

# Self-cleaning elastomeric cool roof coatings with superior performance

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Expancel 

Levasil 

Nouryon



# Our speakers

**Dr Jan Nordin**

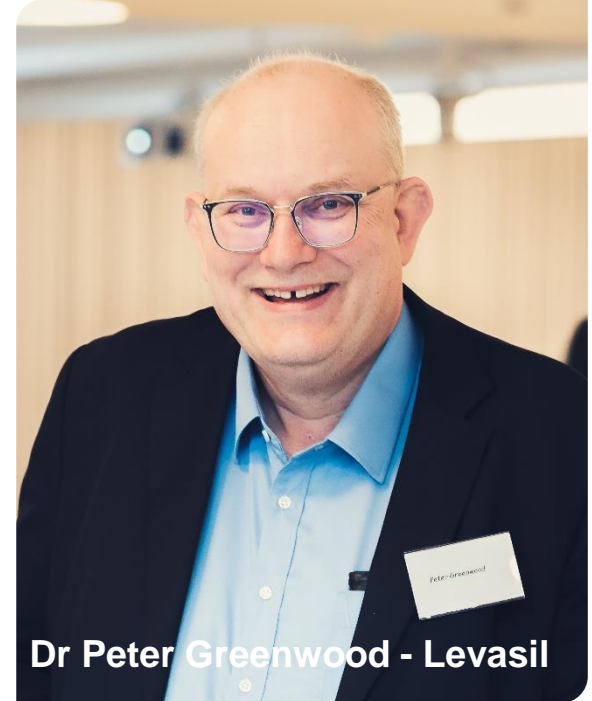
Technical Development Manager  
Expancel

**Dr Peter Greenwood**

Technical Development Manager  
Levasil



**Dr Jan Nordin - Expancel**

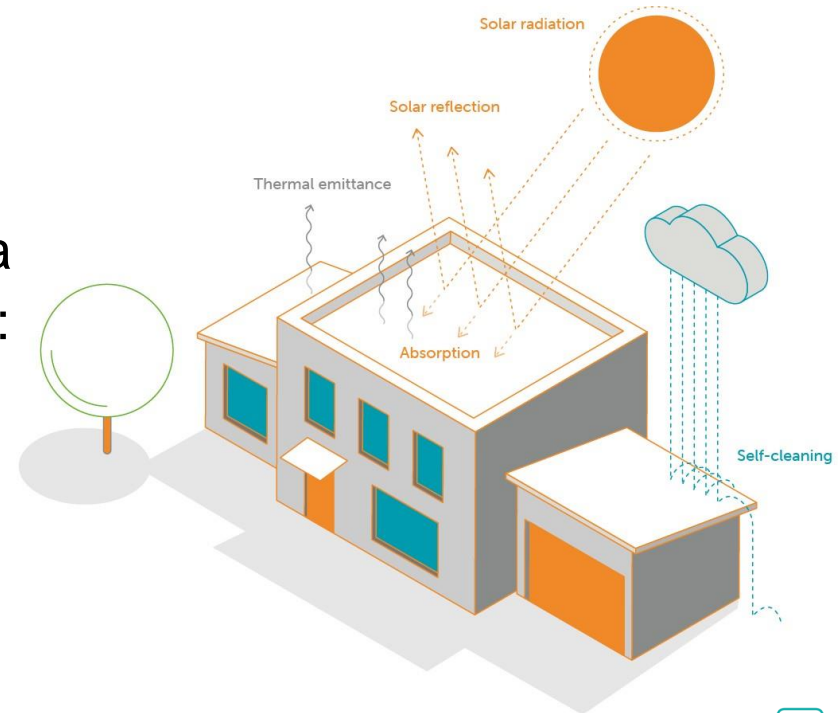


**Dr Peter Greenwood - Levasil**

# Elastomeric cool roof coatings saves energy

Our cool roof concept with Expancel Micropheres and Levasil Colloidal Silica enhance the performance by improving:

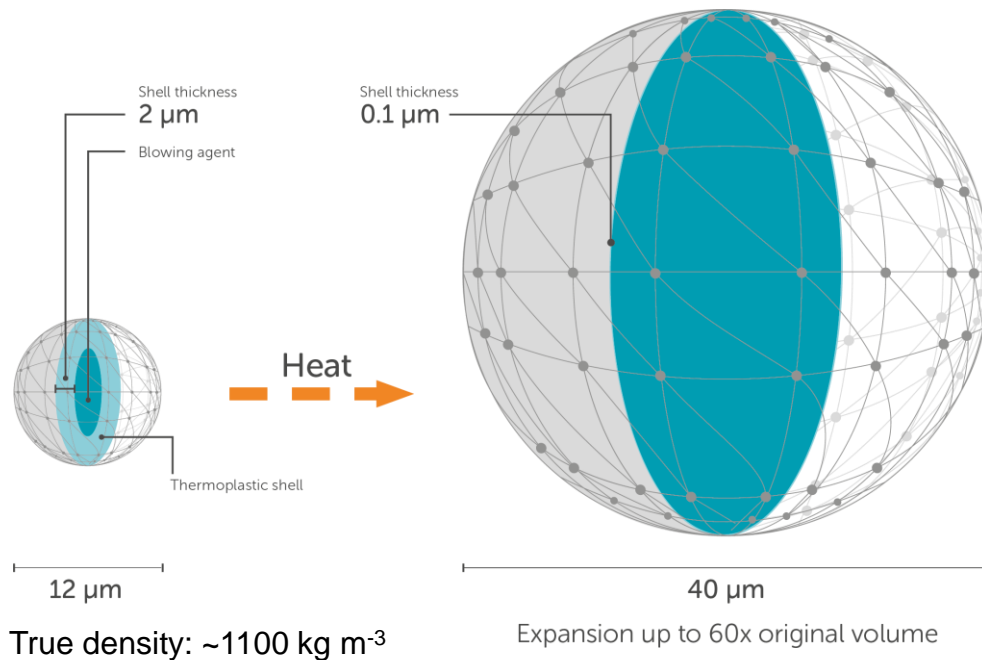
- Solar reflectance
- Elasticity
- Adherence
- Dirt pick-up resistance



Expancel 

LevaSil 

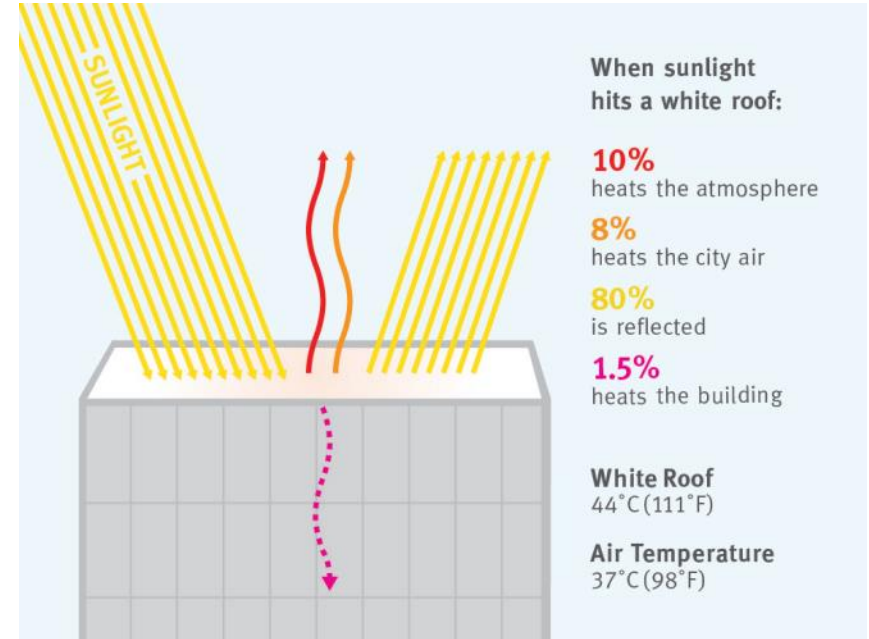
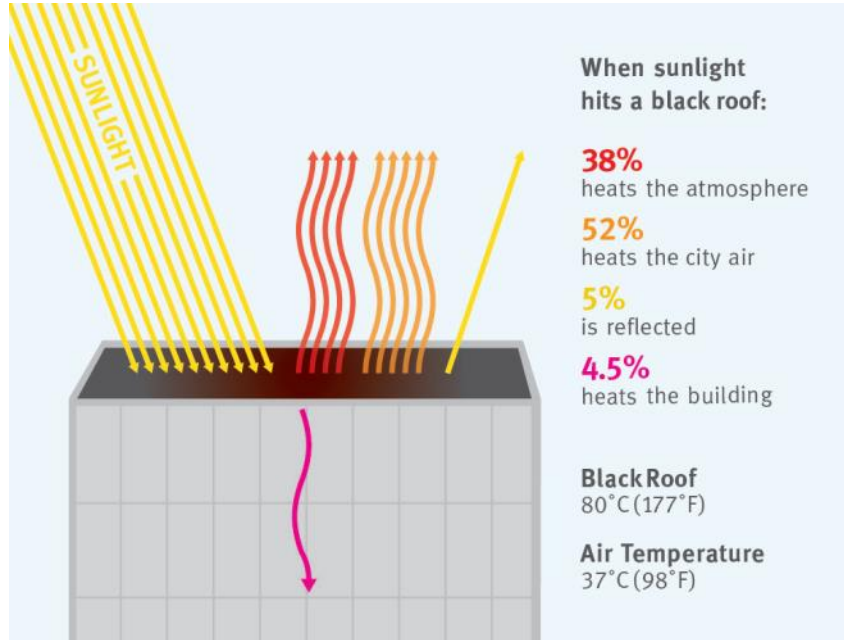
# Hollow thermoplastic microspheres



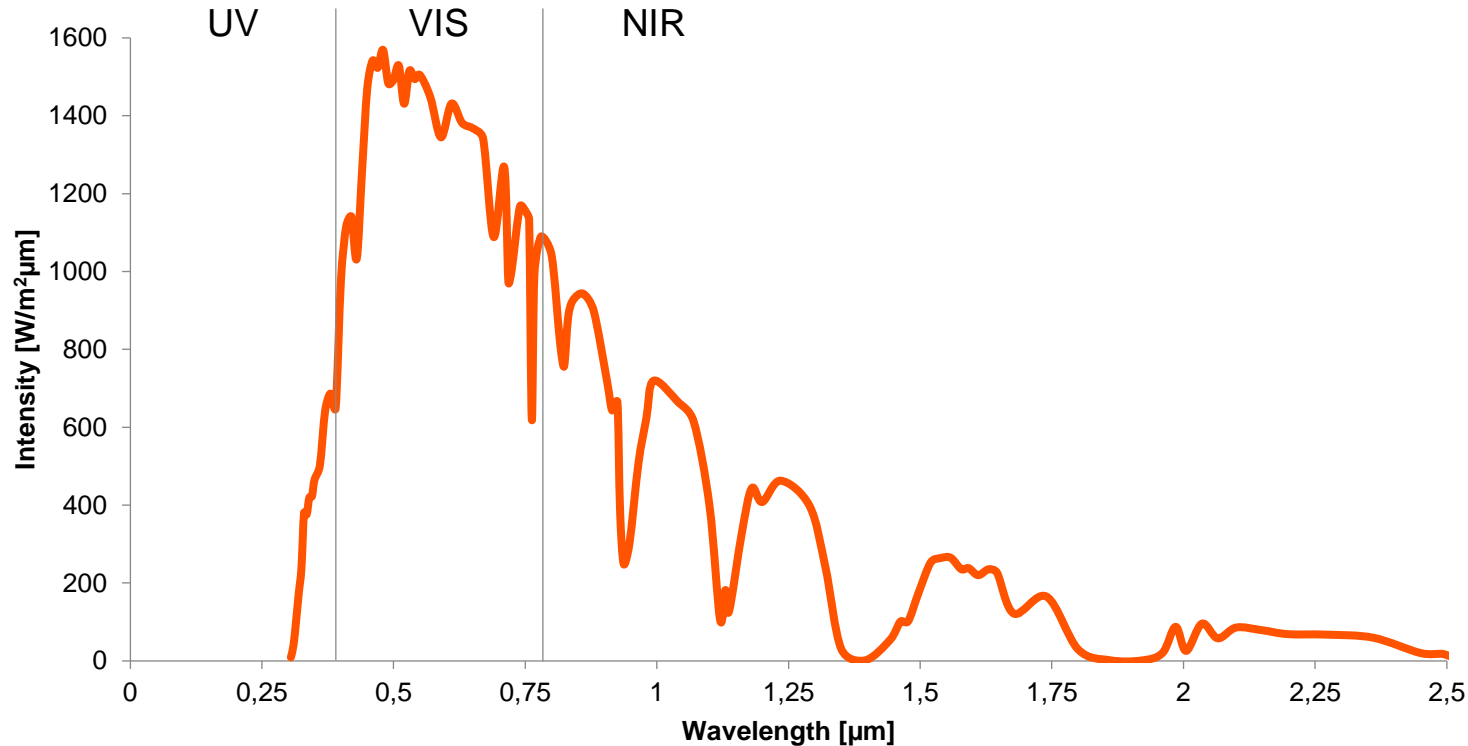
Thermoplastic microspheres are tiny ultra-light gas filled flexible bubbles that can add functionality and quality to paints and coatings.

True density: ~30 kg m<sup>-3</sup>  
Average size: 20-120 µm  
Flexible

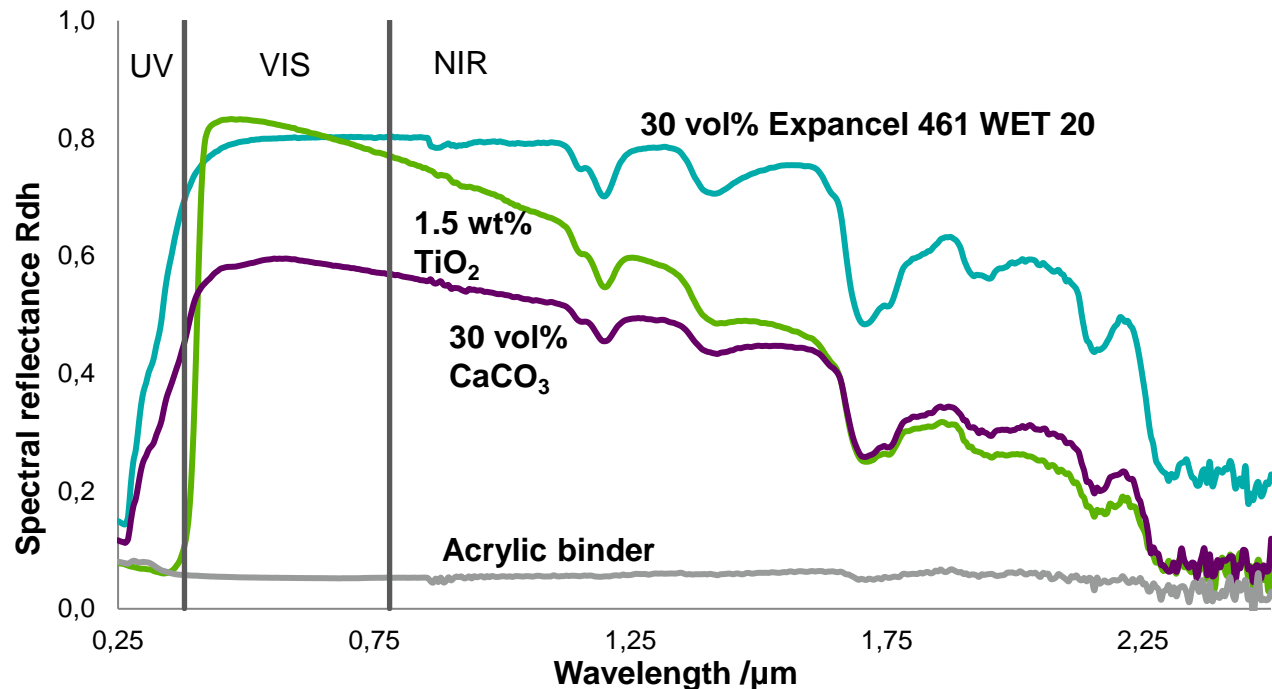
# Elastomeric cool roof coatings



# Solar energy distribution



# Solar energy distribution

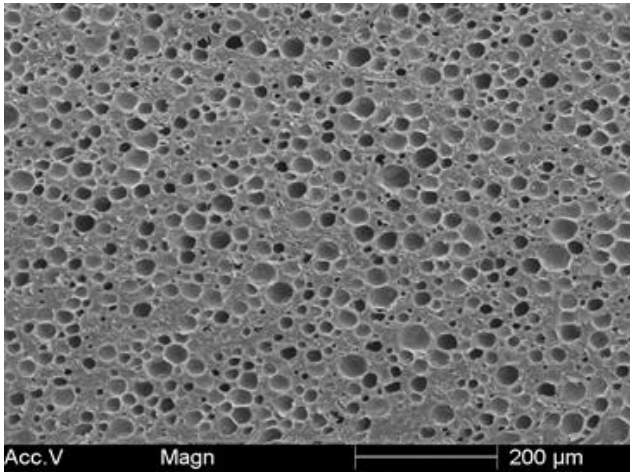


Directional-hemispherical reflection measured at the Bavarian Center for applied energy research (ZAE Bayern). Paint thickness  $0.8 \pm 0.05$  mm.

# Diffuse reflectance of a foam

Coating thickness  
Bubble size  
Bubble concentration

} Number of bubbles

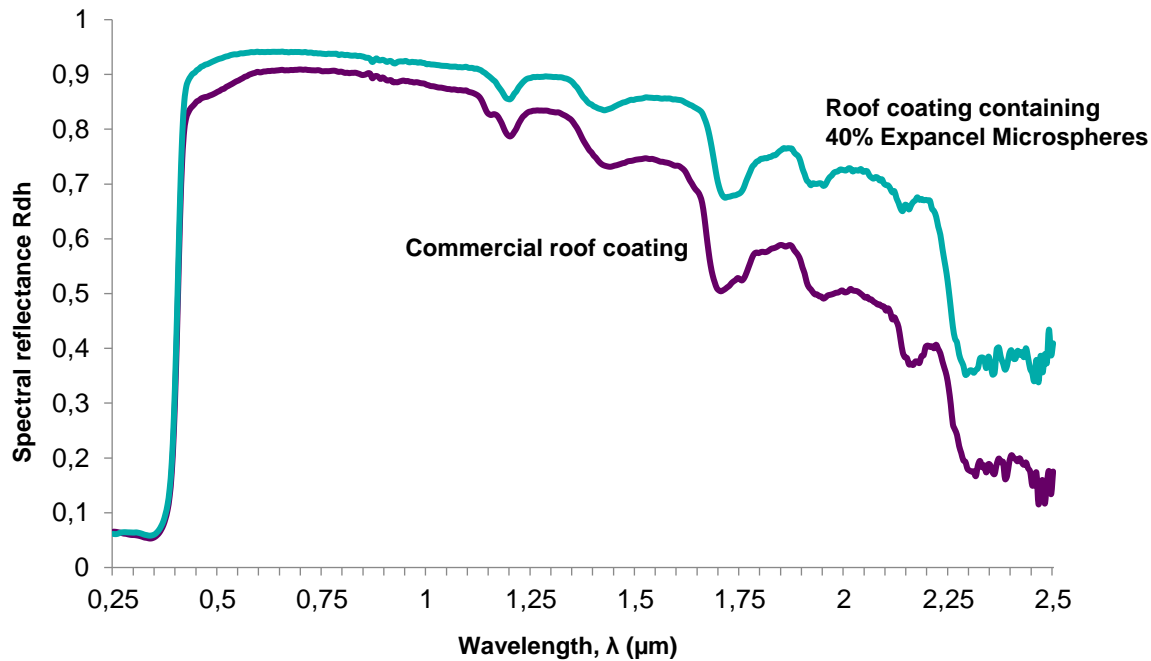


30 vol% 20µm microspheres in an acrylic coating





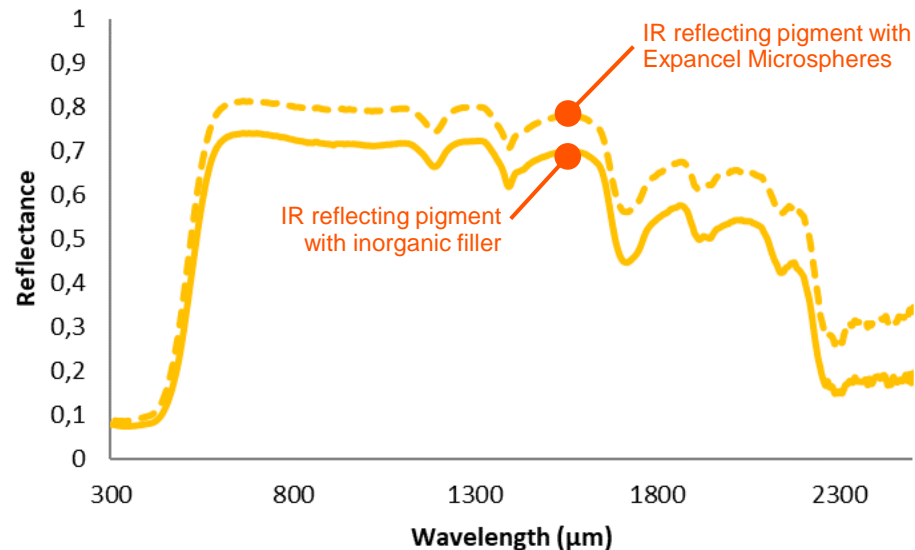
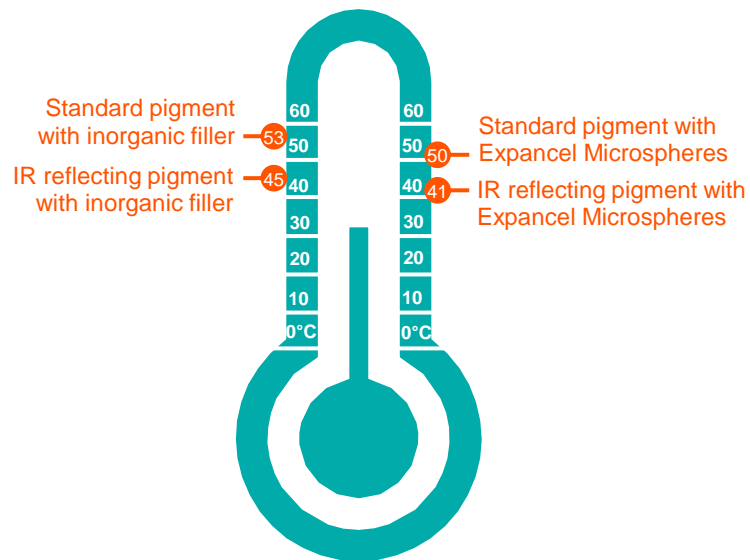
# Solar reflectance of commercial coatings



Measurements performed at the Bavarian Center for applied energy research (ZAE Bayern). Paint thickness  $0.8 \pm 0.05$  mm.

# Solar reflectance when combined with IR reflecting yellow pigment\*

Measured equilibrium coating temperature for four different coatings



\*Soon to be published.

In cooperation with Safic Alcan, the Netherlands. Standard pigment (C377/4027), IR reflecting pigment (NTU 32 SF)

200u

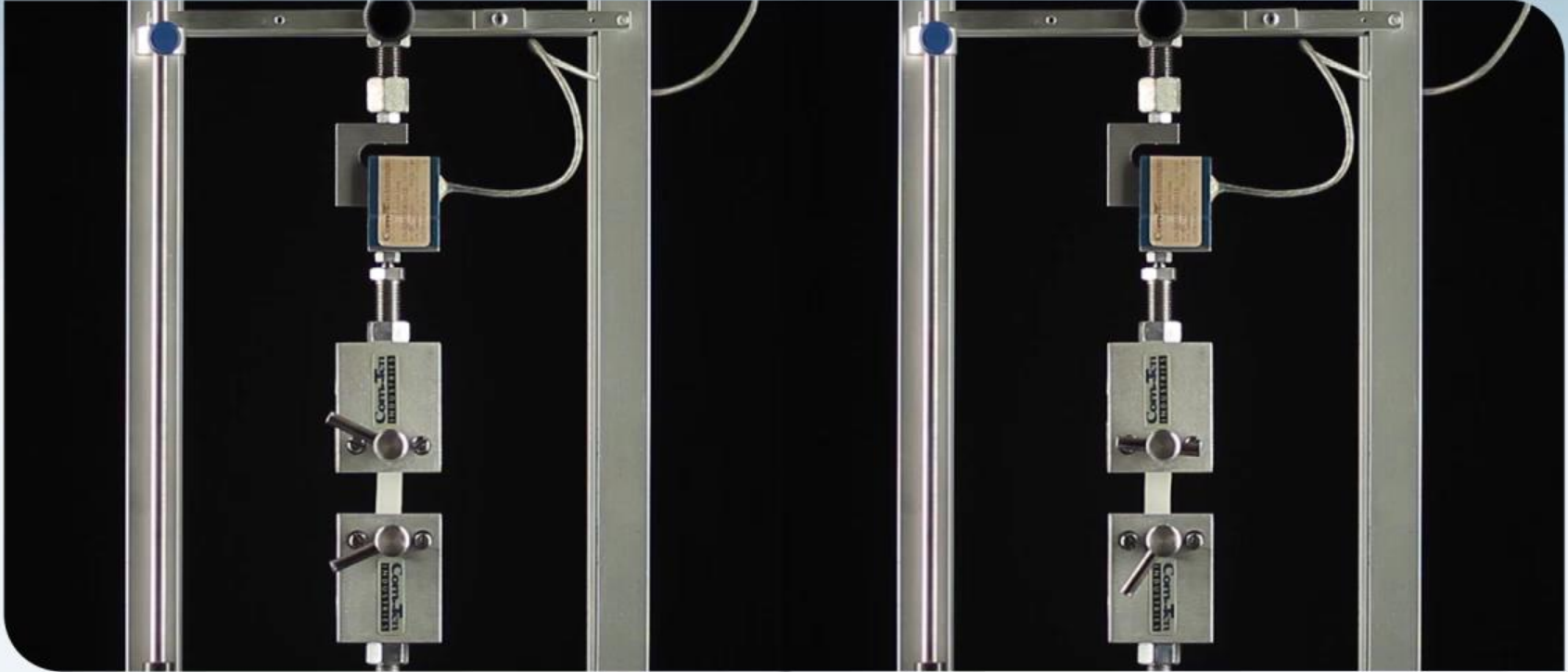
Nouryon

# Resilient properties of thermoplastic microspheres

Expancel

Synergies in cool roof coatings | Nouryon 11

# Elastomeric properties of cool roof coatings



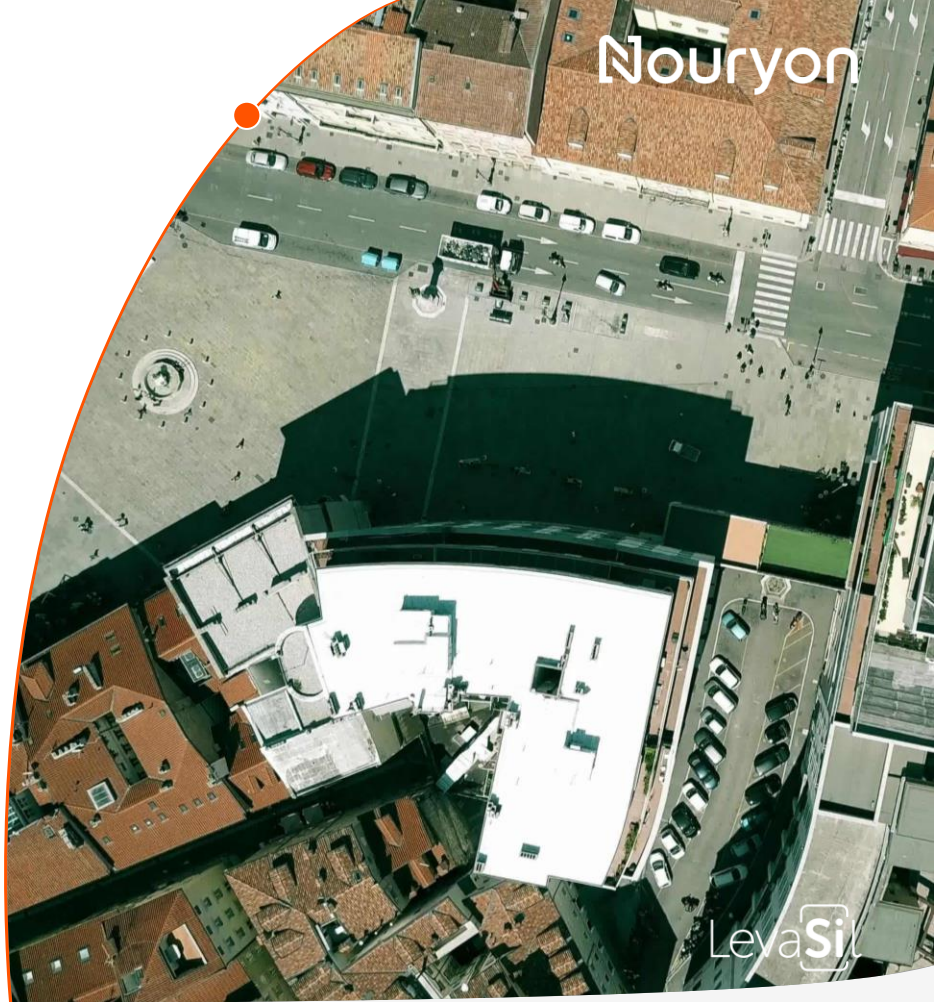
# Technology challenges for elastomeric cool roof coatings

Traditional elastomeric coatings are very tacky which attracts dirt:

- Heat absorption is increased
- Service life is reduced
- Need for manual cleaning

# Keep coating clean

Addition of our silane modified colloidal silica **Levasil CC301** significantly enhances the dirt pick-up resistance by reducing tackiness.





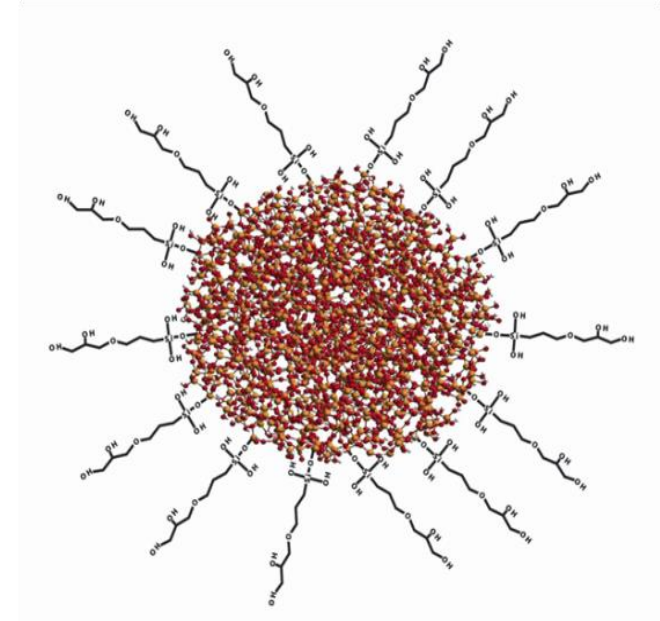
# What is colloidal silica?

- Safe for both humans and the environment.
- Very small particles of amorphous silicon dioxide ( $\text{SiO}_2$ ), dispersed in water.
- Large surface area, due to the numerous small particles.



# Levasil CC - our silane modified colloidal silica products

- Discrete mono-disperse particles
- Particle sizes: 5 – 12 nm
- Neutral pH and reduced sodium content is possible (both beneficial in coating area)
- Great stability throughout the pH range, 2-12
- Total solids: 15 - 40 wt-%
- Compliant with current and proposed VOC legislation and EU eco-labelling



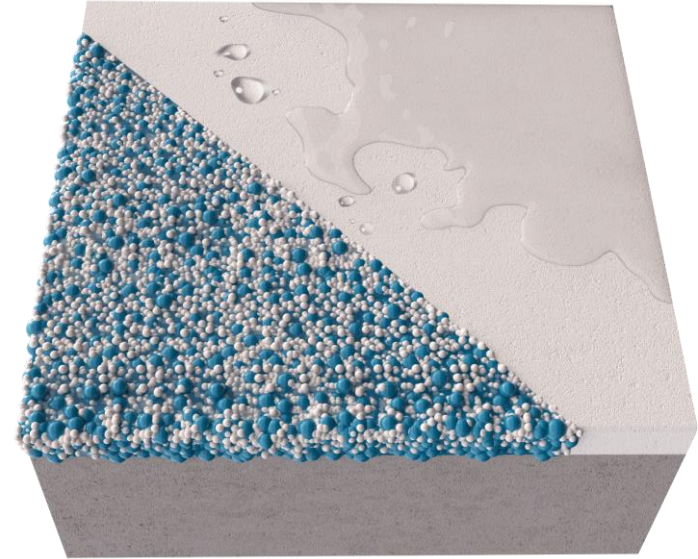
LevaSi



# Surface enrichment of silica

The enrichment of colloidal silica on the surface and at the substrate interface gives benefits such as:

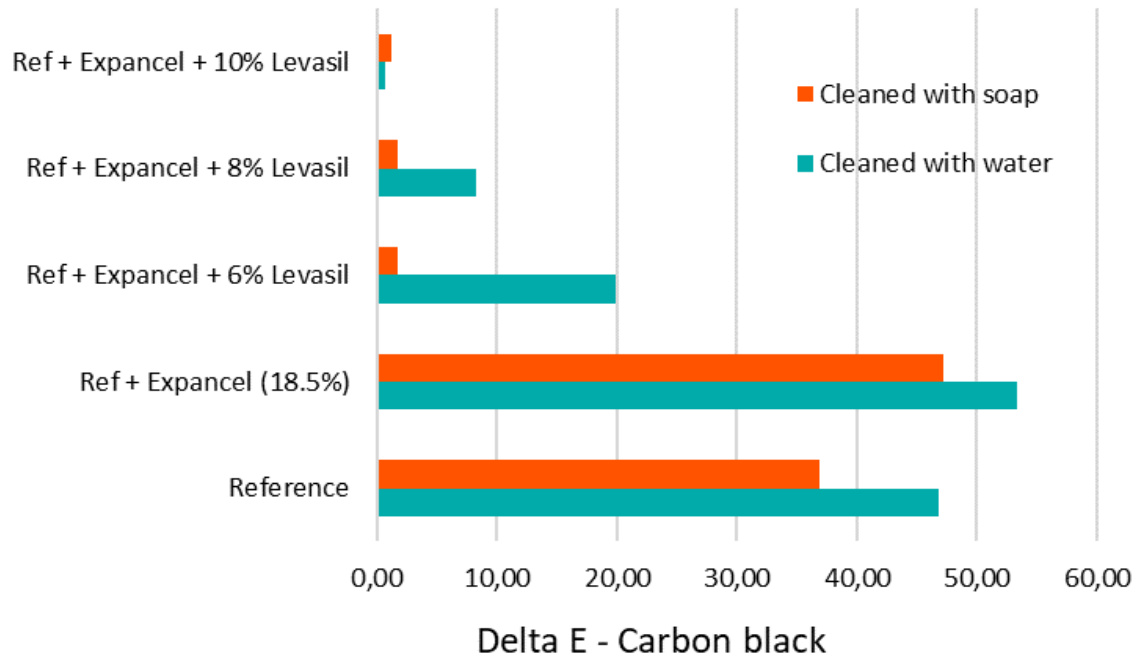
- Reduced tackiness and thereby improved dirt pick-up resistance
- Increased hardness and strength
- Better substrate adherence
- Longer lifetime of the coating



Water forms a film on the surface and dirt run off with the water. The coating maintain its performance.

# Improved dirt pick-up resistance

Dirt pick-up resistance - fresh coatings



- Addition of Levasil CC301 reduces dirt pick-up dramatically
- Efficient towards both hydrophobic (carbon black) and hydrophilic dirt (iron oxide)

# Improved adherence

Improvements in wet and dry adherence, particularly **wet adherence** can be seen when using compositions comprising Levasil.

Formulation	Adherence (dry) N/m	Adherence (wet) N/m
Reference (Ref)	753	256
Ref + Expancel (18.5%)	677	388
Ref + Expancel + 6 % Levasil CC301	732	<b>632</b>
Ref + Expancel + 8 % Levasil CC301	752	<b>938</b>
Ref + Expancel + 10 % Levasil CC301	811	<b>811</b>

# Flexibility meets ASTM D6083

Low temperature (-26 °C) flexibility properties of the coatings meet requirements laid out in ASTM D6083.

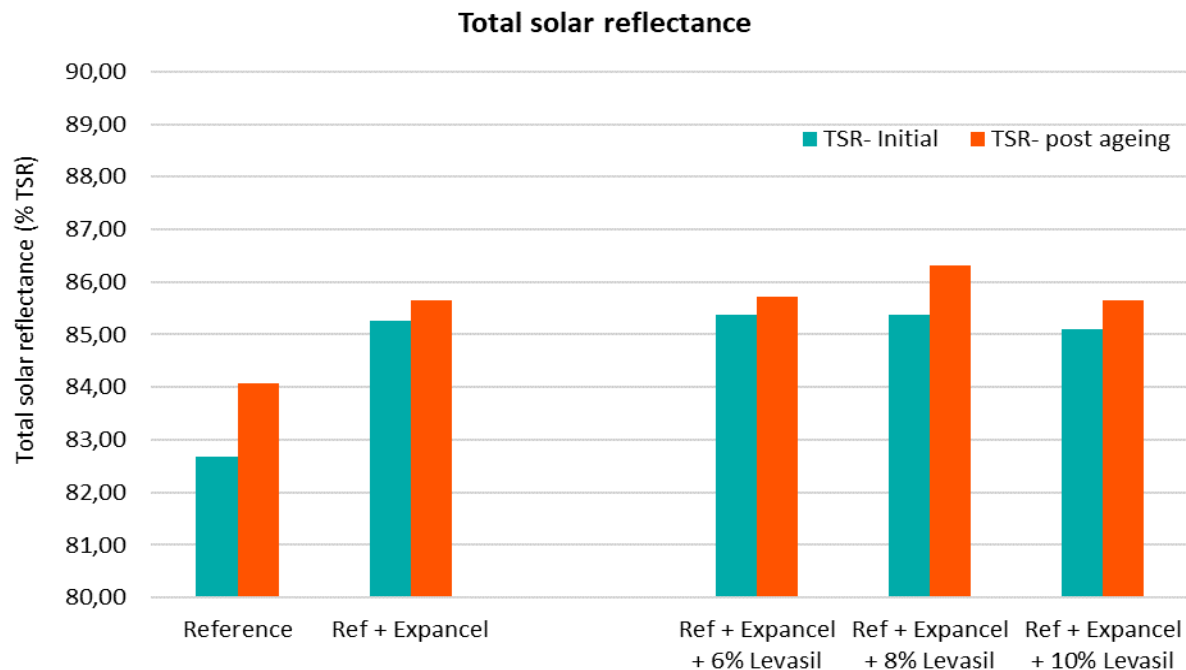


Reference

Ref + Expancel

Ref + Expancel + 8% Levasil

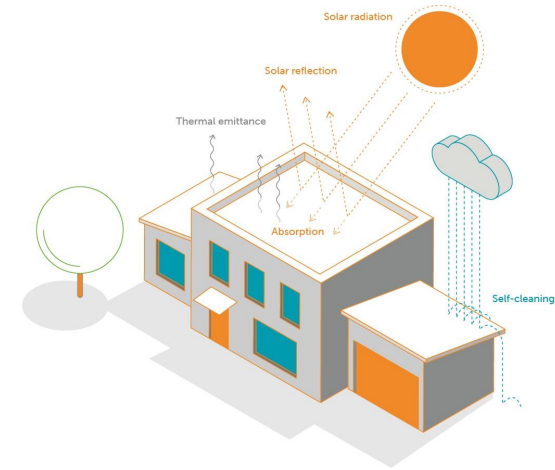
# Enhanced solar reflectance



- The total solar reflectance is improved by the addition of Expancel
- No influence on solar reflectance from addition of Levasil

# Expancel and Levasil synergies in elastomeric cool roof coatings

- High elasticity and excellent solar reflectance can be combined with outstanding dirt pick-up resistance in a cost-efficient manner.
- Strong improvement in adherence of the coating without sacrificing coating flexibility or reflectance for both fresh and aged coatings.
- Long lasting effect on dirt pick-up resistance.



# Thank you for listening!

**Do you want to know more?  
Get in touch!**

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