

# Thermal Infrared Coatings

Low observable technology



**AkzoNobel**

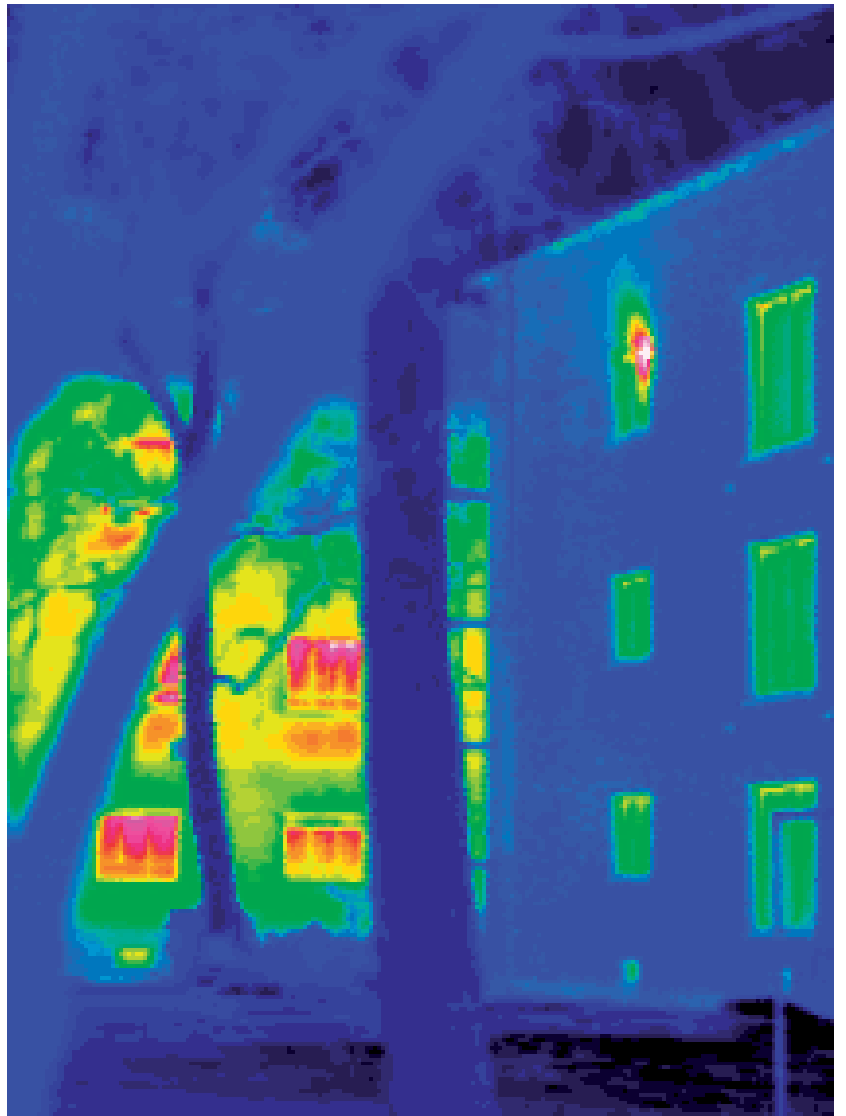
Tomorrow's Answers Today

## What is a Thermal Infrared Coating?

Thermographic cameras were created to produce images of invisible thermal infrared or 'heat' radiation and can visualize temperature differences. A thermographic camera will reveal an accurate thermal image (thermogram), and makes it possible to 'see' the signature of objects and its environment with or without visible illumination.

Temperature differences of +/- 25°C (45°F) between an object and its surroundings are not uncommon in the operational theatre. Under ideal conditions thermographic cameras can detect temperature differences as little as 0.1°C (0.2°F). As distance between camera and object increases the accuracy diminishes. Transmittance of radiation through the atmosphere can also be hindered by metrological conditions, like mist or airborne particles.

When observed through a thermographic camera, warm objects stand out well against cooler surroundings. For example, a military tank warmed-up by the sun may radiate at a higher temperature than its surroundings long into a cold night and becomes clearly visible against the environment. Thermal infrared coatings help to disturb the thermal signature of a military asset by influencing the emissivity of their host. This makes detection more difficult and improves the survivability of military assets, leading to improved effectiveness and reduced casualties.



## Technology

Thermal or far infrared (FIR) radiation is not visible to the human eye but can be detected by thermographic cameras. Essentially, it is the part of the electromagnetic spectrum that is defined as heat radiation (900 to 14000nm wave band – figure 1). Everything with a temperature above absolute zero (-273°C/-460°F) emits heat. This includes very cold objects like ice cubes. The higher an object's surface temperature, the more infrared radiation is emitted.

Thermal infrared coating concepts strive to reduce the emissivity of an object in order to disturb the thermal signature. The coating needs to be modelled for the environment the object is being deployed to.

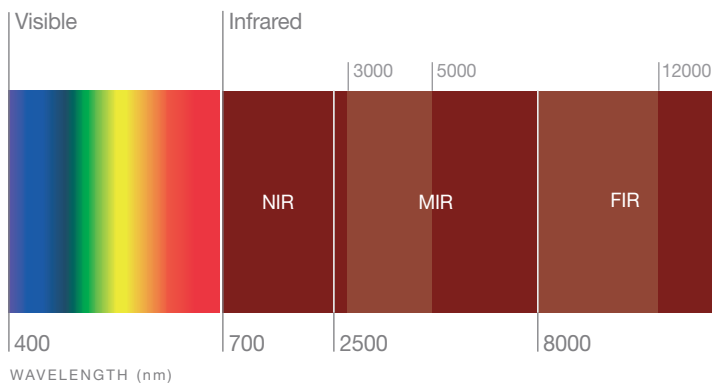


FIG. 1 - Schematic of the electromagnetic spectrum.

## Optional functionalities:

Lowering the emissivity of an object generally means that the visible (VIS) & near infrared (NIR) reflectance level will also change. Since reflectance is different from heat radiation, it is very difficult to balance the two when developing and customizing thermal infrared camouflage coatings.

New coating developments may provide the potential to apply a temporary, peelable coating that can disturb the thermal infrared signature. Peelable coatings have the advantage that they can be adaptively controlled as needs change. A tank that is showing up as cold on the sides and warm on the top can be thermally camouflaged by the application of a peelable coating on the top of the tank. This will lower the thermal emissivity and disturb its thermal signature. When thermal camouflaging is no longer necessary, the temporary coating can be peeled off manually.

The concept of a multi-color camouflage pattern, with only one color having a thermal infrared coating solution, may also enhance the effectiveness of stealth and provide a delay in the detection of the object type.

## Summary:

The development of thermographic cameras created a need for effective thermal infrared stealth capabilities. Thermal infrared coatings can ultimately contribute to the success of a mission by reducing or disturbing the thermal signature of military assets. New coating developments may even lead to the availability of active thermal infrared camouflage systems that provide one more crucial level of protection in military defense.

## More Information:

With a long and successful history of serving all sectors of the armed forces, 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.

Our specialist products meet the requirements of various coating defense standards and military performance specifications.

For more information on thermal infrared coatings and other specialist coatings, contact your local AkzoNobel Aerospace Coatings representative, visit our website at [www.akzonobel.com/aerospace](http://www.akzonobel.com/aerospace) or e-mail us at: [customer.service@akzonobel.com](mailto:customer.service@akzonobel.com)



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