

2.4 Light and colour – infrared

In chapter 2.3, we looked at the interactions between various wavelengths and coloured objects. Special effects are encountered, however, when working with radiation outside the visible spectrum. In the long wave infrared range in particular, coloured and printed materials behaves differently than in the visible spectrum.

Both the reflection and absorption of infrared radiation is more dependent on the material and surface properties than on the material colour. Accordingly, an identical material will reflect and absorb to the same degree, regardless of its colouration. If light falls on a printed surface, for example, then the actual print present on the surface can be made almost entirely invisible to the camera. All colours will reflect this radiation uniformly. A similar effect is seen with various coloured plastics, labels – and even with many types of thermal transfer printing.

Black and white areas are one exception here. For these, the ground rule continues to apply: black is the strongest absorber of all wavelengths, while white reflects all wavelengths equally. As a result, black and white objects still appear black and white in the image. This means that infrared lighting can be used in conjunction with coloured objects to selectively mask certain areas.

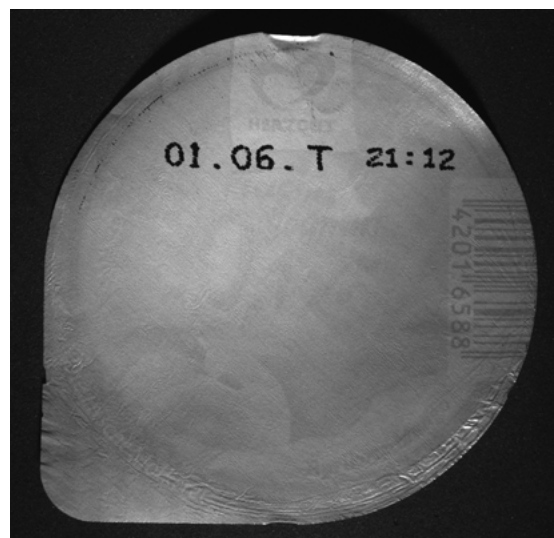
A practical example

In food packaging in particular, an appealing design is considered important, since it will encourage the consumer to buy the product. Accordingly, the design typically features an all-over, multi-coloured print. If a particular printed feature – such as the shelf life expiration date or a barcode – needs to be detected, this presents us with an image processing problem. This is where infrared lighting comes into play. Important markings such as the shelf life expiration date are often embossed or printed in black. If we exploit the effects of infrared radiation on colour, we can simply make a distracting background “fade away”. The overprint we need is brought into the foreground and can easily be analysed.

Apart from its usefulness with coloured test objects, this is not the only place where longwave infrared radiation has an important role to play. Infrared lighting can also be used to look inside certain kinds of materials. This technique is used in inspections using backlight systems on conveyor belts, for example. Infrared radiation can also be used in combination with specialised filters to attenuate (block) extraneous light. In chapter 3, this technique will be looked at in detail.



Aluminium cap for yoghurt pot under white light



Aluminium cap for yoghurt pot under infrared radiation

Influence of the lighting angle

Wavelengths

Optical filters

Flash vs. continuous

Fluorescence applications

Lighting systems for the reading and verification of codes

Lighting technology for shape-from-shading