**AkzoNobel Aerospace Coatings**

**Cool chemistry**

**What is a Solar**

**Heat Reflective**

**coating?**

Objects painted in light

colors tend to reflect the

heat and stay relatively cool

to the touch when exposed

to the sun. Conversely, dark

surfaces tend to absorb

the heat with a subsequent

temperature increase. For

example, when you place

your hand on a dark colored

vehicle that has been out

in the sun, the exterior

substrate feels very warm

and the interior temperature

of the vehicle also increases.

This is because most dark

colors absorb a large portion

of infrared radiation (heat)

from the sun.

Solar heat reflective coatings (SHR) have an

integrated technology that reflects infrared

radiation (heat) from the sun and keeps the

coated item cooler, independent of the color

of the coating. This can help to minimise air

conditioning unit work load and operational cost,

while providing a more comfortable working

environment for personnel and protection of

heat sensitive electronic equipment.

When used as a camouflage coating, surfaces

painted in colors which appear to be visually

identical, can reach considerably lower

temperatures than those surfaces painted

with conventional camouflage coatings in the

same visual color.

**Technology:**

Solar energy that reaches the earth is absorbed in wavelengths of 300 nanometers (nm) to 2500

nanometers. About 5% of this solar energy is in the Ultraviolet (UV) range. Another 46% of the total

energy of the sun is in the visible spectrum where light in all its various colors is visible to the naked

eye. The remaining 49% is in the Infrared (IR) range. Radiation in this region is invisible to the naked

eye, but we can still feel the effects of its energy in the form of heat (figure 1).

It is important to note that objects can absorb, reflect and emit radiation outside the

visible spectrum.

200

150

100

50

0

300 700 1100 1500 1900 2300 2500

WAVELENGTH ( nm)

**Spectrum of solar radiance**

UV

5%

VISIBLE

4 6%

INFRARED

4 9%

INVISIBLE

REGION (HEAT )

SOLAR ENERGY

INTENSI TY

FIG. 1 - SPECTRUM OF SOLAR RADIANCE.

Through the use of a thermal imaging camera, a visual record is made of the temperature of the test materials.

The panel on the left uses traditional pigments, while the panel on the right uses cool chemistry pigmentation.

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Solar heat reflective coatings are designed to reflect invisible infrared

radiation (heat). Independent on the visual darkness, they reduce solar

heat build-up without impairing the durability of the finish.

This is accomplished with special pigmentation and formulation

techniques, using Solar Reflective Pigments. Solar Reflective Pigments

have been altered, physically and chemically, to reflect infrared radiation

while still absorbing the same amount of visible light, thus appearing as

the same color as lesser reflecting pigments, yet staying much cooler

(figure 2).

Fig. 2 - SHR coatings show a substantial higher reflection of infrared radiation.

In some cases, solar heat reflection can be further improved by applying

a thin layer of white basecoat under a thin layer of the final color. This is

particularly effective for colors which are “semi” transparent in the Near

Infrared (NIR) region (figure 3). The approach taken to achieve the lowest

solar heat absorption is color dependent.

Fig. 3 - Blue topcoat applied over a white basecoat shows a substantial higher reflection of infrared radiation.

**Optional functionalities:**

SHR coatings can also be formulated as a Chemical Agent Resistant

Coating (CARC). This means that a tank painted with SHR CARCs could

provide protection to personnel and fixed assets from NBC warfare while

keeping the interior of the tank cool, reducing cooling energy consumption,

in addition to providing visual and thermal camouflage.

**Summary:**

Solar heat reflective coatings are developed to answer to the need for cool

coatings in varying colors. They have the ability to reflect heat from the

sun, which helps to provide a more comfortable indoor working

environment whilst operating in hot climates. They help to minimise air

conditioning unit work load and operational cost, in addition to providing

protection to heat sensitive electronic equipment.

SHR coatings can be formulated specifically tailored to the different

requirements of the aerospace or land defense industry. In case of military

use, the complete coating solution depends upon the shade of camouflage

needed and the performance necessary for the success of the mission.

Solar Heat Reflective coatings can not only be formulated as a Chemical

Agent Resistant Coating (CARC), but also as a temporary camouflage and

Chemical Agent Absorbing Coating.

**More Information:**

Equipped with over 75 years of accumulated experience and technical

know-how in the aerospace and land defense industry, AkzoNobel is

ideally placed to offer advice and specialist coating technology that not only

protects and enhances operating image and performance but also adds

efficiency and quality during asset construction.

For more information on SHR and other specialist coatings, contact

your local AkzoNobel Aerospace Coatings representative, visit

our website at www.akzonobel.com/aerospace or e-mail us at:

customer.service@akzonobel.com

100

75

50

25

0

300 700 1100 1500 1900 2300 2500

WAVELENGTH ( nm)

**Grey - SHR & Non SHR**

SHR

NON SHR

REF LECT ION %

100

75

50

25

0

300 700 1100 1500 1900 2300 2500

WAVELENGTH ( nm)

**Brown - SHR & Non SHR**

SHR

NON SHR

REF LECT ION %

100

75

50

25

0

300 700 1100 1500 1900 2300 2500

WAVELENGTH ( nm)

BLUE 3 9μm OVER WHI TE

BLUE 3 9μm OVER BLACK

REF LECT ION %