

*Data sheet: C1.11*

Benefits & Properties

## Heat-Reflective CHROMADEK®

### Introduction

Four of the standard colours of the Chromadek® range (See Data Sheet C1.4), Buffalo Brown, Charcoal Grey, Dark Dolphin and Aloe Green are produced by utilizing an advanced thermal technology paint system. This advanced paint system incorporates a heat reflective pigment into the paint providing up to 8°C cooling and improved durability. The durability of an exterior coating is measured according to its capability of maintaining gloss, colour and film integrity.

### How Heat Reflective Chromadek® Work?

The heat reflective pigments present in Heat Reflective Chromadek® are chemically inert and highly stable. Heat Reflective Chromadek® reflects more of the sun's energy to prevent the coating from absorbing energy directly resulting in less heat build up and indirectly resulting in longer life-cycles (less fading).

In order to understand how Heat Reflective Chromadek® works it is essential to understand the nature of energy with which coatings act.

#### - Composition of Solar Energy:

As illustrated in Figure 1 (taken from ASTM E159-98), over 50% of the sun's energy is invisible and it extends over three light spectra. Only 5% of the light spectrum presents Invisible Ultraviolet light, present in the 300-400 nanometers region. 5% might seem very small, but in terms of coating degradation this small value is quite significant. About 4% of solar energy is present in the visible region at ground level implying that a staggering percentage of more than 50% of solar energy is found in the invisible infrared region. This results in a high volume of energy that could possibly be absorbed by the coating which could result in fading of the coating.

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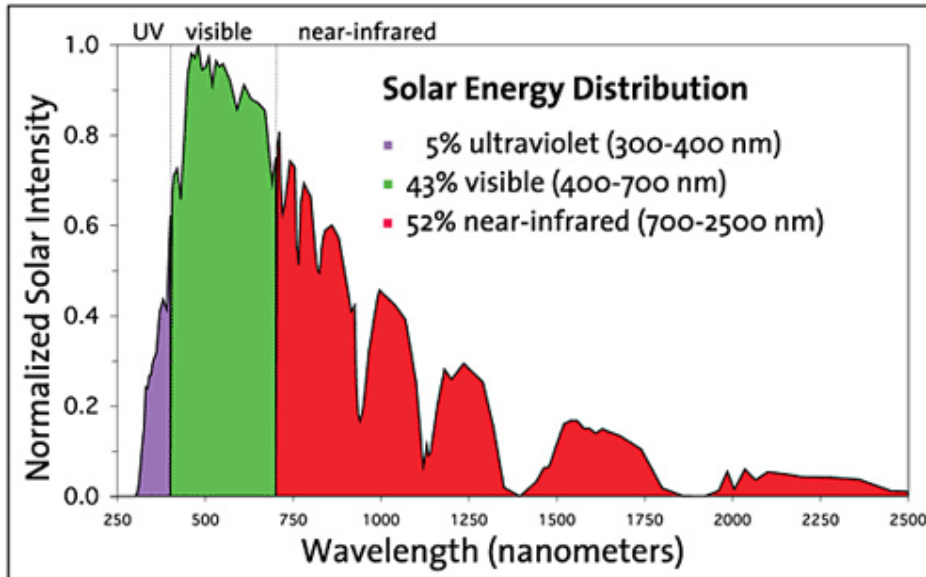


Figure 1: Solar Energy Distribution (ASTM E159-98).

### Heat Reflective Chromadek® versus <sup>1</sup>Standard Chromadek®

Evaluations were performed in order to validate the improved cooling capability and durability properties of Heat Reflective Chromadek® compared to Standard Chromadek®.

#### a) Cooling

Figure 2 represents test data measured in Vereeniging South Africa during January 2004 by Becker's Industrial Coatings.

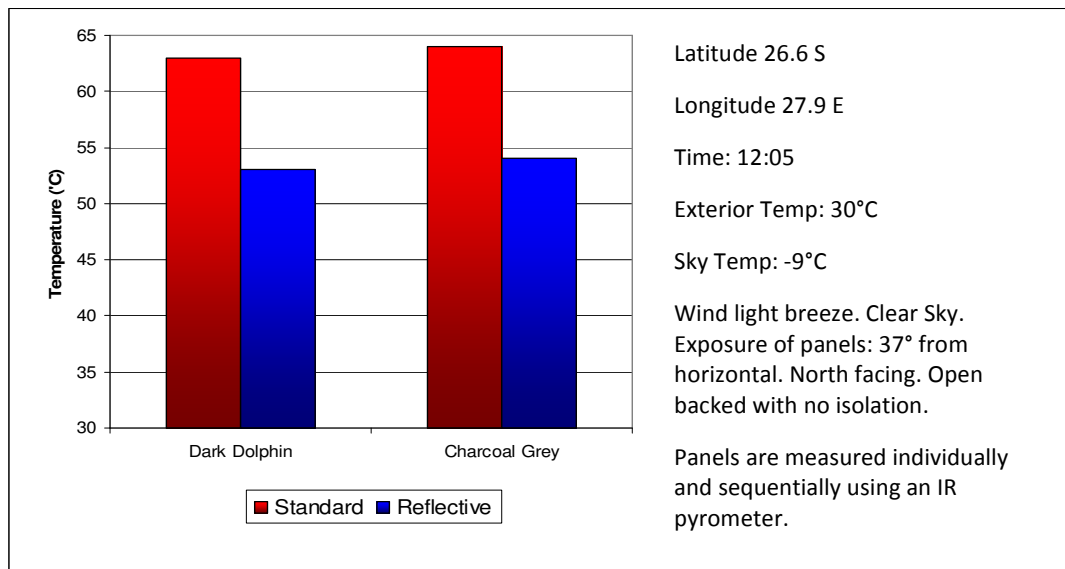


Figure 2: Cooling Effect of the Heat Reflective Coating.

<sup>1</sup> Standard Chromadek® refers to coatings with no heat reflective pigment.

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From figure 2 it is clear that heat reflective Chromadek coatings offer up to 8°C cooling.

### b) Durability

UV weathering testing performed by ArcelorMittal's Research and Development (R&D) Department in Liege, Belgium, during March 2009 confirmed that the new Heat Reflective pigment increases the quality of the coating.

#### - Colour

Figure 3 compares the Delta E (the total colour difference), which is a measure of colour quality, obtained by Dark Dolphin Standard Chromadek® with Dark Dolphin Heat Reflective Chromadek® over irradiation.

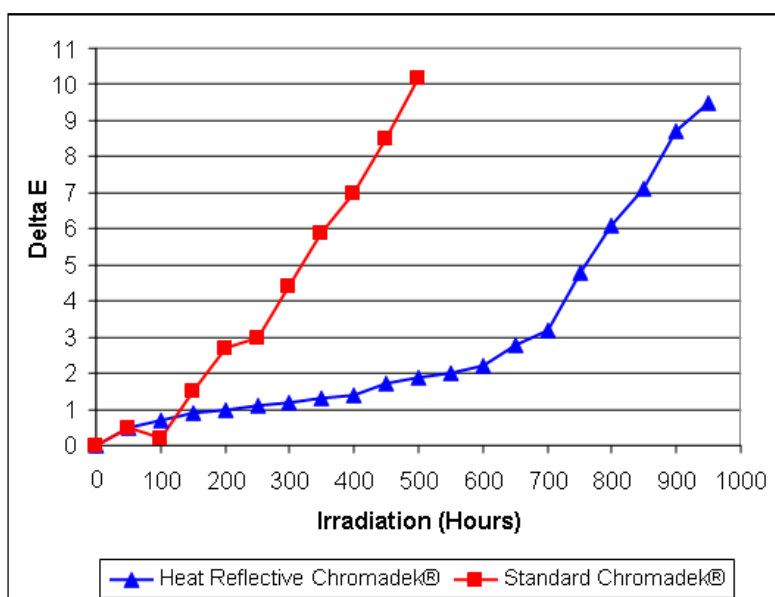


Figure 3: Colour Measurements on Dark Dolphin Chromadek®.

An improvement in colour stability over irradiation is achieved when Heat Reflective Chromadek® instead of Standard Chromadek® is utilized.

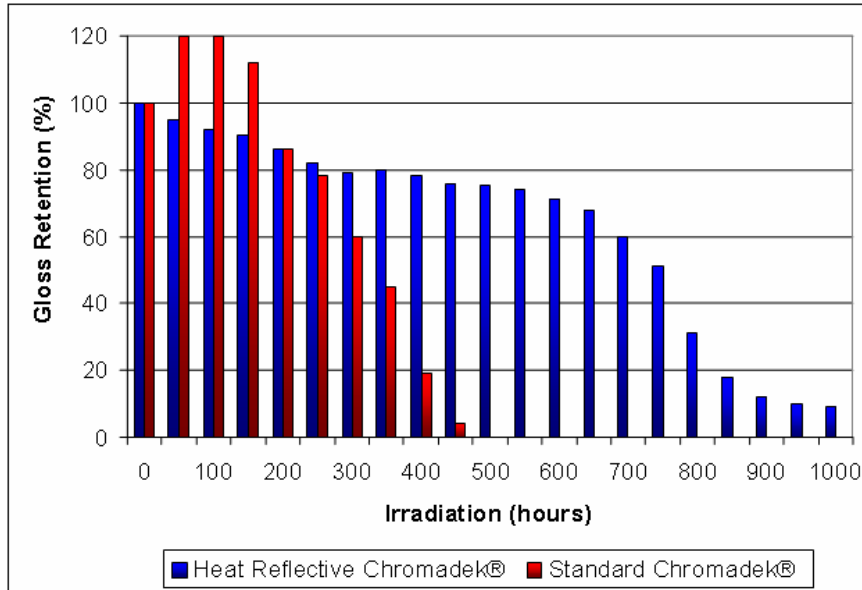
#### - Gloss

Figure 4 compares the Gloss (defined as the level of shininess of a surface) Retention properties of Heat Reflective Chromadek® with Standard Chromadek® over irradiation.

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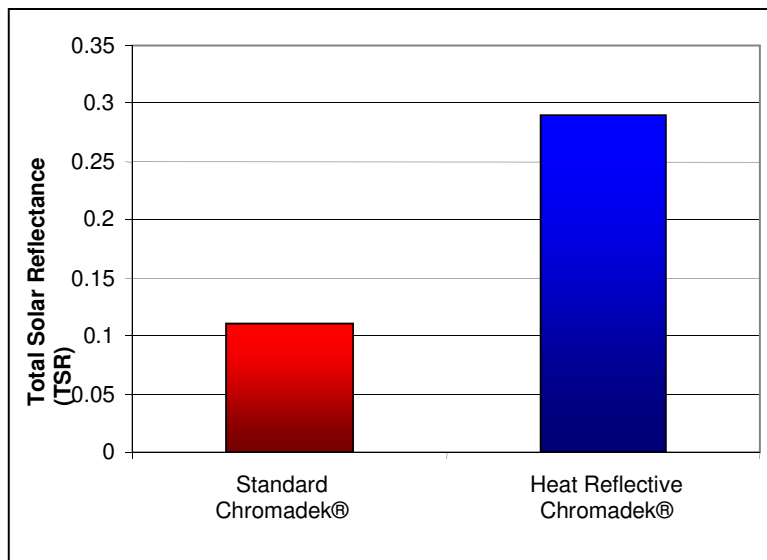


**Figure 4: Gloss measurements on Dark Dolphin Chromadek®.**

Heat Reflective Chromadek® retains its Gloss more efficiently than Standard Chromadek®.

**- Total Solar Reflectance (TSR)**

Total Solar Reflectance (TSR) is defined as the amount, expressed as percentage or decimal, of infrared radiation reflected from the surface.



**Figure 5: TSR measurements of Dark Dolphin Chromadek®.**

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The high TSR characteristic of Heat Reflective Chromadek®, as illustrated in Figure 5, explains why Heat Reflective Chromadek® is cooler and experience higher durability than Standard Chromadek® over irradiation.

### Benefits of Chromadek® Thermal Coatings

Heat Reflective Chromadek® offers the following benefits:

- a) Increased durability:
  - Increased gloss retention.
  - Improved colour stability (less fading).
  - Sustainable film integrity.
- b) Reduced heat transfer into buildings.

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