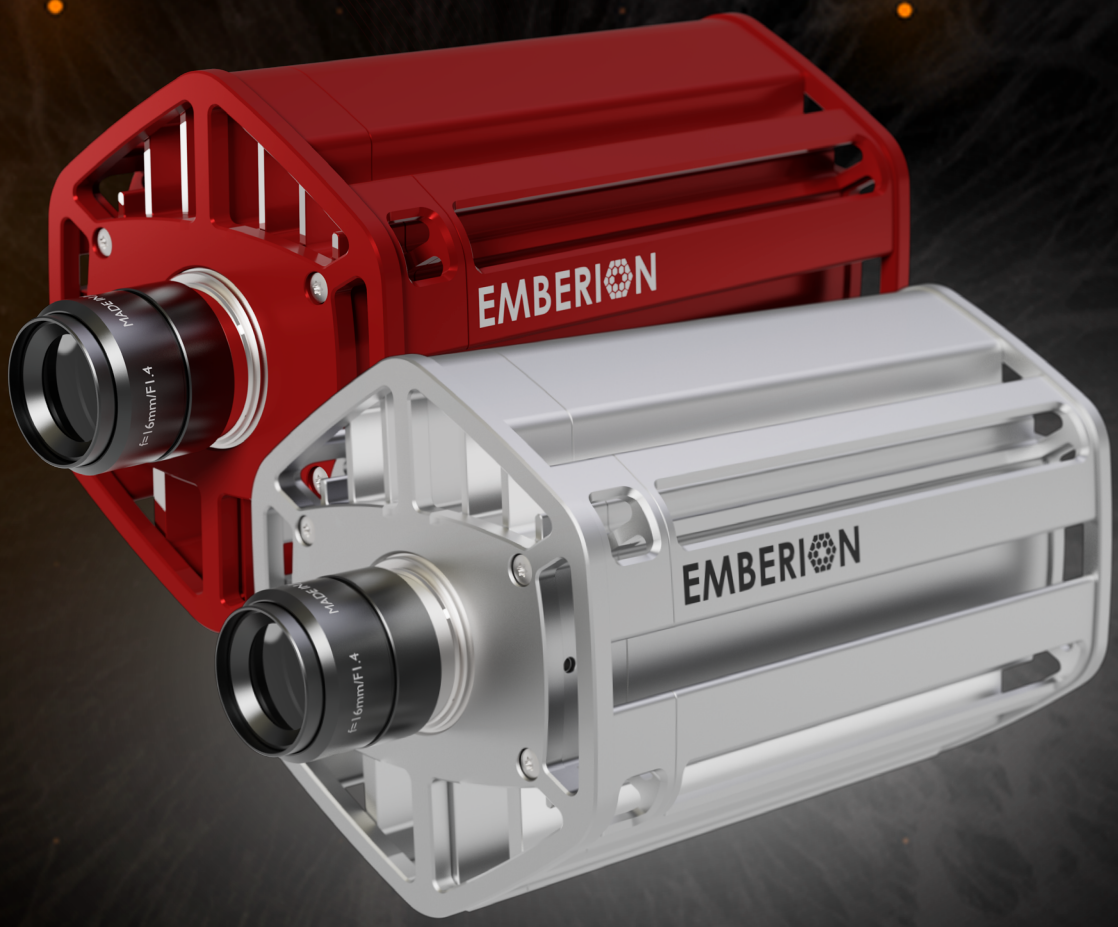
VIS-SWIR CAMERAS

Product catalogue



EMBERION

Broaden your vision

Broaden your vision

Wide spectral range camera from visible to shortwave infrared (VIS-SWIR) up to 2000 nm with one image sensor from Emberion

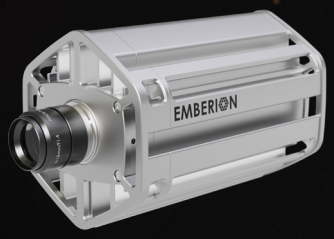
Integrated camera solutions to provide optimal images beyond human vision

High Dynamic Range (HDR) without saturation and capability for linear output for optical measurements targeted for a variety of imaging application needs

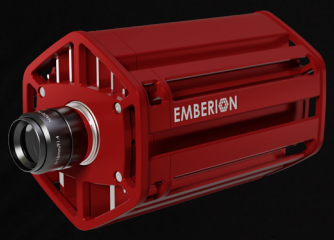
Scalability, affordability and customizability is enabled by monolithic integration of colloidal quantum dots (CQD) using inhouse designed CMOS readout IC which allows unique measurement modes and high frame rate

Emberion VS20 product family

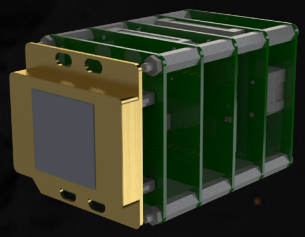
Emberion VS20 Camera Link
up to 86 fps



Emberion VS20 GigE
up to 400 fps



Emberion VS20 GigE camera core
up to 400 fps
Size, weight, power consumption optimised



Future Developments :
Megapixel & push-broom cameras for SWIR
MWIR & Ultra-broadband cameras 3-5 µm

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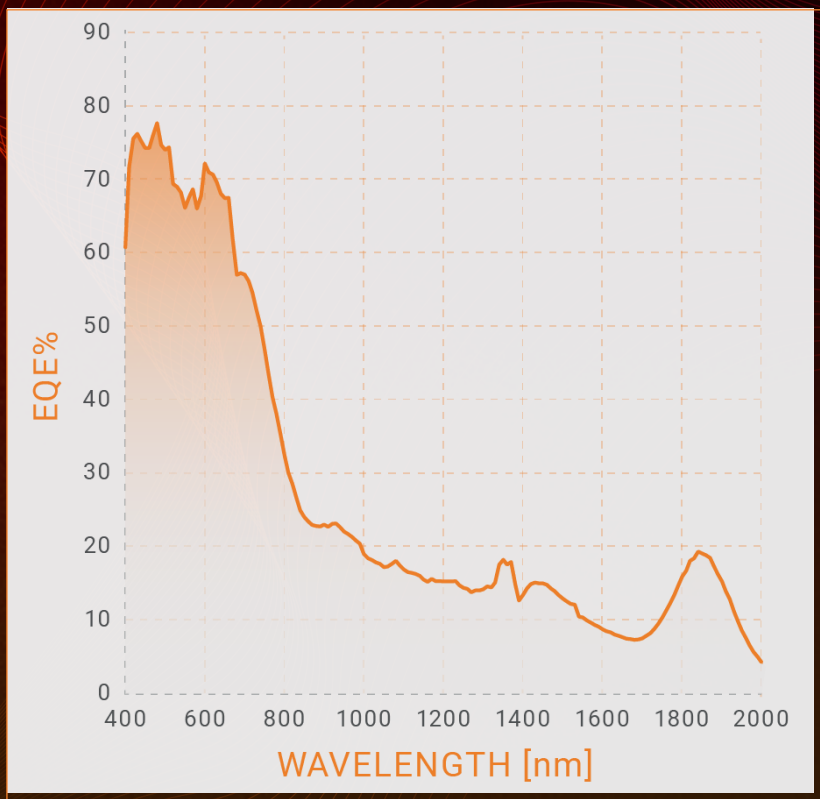
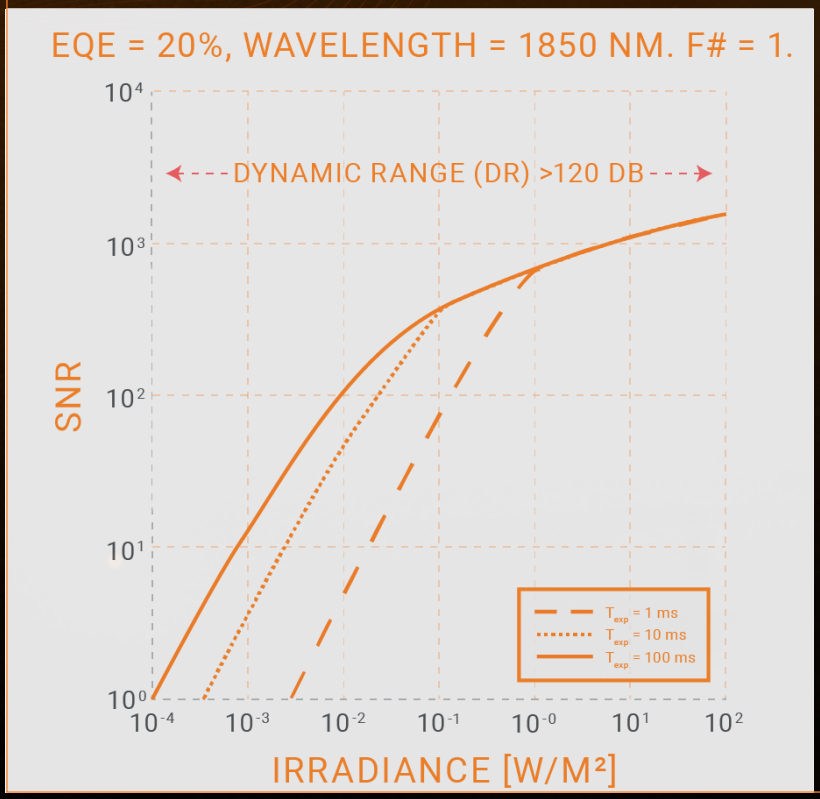
Highlights



Broad Spectrum
400-2000 nm

High Speed
400 fps



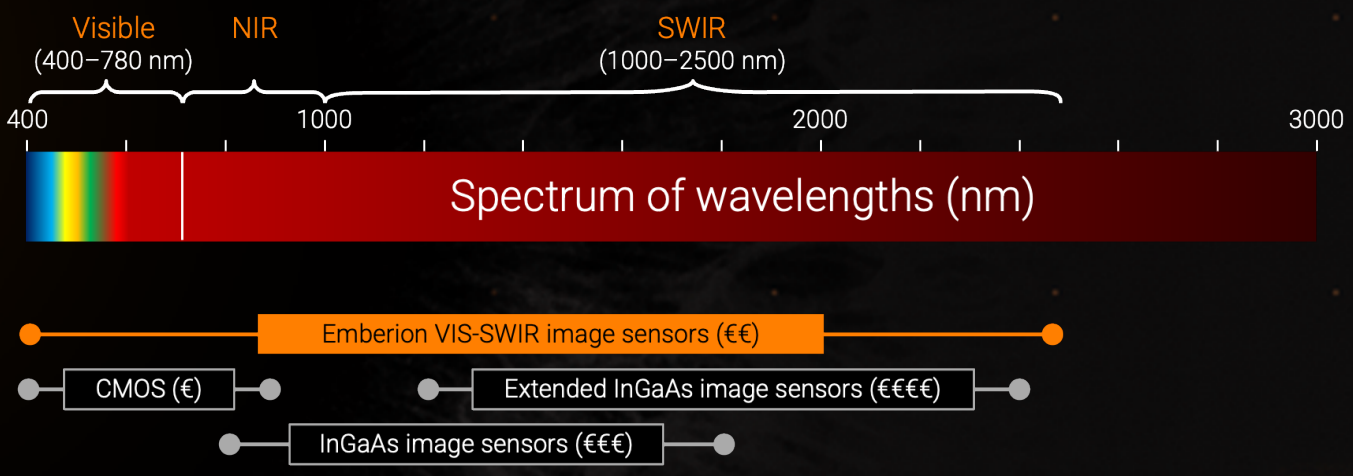
High Dynamic Range
>120 dB

EQE External Quantum Efficiency, taking losses, reflection and recombination into account
SNR Signal to Noise Ratio

Comparison with InGaAs

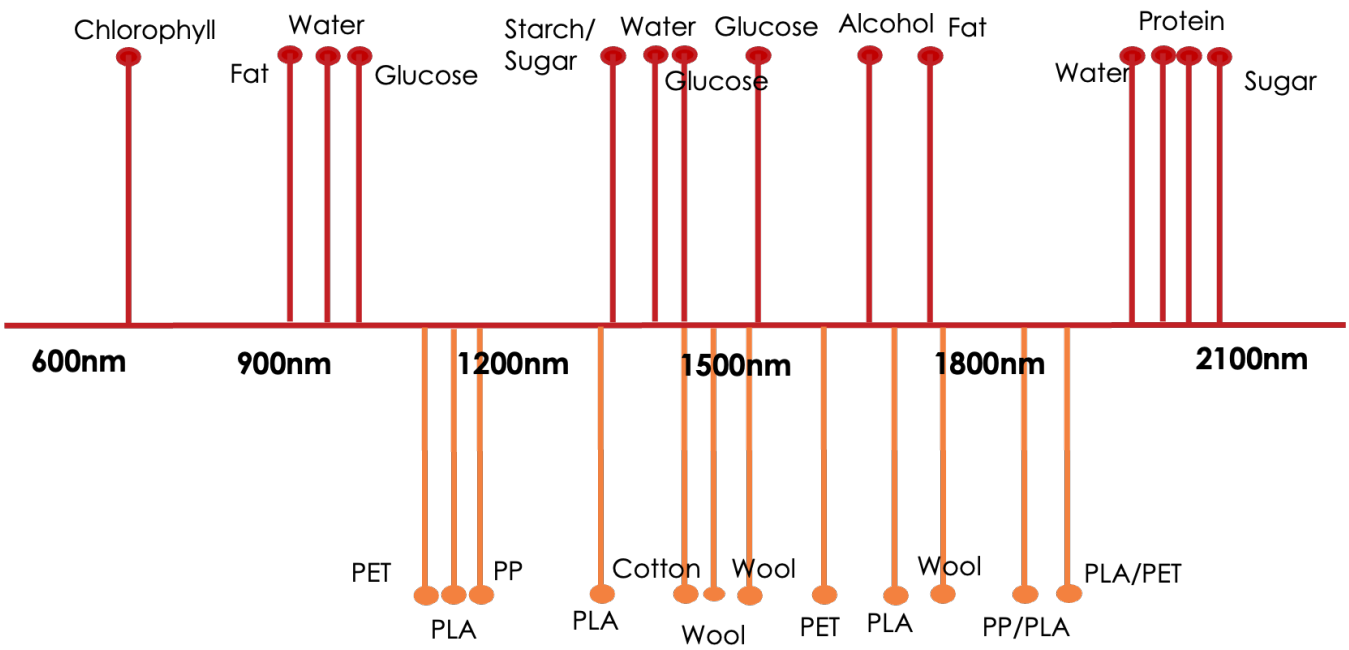
Image taken by InGaAs camera on a cloudy day. There are some prominent dissimilarities in the contrast differences, e.g. tree leaves appear much lighter and the sky is saturated in comparison to the Emberion VS20 (right image).

The non-linear response characteristic and the wider spectral sensitivity range of Emberion cQD sensor offer a wider dynamic range, see the contrast differences in the clouds, balconies and car windows.



InGaAs Indium Gallium Arsenide

Spectral peaks

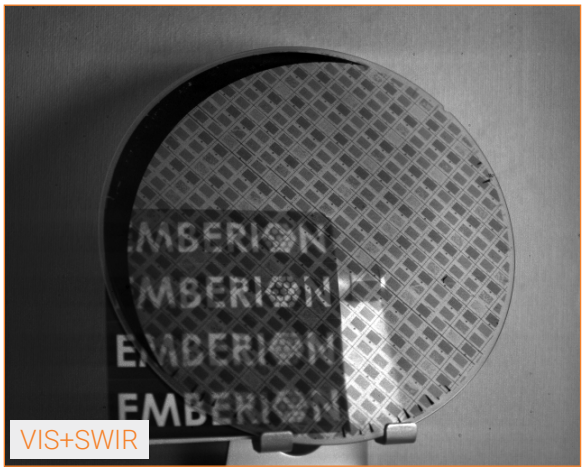


Application examples

- Plastic sorting
- Packaging inspection & moisture detection in packages
- Food quality assessment & sorting
- Precision farming & horticulture
- Surveillance in demanding weather conditions such as rain, fog & haze
- Detection of military laser range finders and target designators
- Semiconductor & solar panel inspection
- Enabling multi and hyperspectral imaging
- Medical and dental imaging: ability to distinguish between different tissue types

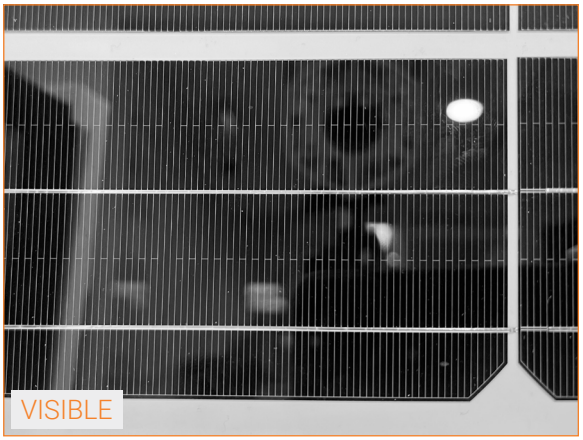
Wafer inspections

Silicon wafer is highly reflective and opaque in VIS light. Thus, objects placed behind the wafer are not visible and only the surface CMOS IC structures can be inspected.

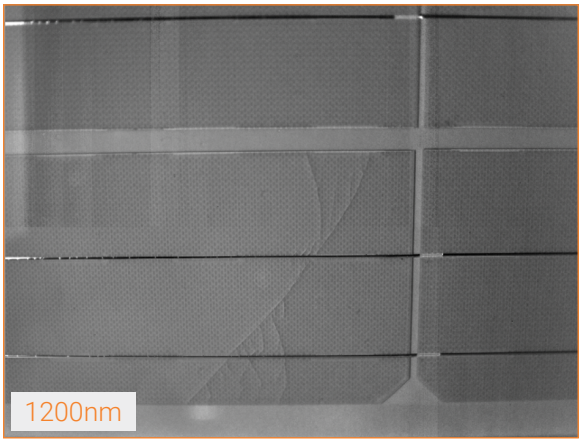


At the longer SWIR wavelengths Si-wafer becomes transparent which allows the examination of the internal and backside structures as well.

Solar panel inspections



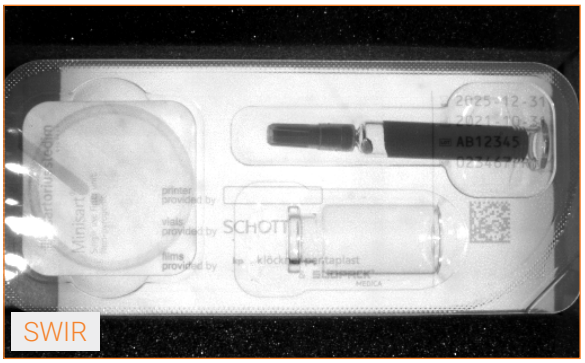
Solar cells can be easily damaged during solar panel production. Under visible light, cracks cannot be detected.



At SWIR wavelength crack become visible, and can be detected by Emberion VS20 SWIR camera. The cracks at solar panel can be observed using 1200 nm filter to identify the cracks.

Medical vial inspection

Full VIS-SWIR spectrum image shows the printing on the packaging and the vials underneath the opaque package are barely visible.



SWIR image shows the vials very clearly underneath the opaque package. Some of the printed package labels are not visible in IR light. The fill-up level of the transparent liquid in the vial is very visible due to water high light absorption at 1450 nm and 1940 nm.

Through plastic packaging

Pistachios in a plastic packaging with opaque printed labels.

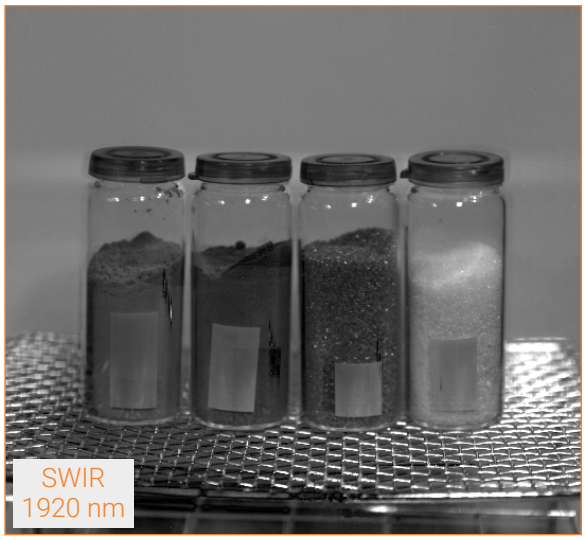
Pistachios are visible through the plastic packaging, the labels are partially transparent in SWIR light.

Through paper wrapping labels

Vials with paper wrapping 3 times (left) and 4 times (right). Paper becomes translucent at specific SWIR wavelengths. This is important for measurements to liquid levels through paper using correct light conditions.

Powder identification

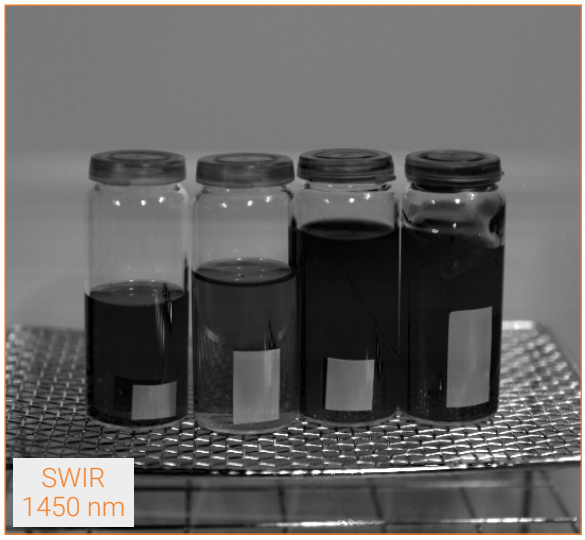
Powder types from left to right: Potato starch, baking soda, sugar, table salt.



Different contrast levels are observed at SWIR wavelength allowing differentiation of the powder/granule types.

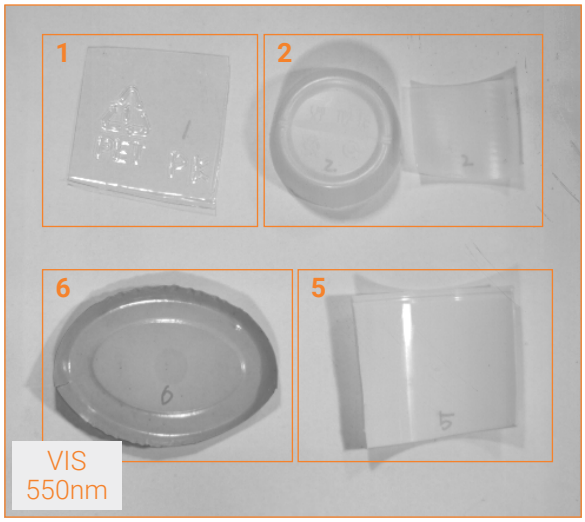
Liquid analysis

Kerosene, hand sanitizer gel, IPA and water samples all appear colourless and transparent.



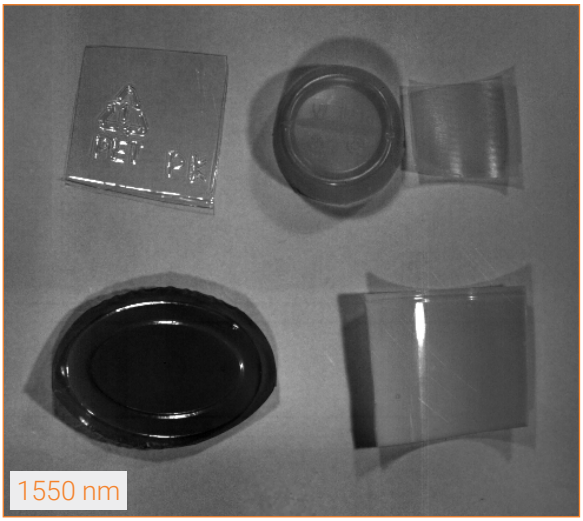
Samples containing water and alcohol appear darker than kerosene and oil. Also, the high viscosity of the gel is very prominent in SWIR image.

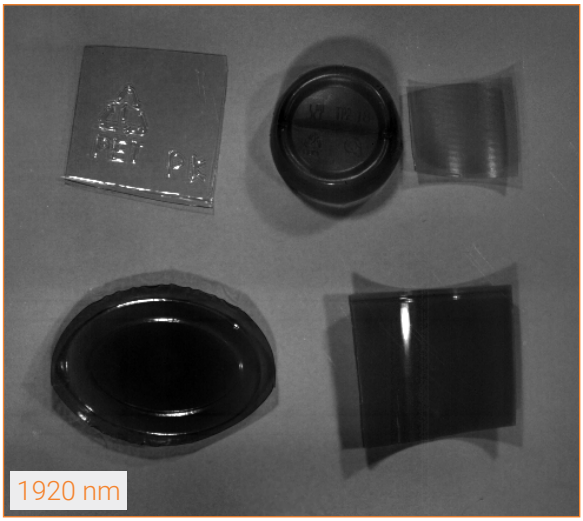
Separation of plastic types



Sample types

Sample type 1 - PET
Sample type 2 - LDPE
Sample type 5 - PP
Sample type 6 - PS





Plastic types have absorption peaks at different wavelengths as the molecules absorb the infrared energy thereby creating stronger and differential contrast levels. The images taken with the Emberion VS20 show that LDPE (2) is absorbing extended SWIR 1920 nm much more prominently compared to 1550 nm and visible at 550 nm. Machine Learning/ AI classification can be used to differentiate the plastics types during optical sorting processes e.g. plastic recycling.

Bruising inspection

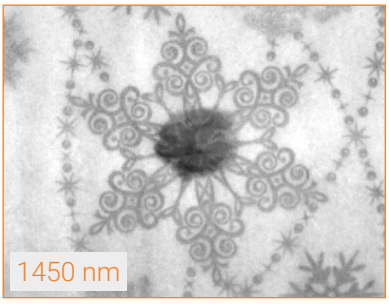
Visible spectrum image does not show any signs of internal bruising of the apple caused by rough handling.

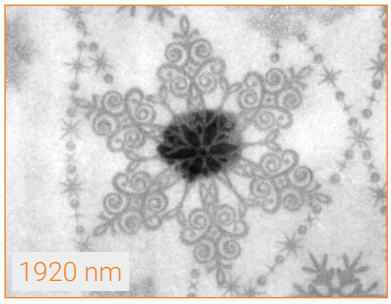
Bruising changes the water density and water distribution in the fruit tissue. Due to the IR light absorption peaks of water around 1450 nm and the bruising is clearly visible.

Water detection

Water is transparent in visible light. Water drops on coffee beans are barely noticeable. Water molecules reflect most of the visible spectrum energy thereby appearing transparent/ translucent.

Due to light absorption peak of the water around 1450 nm and 1940 nm, the water droplets absorb those infrared energy thereby showing maximum contrast levels which helps to identify moisture ingress.



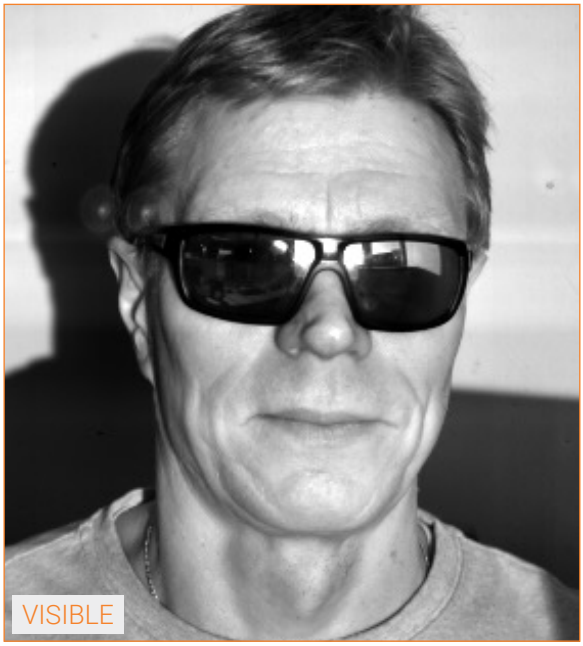


Emberion VS20 has been used to detect water at specific wavelengths. Water absorption peak shows highest contrast at 1920 nmdecreasing contrast levels at 1450 nm, at visible wavelength it is almost transparent.

See through smoke

Image on the left showing visible smoke from campfire blocking the scene. The same image can be seen through the smoke using Emberion VS20 SWIR camera with 1550 nm filter. SWIR penetrates through smoke particles allowing adverse condition surveillance (defense, night vision, firefighting, automotive)

Face recognition with sunglasses



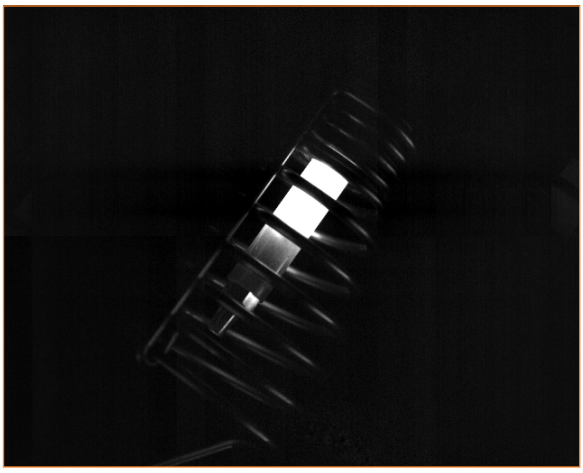
Eyes are barely visible behind the sunglasses which makes face recognition very difficult.

Black plastic sunglasses are fully transparent allowing easier detection of facial recognition.

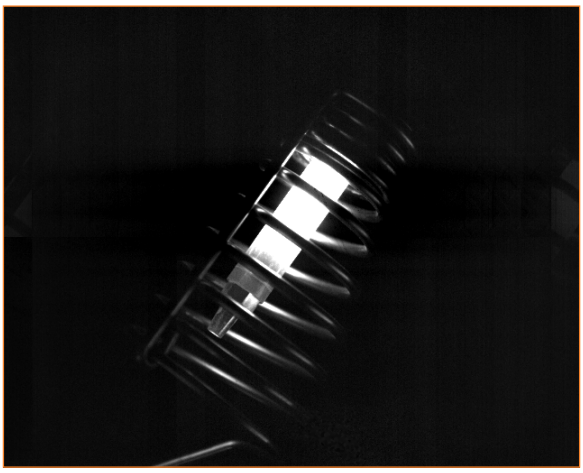
Soldering iron under SWIR

Soldering iron at 200 °C

Soldering iron at 300 °C



Soldering iron at 400 °C



Soldering iron at 500 °C

Emberion VS20 can be also used for temperature indication. Due to the high dynamic range of the camera bright soldering iron does not saturate the sensor and wide range of temperature profiles can be observed in the same scene allowing broad temperature analysis for various applications.

See images above showcasing hot soldering iron pictures taken by Emberion VIS-SWIR camera from 200 °C to 500 °C.

Contact us!

Website:
www.emberion.com

Sales:
sales@emberion.com

Support:
support@emberion.com

Locations:

FINLAND OFFICE,
HEADQUARTERS
Emberion Oy
Metsänneidonkuja 8,
02130 Espoo, Finland

UK OFFICE
Emberion Ltd
151 Cambridge Science Park,
Milton Road,
Cambridge CB4 0GN, UK