Spectral Imaging

Process Technology

MINERALS - ROCK - DEBRIS

Mineral sorting and recycling of construction material

idMgO
idCM

LLA Instruments GmbH

Raw minerals, rock and construction material

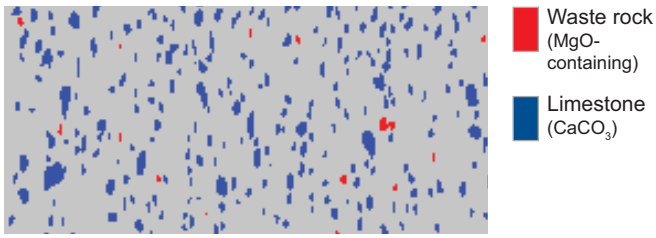
NIR-spectroscopy for identification of industrial minerals

The production of high-quality mineral products and building materials demands high-grade raw materials. For a successful quality control by common UV/VIS sensor sorting, the valuable minerals and the waste rock fraction must differ significantly in their colour. If both fractions are not different in colour, the application of modern near infrared process technology will enable a successful separation nevertheless. NIR-spectroscopy is a contact-free and non destructive analysis technique and is based on the excitation of molecular vibrational modes by infrared light. The detection of the absolute remission at discrete wavelengths results in characteristical spectral information for each NIR-active material. This information is the basis for the applied analysis algorithm during the identification and sorting process of stones and minerals. According to the mineral composition of the raw material and the sorting task, an identification module is developed. These modules are easily modifiable for individual customer preferences. The NIR process spectrometer KUSTA2.2MPL and KUSTAx.xMSI are especially engineered for industrial purposes and are easy to incorporate into existent systems.

Application: separation of dolomite and calcite - idMgO

Limestone has a global annual production rate of 1000 mega tones and is therefore one of the main products in the mining industry next to sand and grovel. Limestone must contain a preferably low amount of magnesium oxide (MgO) for usage in cement production or as additive in smelting. The amount of MgO originates from dolomite impurities in the raw material. The NIR analysis module idMgO was developed for identification of the MgO phases in limestone. This module reduces the amount of MgO in the resulting product significantly and is customised for specific on-site conditions of the natural mineral deposit. The identification of clay mineral impurities in limestone is available as optional module.

Separation of value rock and waste rock ...



...by NIR-sorting (NIR process identification of limestone) ...

...on-site/ in the process

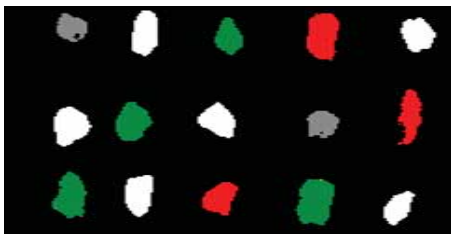
Applications

Application: recycling of construction material - idCM

Demolition, deconstruction and restoration of buildings create a vast amount of debris consisting of e.g. concrete, gas concrete, lightweight concrete, brick, sand-lime brick, mortar, and gypsum. However, these used construction materials are too valuable for disposal. As a recycled (RC-) construction material, these offer a resource-friendly alternative to virgin construction material.

To this day, rudimental techniques such as permanent magnets for metal separation and crushers for milling of large debris parts are used besides the dominating sorting technique: manual separation. These techniques are not suitable for the production of high-quality RC-materials featuring properties comparable to virgin construction materials. In this case, the usage of NIR-technology offers new potential for RC-products.

Input material - digital camera picture



Input material - result NIR identification

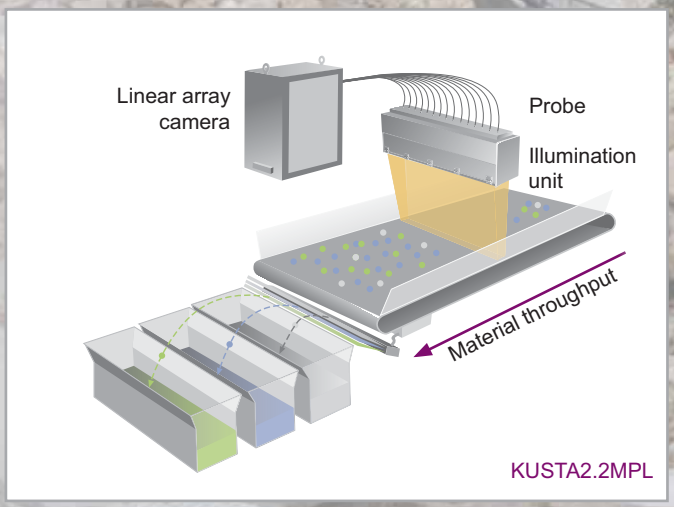
The analysis software idCM (idConstruction Material) in combination with the KUSTA2.2MPL or KUSTAX.XMSI camera systems allows an identification of construction material fractions in debris - even if separation by colour differences is impossible. Gypsum-containing construction materials are identified with high accuracy. This enables the significant reduction of the sulphate content in the resulting RC-product thus developing new markets for RC-material e.g. as additive in concrete production. RC-construction material used as base layer in road construction should offer a high physical density.

The application of idCM in the sorting process reduces the amount of low density fractions in debris by identification of materials such as gas concrete, gypsum and lightweight brick varieties. If extraneous materials such as paper or plastics (from pipes or insulated wires) have similar colours to the construction material, the NIR-technique will offer a solution as well. For this purpose an optional module is available which ensures the separation of paper and plastics for further recycling. Wood - even with contaminated surfaces - is also identified successfully by this optional module.

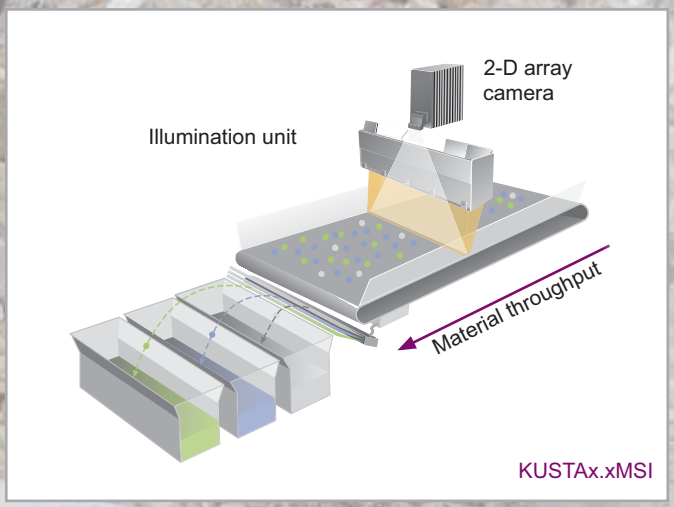
Technical specification

	KUSTA2.2MPL	KUSTA1.7MSI	KUSTA1.9MSI	KUSTA2.2MSI
Wavelength range	1,1 µm – 2,2 µm	0,95 – 1,7 µm	1,3 – 1,9 µm	1,25 – 2,17 µm
Particle size	> 20 mm	3 mm – 20 mm	5 mm – 20 mm	3 mm – 20 mm
Tracks	64	318	192	318
Framer ate (ROI Δλ = 620 nm)	70 Hz	270 Hz (400 ROI mode)	795 Hz bei 100 µs exposure time	270 Hz (400 ROI mode)
Illumination systems	Probe PMAmpl	Illumination unit PMAmsi		
Conveyor belt width	Up to 2 m			
	For wider conveyor belts, two systems may be combined			
Optional accessories	RGB-Sensor Handheld scanner Single measuring units	Mirror unit RGB-color camera		
PC-configuration	Dual-core industrial PC, Windows® embedded			
Serial interface	TCP/IP UDP RS232	TCP/IP UDP		
Conveyor belt speed	Up to 3 m/s			
Construction material	Depending on sorting task			
Calcite/ dolomite	+	-	-	++
Talc	+	+	+	++
Borates	+	++	-	-
Bauxite	+	-	-	+

++ particularly suitable + suitable - limited suitablility



KUSTA2.2MPL



KUSTAx.xMSI

Your question to minerals / material recycling is not answered?
Contact us for a customised solution:

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