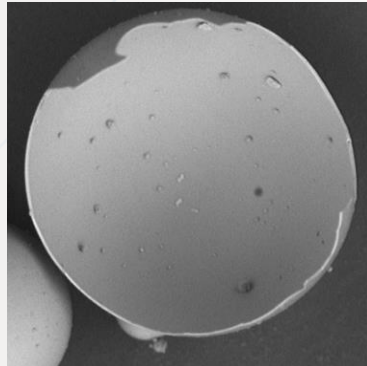
- ✓ True Density or Effective Particle Density <1 g/cc
- ✓ Hollow Structure, Microsphere
- ✓ Lightweighting and Insulating as main Function intended

Hollow Glass



Omyasphere 900 Series

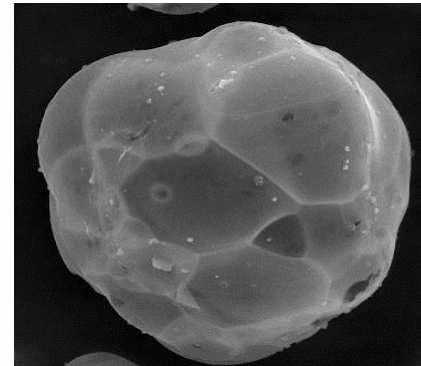
Cenospheres



Expanded Glass



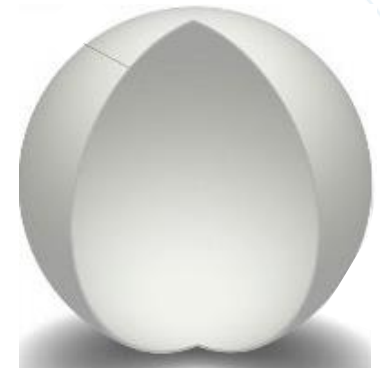
Closed-Cell
Expanded Perlite



Omyasphere 200 Series

Omyasphere 400 Series
Higher Resistance

Polymeric





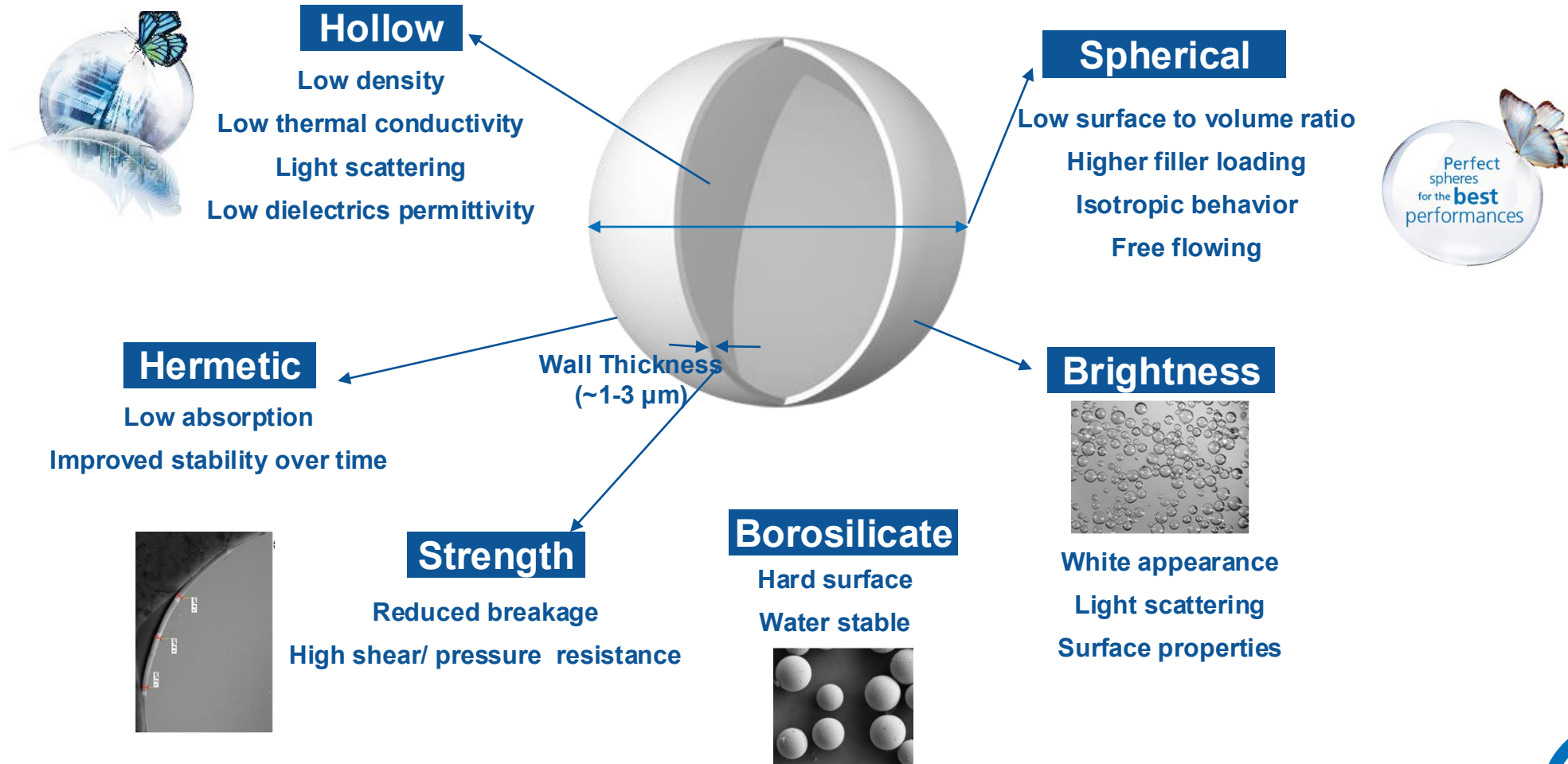
Omyasphere 900 Series

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Hollow Glass
Microspheres



Key Attributes and Benefits

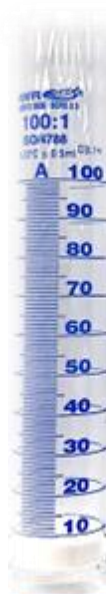


LWF Density – Volume Approach

Approaching LWF by volume rather than by weight.
Density makes the difference...

Filler	Density [g/cc]
Barium Sulfate	4.5
Titanium Dioxide	4.2
Talc	2.8
Calcium Carbonate	2.7
Ceramic Microspheres	2.5
Cenospheres	<0.95
Expanded Glass	<0.8

20g
Filler



Density~2.7g/cc

20g
Omyasphere 900



Density~0.22g/cc

x12

LWF comparison on a volume basis, not by weight.
Replacement on a weight basis will lead to formulation issues (oversaturating the system)



Portfolio for Construction Applications

* PROPERTIES					PRIMARY CONSTRUCTION APPLICATIONS						
Applications	True Density [g/cm³]	Compressive Strength [MPa/Psi]	D50 [µm]	D90 [µm]	Spackles Putties Smoothing compounds	Acrylic Plasters	Comfort Paints / Anti-condensation Paints / Acoustic Paints	Thermal insulating Paints	Deco Paints	Elastomeric Roof Coatings	Adhesive & Sealants
Omyasphere 915 - CNZ	0.15	4 / 500	85	120	✓	✓	✓	✓	•	•	•
Omyasphere 920 - CNZ	0.2	4 / 500	65	110	✓	✓	✓	✓	•	•	•
Omyasphere 925 - CNZ	0.25	5 / 750	65	100	✓	✓	✓	✓	•	•	•
Omyasphere 938 - CNZ	0.38	38 / 5500	40	65	•	•	•	✓#	✓#	✓#	✓
Omyasphere 922 S - CNZ	0.22	8 / 1200	45	70	✓#	✓#	✓#	✓#	✓#	✓#	✓
Omyasphere 928 S - CNZ	0.28	28 / 4000	45	65	✓#	✓#	✓#	✓#	✓#	✓#	✓
Omyasphere 938 S - CNZ	0.38	38 / 5500	30	50	•	•	•	✓#	✓#	✓#	✓
Omyasphere 942 S - CNZ	0.42	55 / 8000	25	40	•	•	•	✓#	✓#	✓#	✓

* Typical values – no specs

✓ # = suitable when Spray applied



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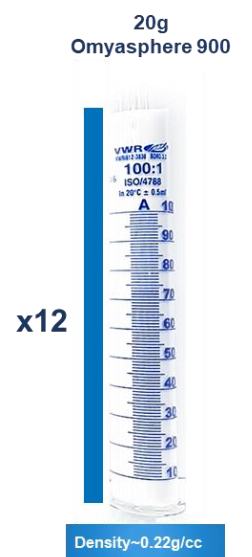
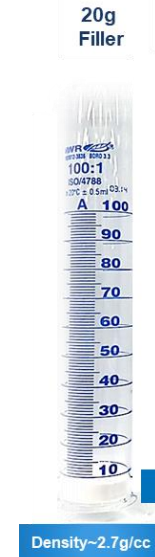
Case Study: High Reflective Coatings / Cool Roof



Omyasphere 900 Selection

- Product selected for this application/ case study: **Omyasphere 922S**

	True Density [g/cm ³]	Compressive Strength [MPa/Psi]	D50 [μm]	D90 [μm]
Omyasphere 922 S	0.22	8 / 1200	45	70



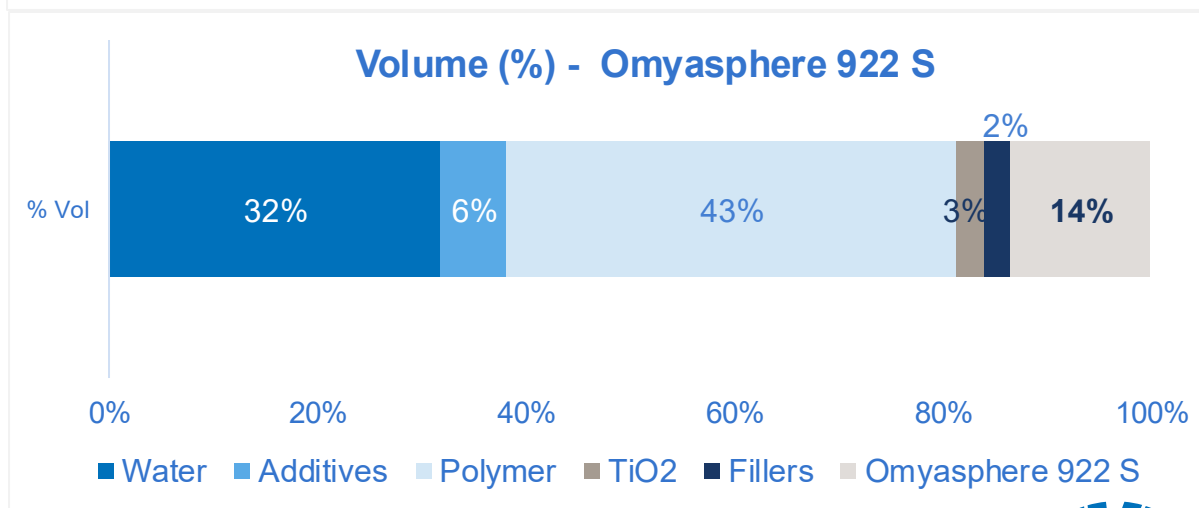
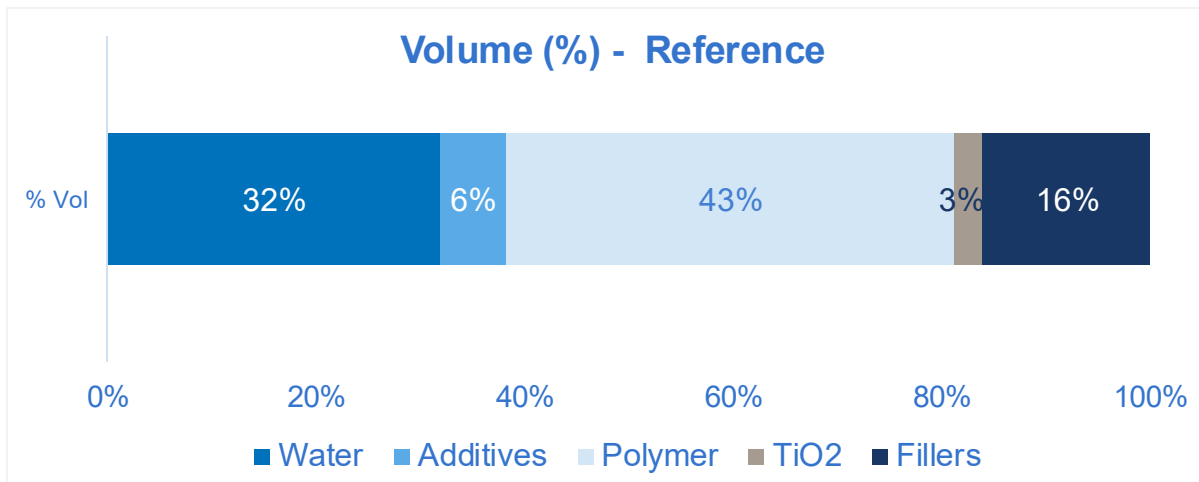
- Suitable for **spraying operations**
- Loading of Omyasphere 922S ~ **2.9% by weight, replacing mineral filler on the volume basis**
- ~12 times lower density (0.22 g/cm³) vs mineral fillers (2.7 g/cm³)!**
- Omyasphere selection can vary depending if any existing microspheres, film thickness...**



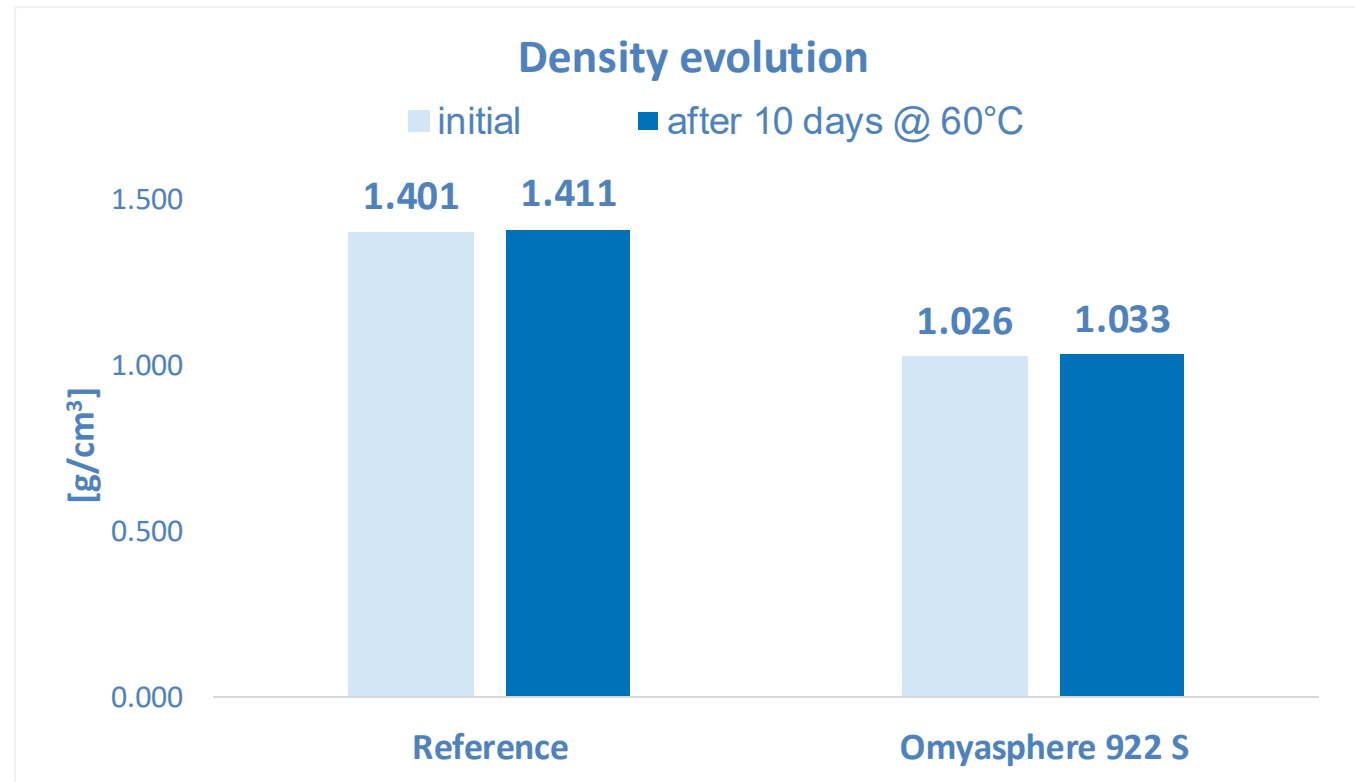
Case Study: High Reflective Coating

Formulation

	Reference	Omyasphere 922 S
Water deionised	23,09	30,58
Dispersant Agent	0,40	0,53
Dispersant Agent	0,29	0,38
pH regulator	0,08	0,11
Rheology modifier	0,41	0,54
Defoamer	0,11	0,14
Coalescent Agent	0,58	0,77
Propylenglycol	2,02	2,67
<i>Omyacarb 10 - GU</i>	28,90	3,03
<i>Optiwhite</i>	2,44	3,23
TiO ₂	8,15	10,79
Pure Acrylic Emulsion	32,79	43,39
Biocide	0,18	0,23
Omyasphere 922S	-	2,9
Defoamer	0,16	0,18
Rheology Modifier	0,40	0,53
Total (%)	100,00	100,00
Density (g/cc)	1,40	1,05
PVC (%)	46	46

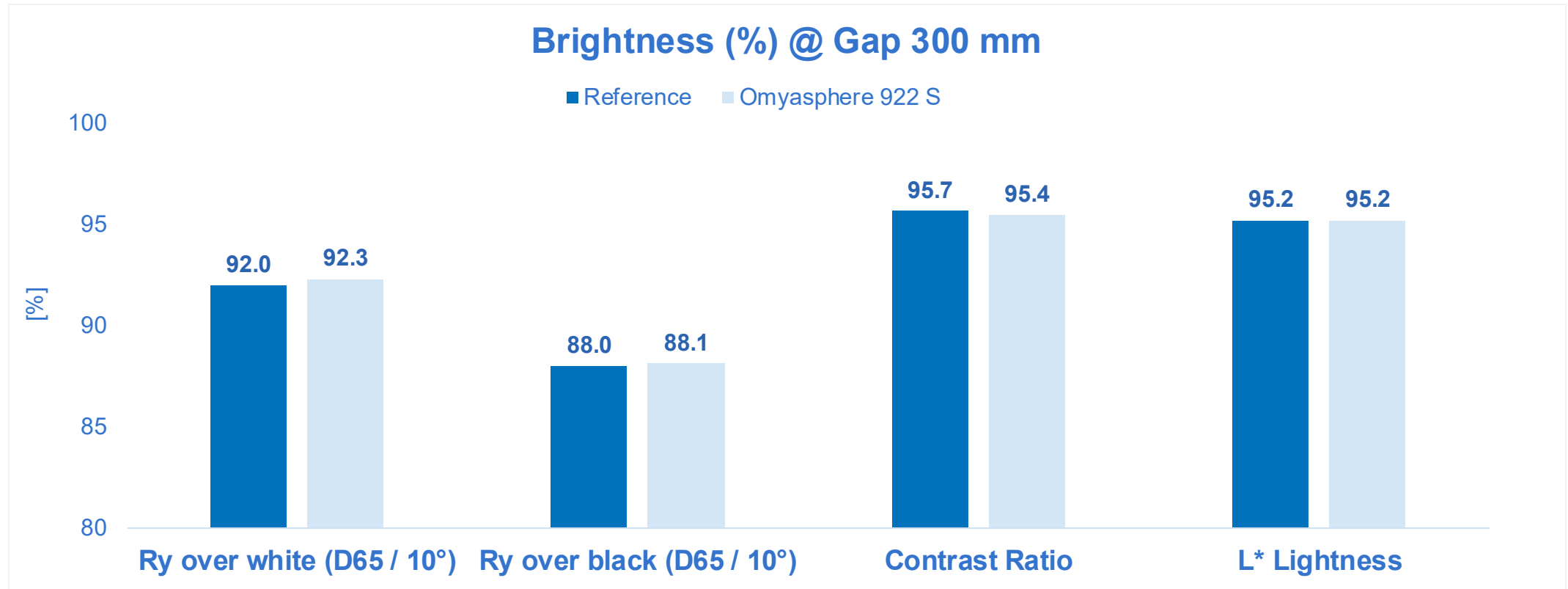


Density



Omyasphere leads to ~26% density reduction vs reference formulation

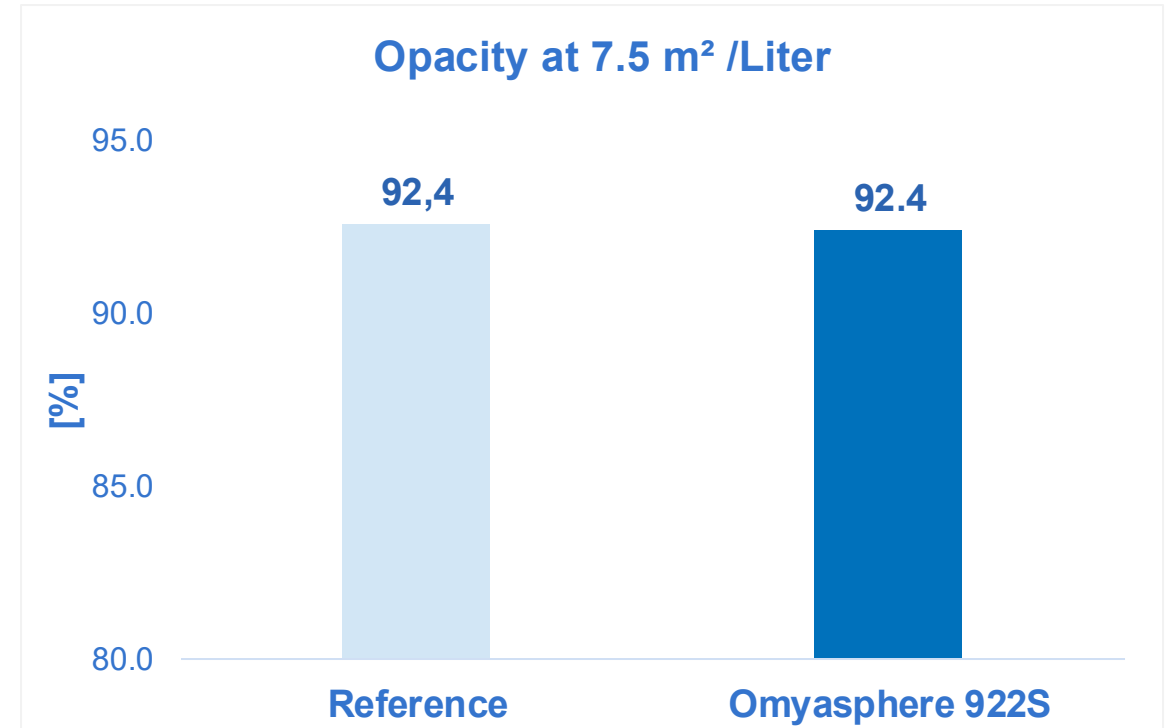
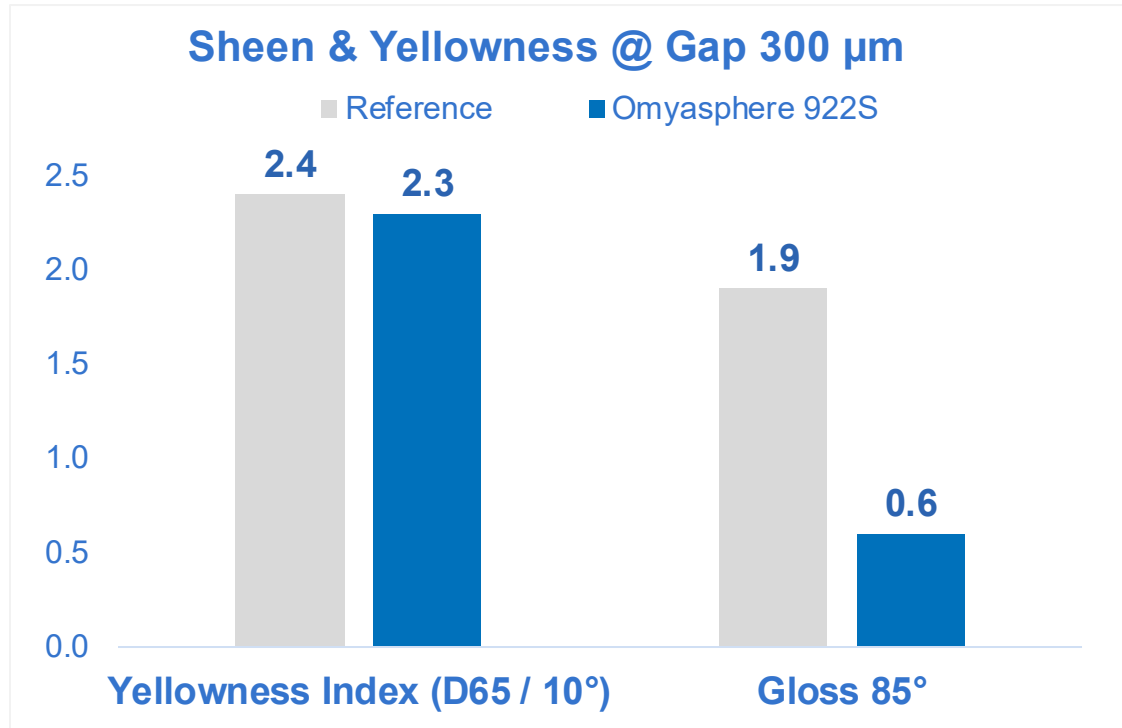
Optical Properties (I)



Omyasphere leads to equivalent Ry, Lightness and Contrast vs reference formulation

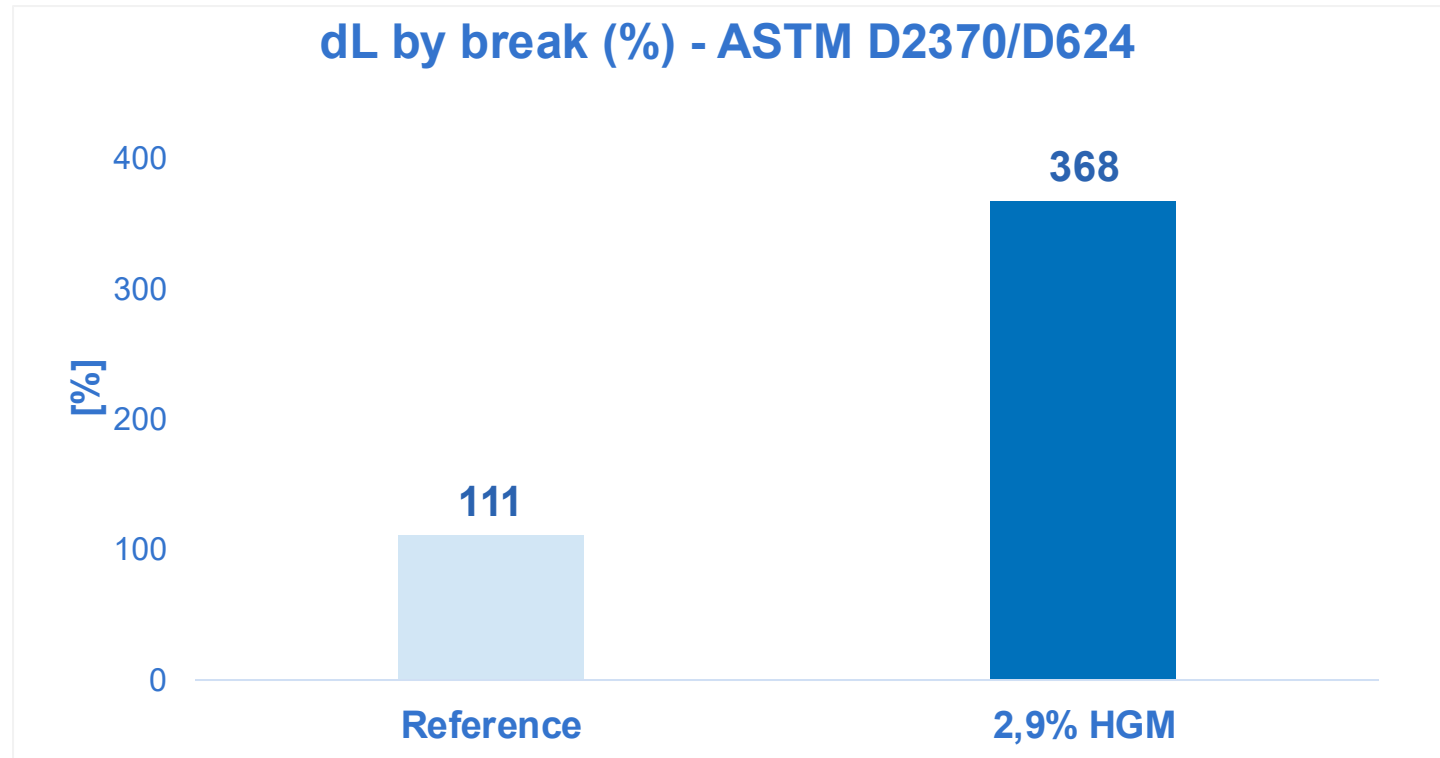


Optical Properties (II)



Omyasphere leads to equivalent YI, Opacity and lower sheen vs reference formulation

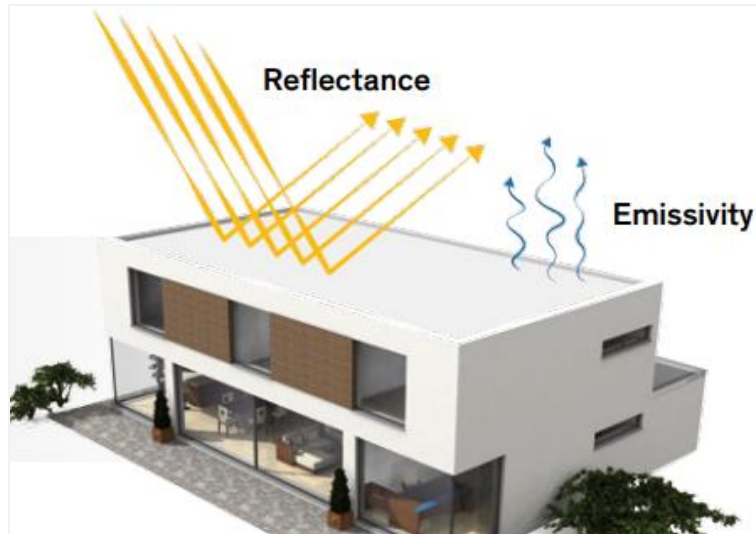
Elongation



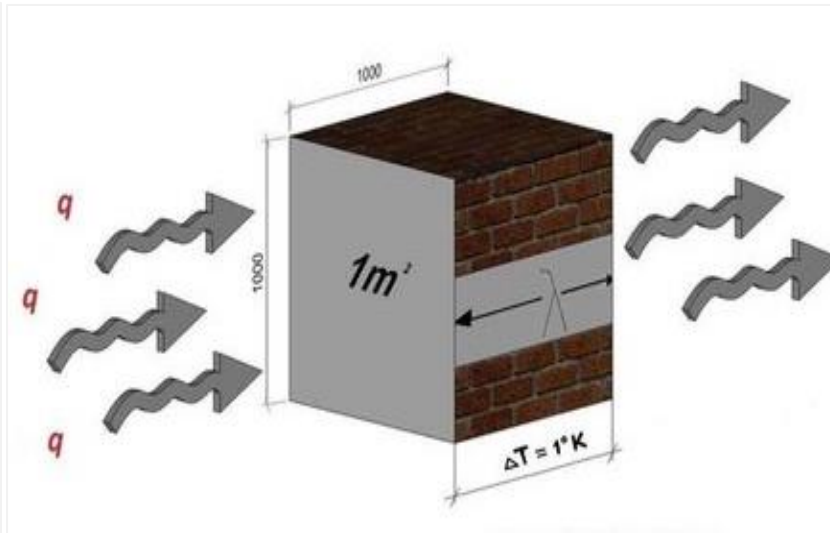
Omyasphere leads to higher elongation resistance vs reference formulation



Mechanism for Cooling Energy Saving



**Reflectance (R) and
Emissivity (ϵ)**

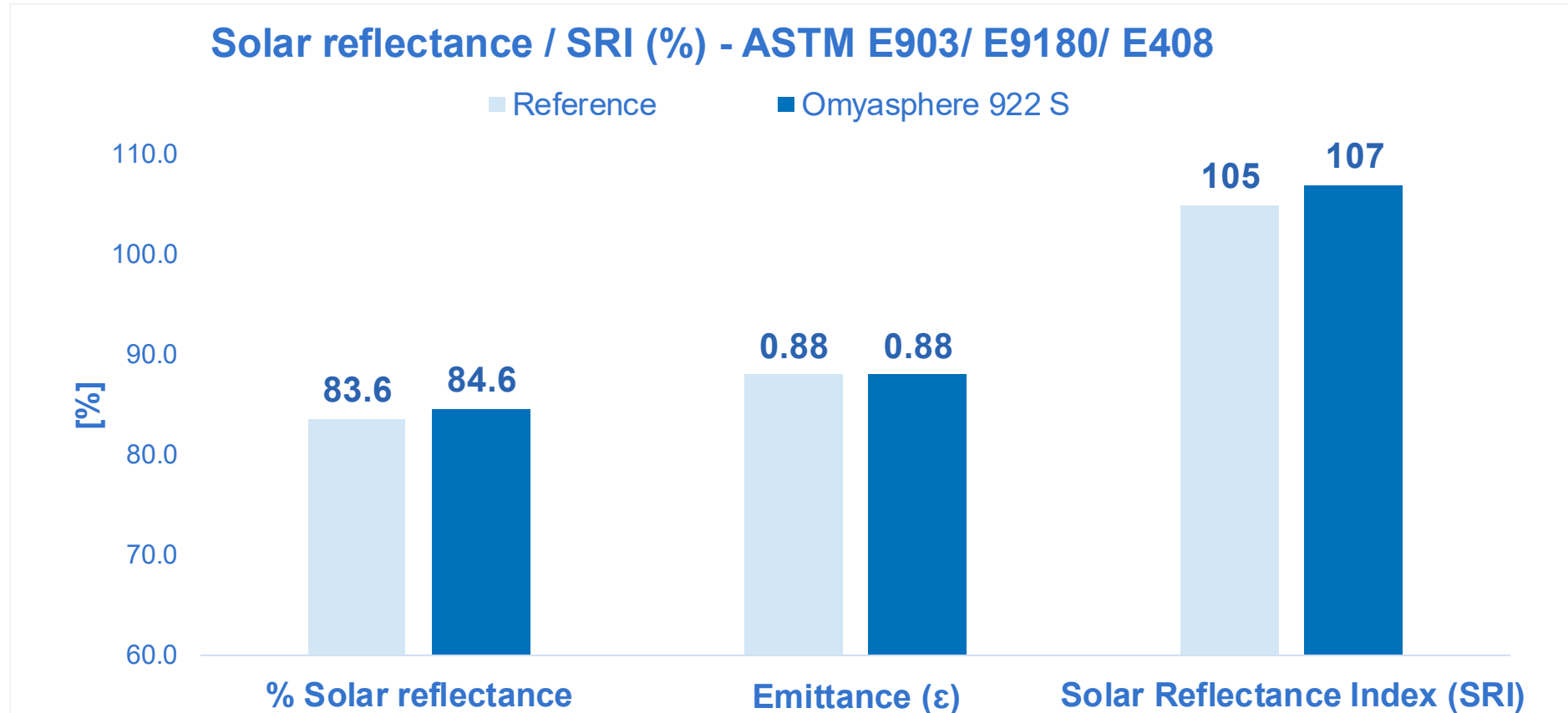


**Thermal Conductivity (λ)
Thermal Diffusivity (α)**

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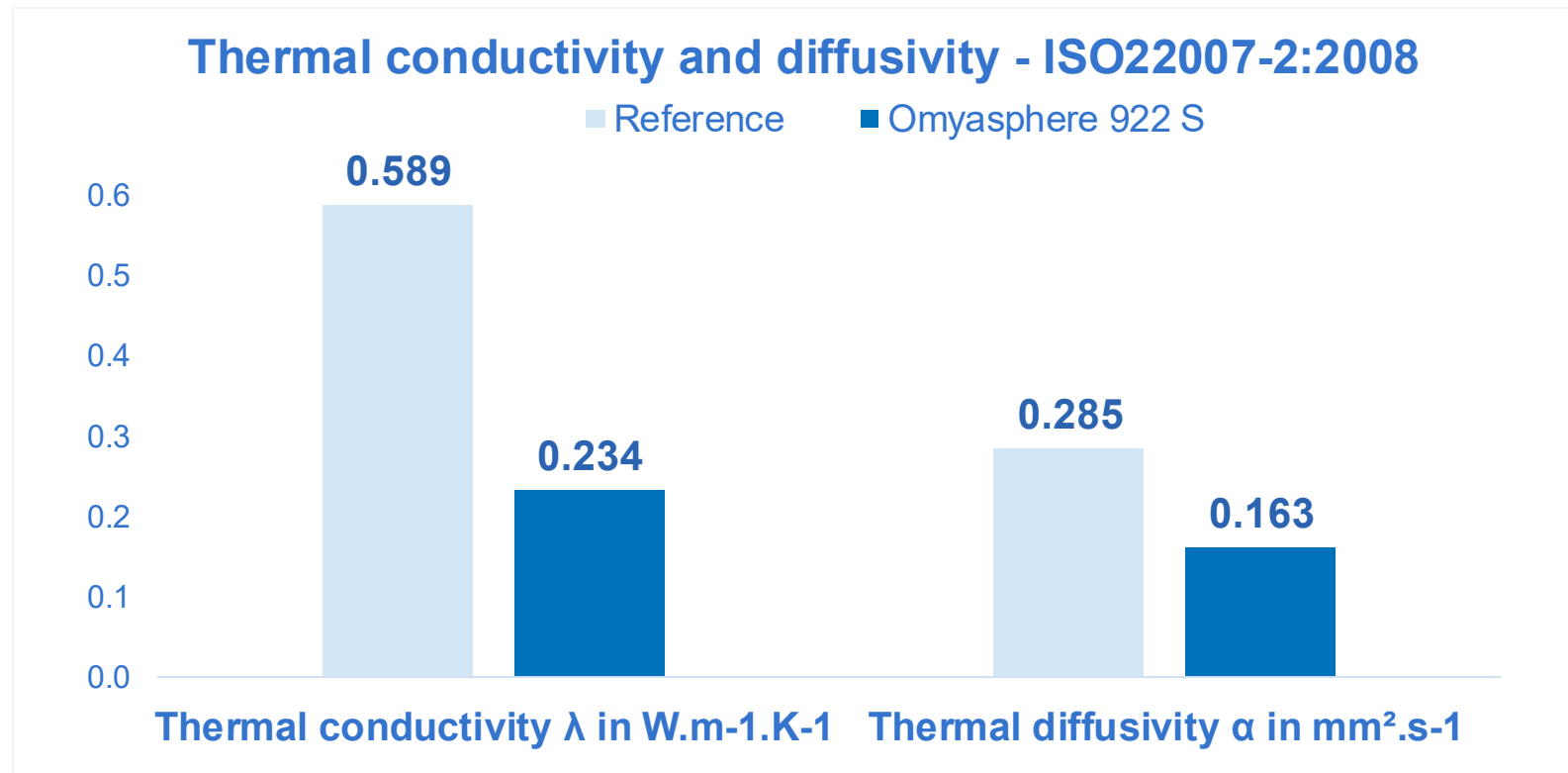
- **Reflectance:** fraction of solar energy reflected
- **Emittance:** relative ability of the roof surface to radiate absorbed heat
- **Thermal Conductivity:** Capacity of the material to transfer heat

Solar Reflectivity Index



Omyasphere leads to higher SRI (Solar Reflectivity Index) vs reference formulation

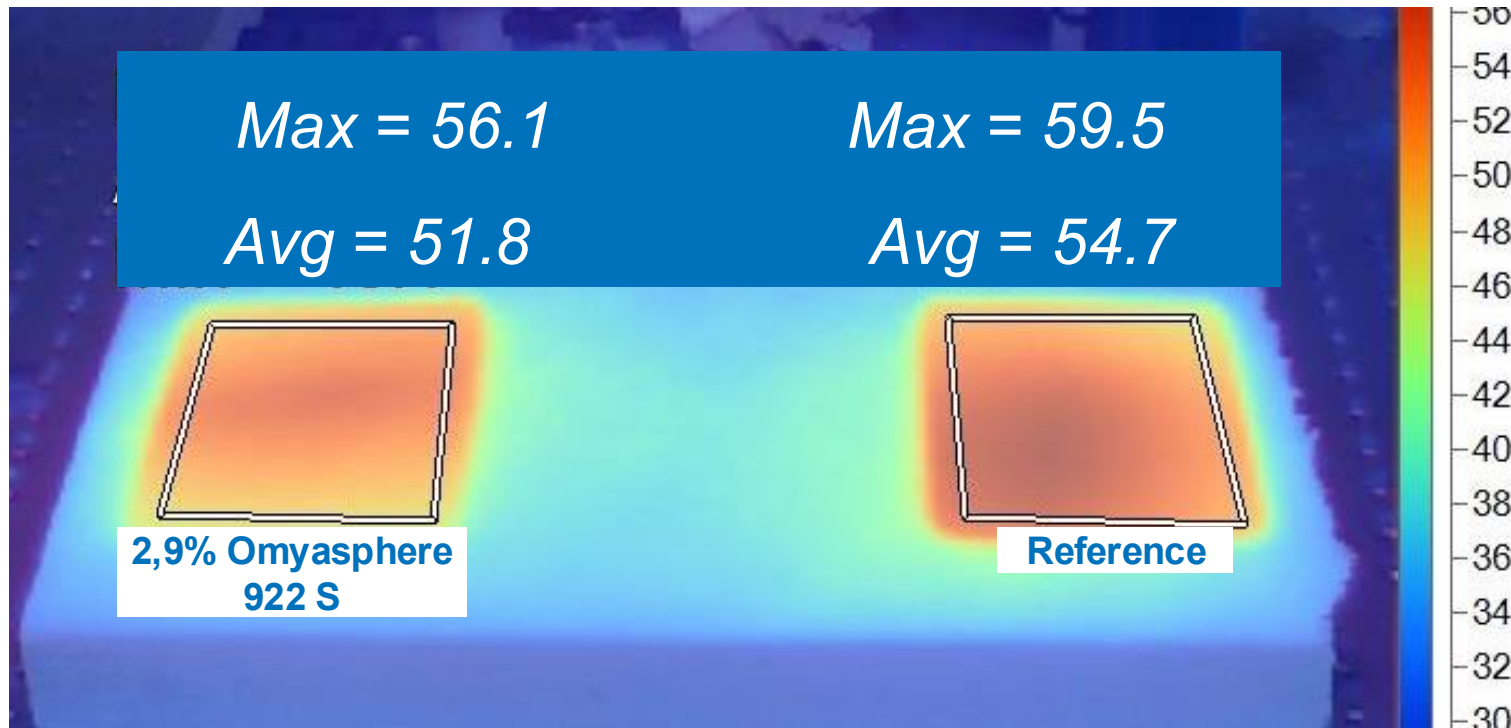
Thermal Conductivity



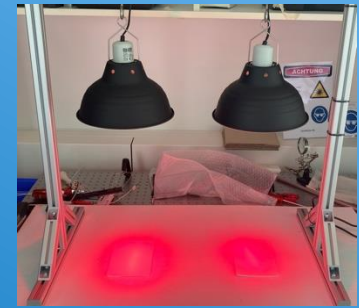
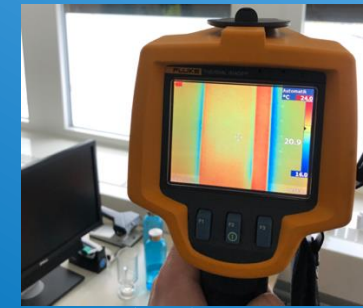
Omyasphere leads to enhanced thermal conductivity reducing lambda (λ) vs reference

Case Study: High Reflective Coating

Heat Build-up



Omyasphere leads to lower heat build up



Higher reflectivity leads to lower surface coating temperatures.

Lower Thermal conductivity leads to lower room T^a build-up and cooling savings.

***According to energy experts, a room temperature reduced by only 1°C offers up to 5 % savings in energy cost*



Summary



Summary

Omyasphere 900 hollow glass microspheres lead to tangible savings:

Weight Reduction ➡ **Safer handling, easier application, less transportation**

Yield Improvement ➡ **Doing more with less**



Higher flexibility, Reduced ageing ➡ **Extending service life**

Enhanced SRI and thermal conductivity ➡ **Cooling energy savings**



Omyasphere improving key Megatrends: lightweighting, extending service life, enhancing comfort properties and improving overall sustainability





Make Your Life Easier with Omyasphere: LWF solutions



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