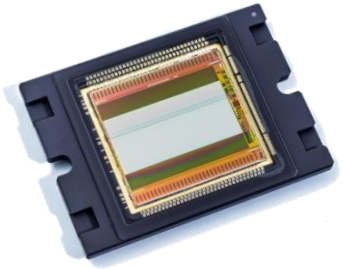
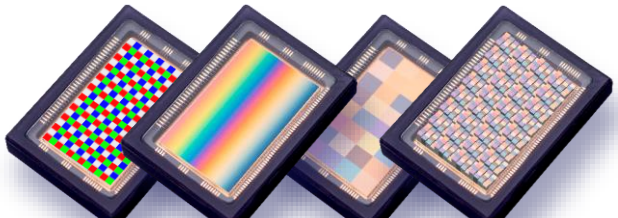
imec spectral imaging - EPIC online meeting

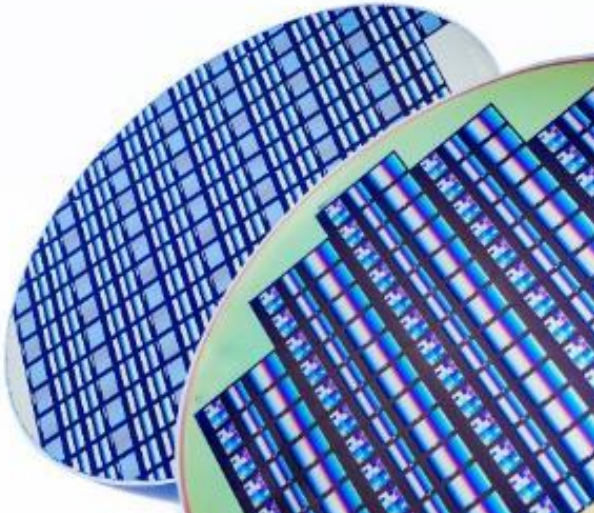
Wouter Charle

imec on-chip spectral imaging as an enabler

- Unique wafer level filter processing democratizes and commoditizes HSI
- We translate application needs into spectral imaging solutions
- From evaluation systems to customized filter manufacturing
- www.imechyperspectral.com – hsi.sales@imec.be







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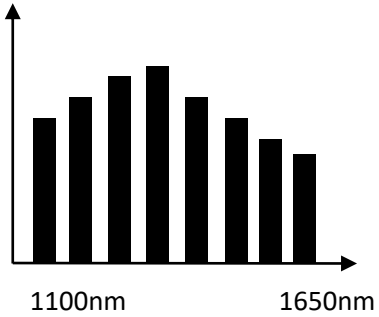
Real-time video imaging in SWIR spectral range

Multi-spectral



Snapshot mosaic
9 / 16+ bands

Applications:

- Industrial machine vision (quality inspection, sorting)
- Security (surveillance, forensics...)
- Agriculture (smart farming)
- Environment monitoring (oil spill detection, deforestation...)
- Medical (surgery, pathology microscopy, wound monitoring...)

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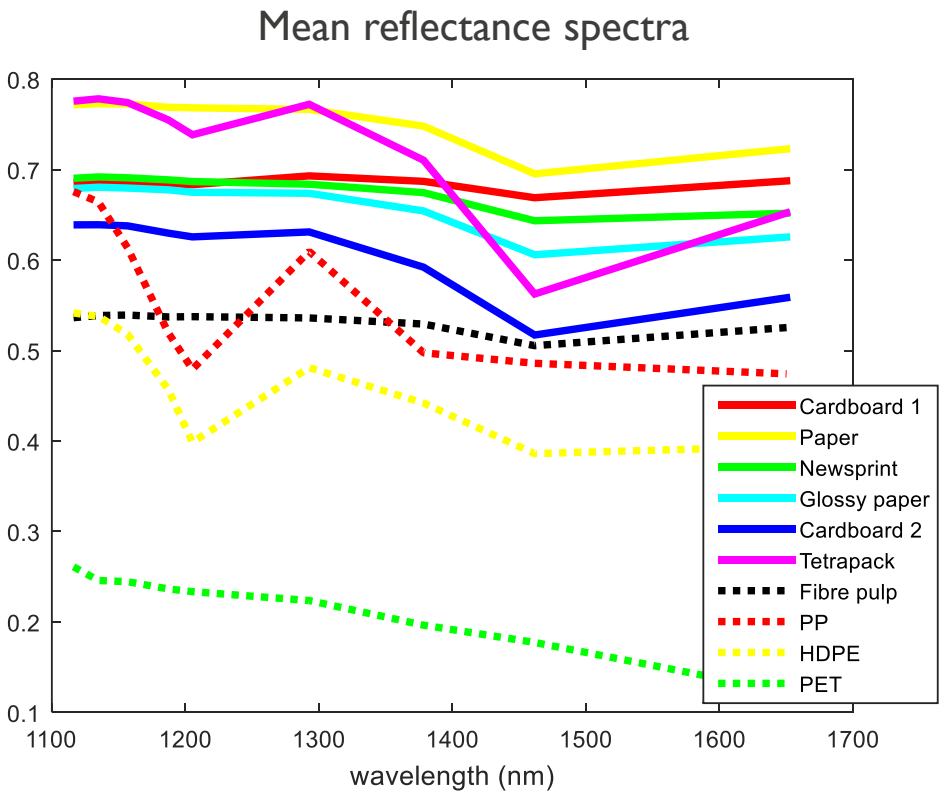
Spectral signature of plastics & cardboards



Machine Learning Classifier

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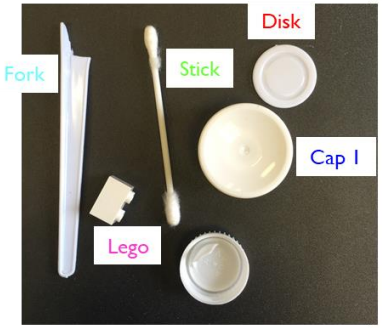
Unique spectral signatures of materials.

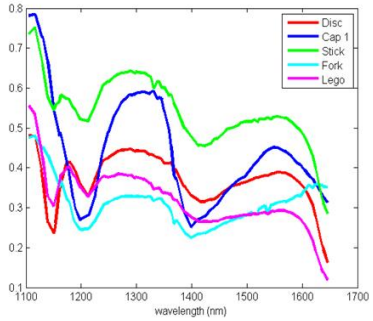
...enables potential use of hyperspectral imaging

Plastics

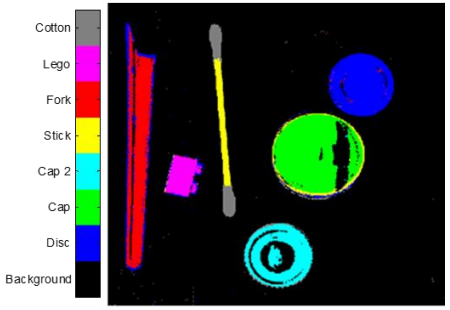
RGB color image



Mean reflectance spectra



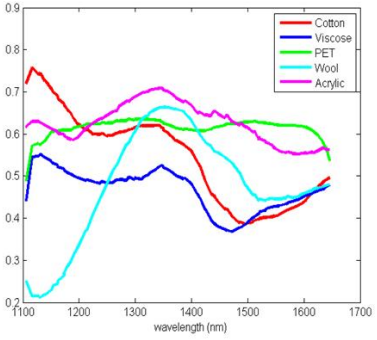
Classified (QDC classifier)



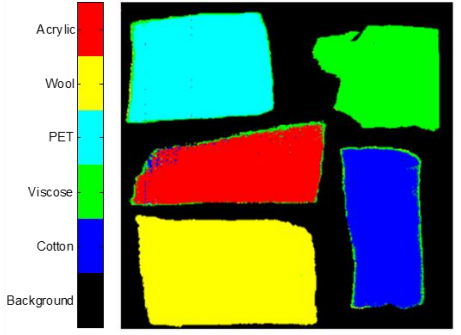
Common Textile Materials

RGB color image

Mean reflectance spectra



Classified image (QDC classifier)



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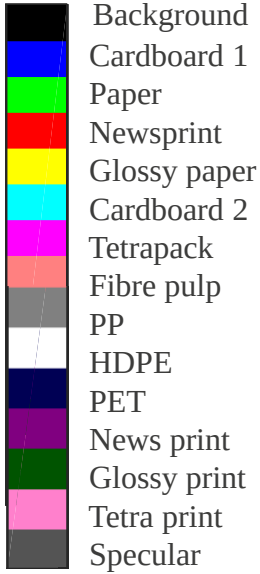
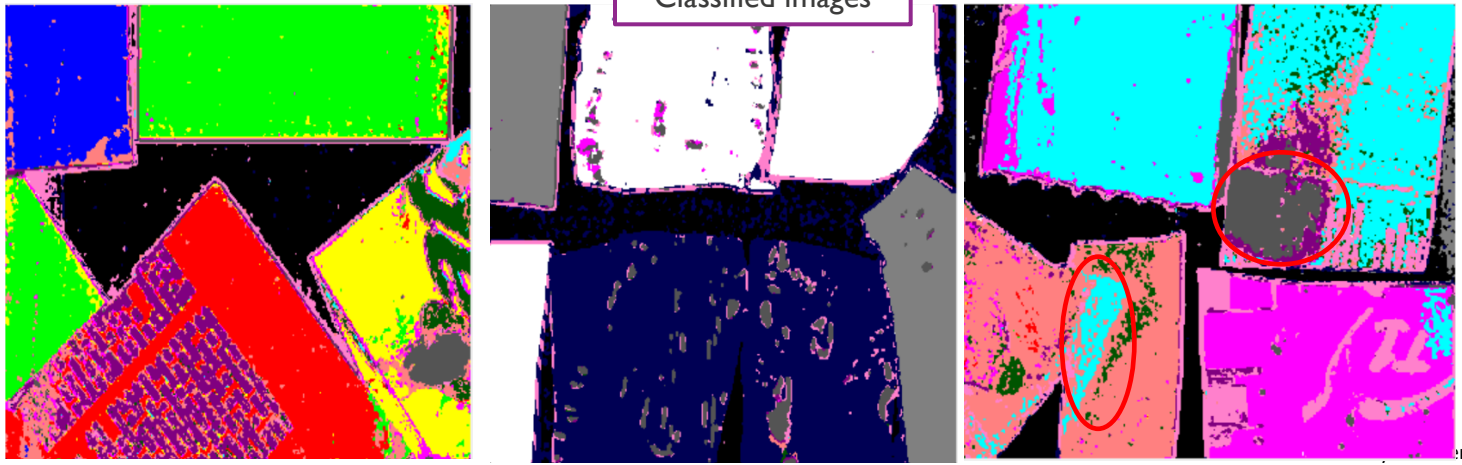
Discrimination of plastic & other materials



RGB images

Classified images



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Demo room imec

Imec's hyperspectral imaging demo room

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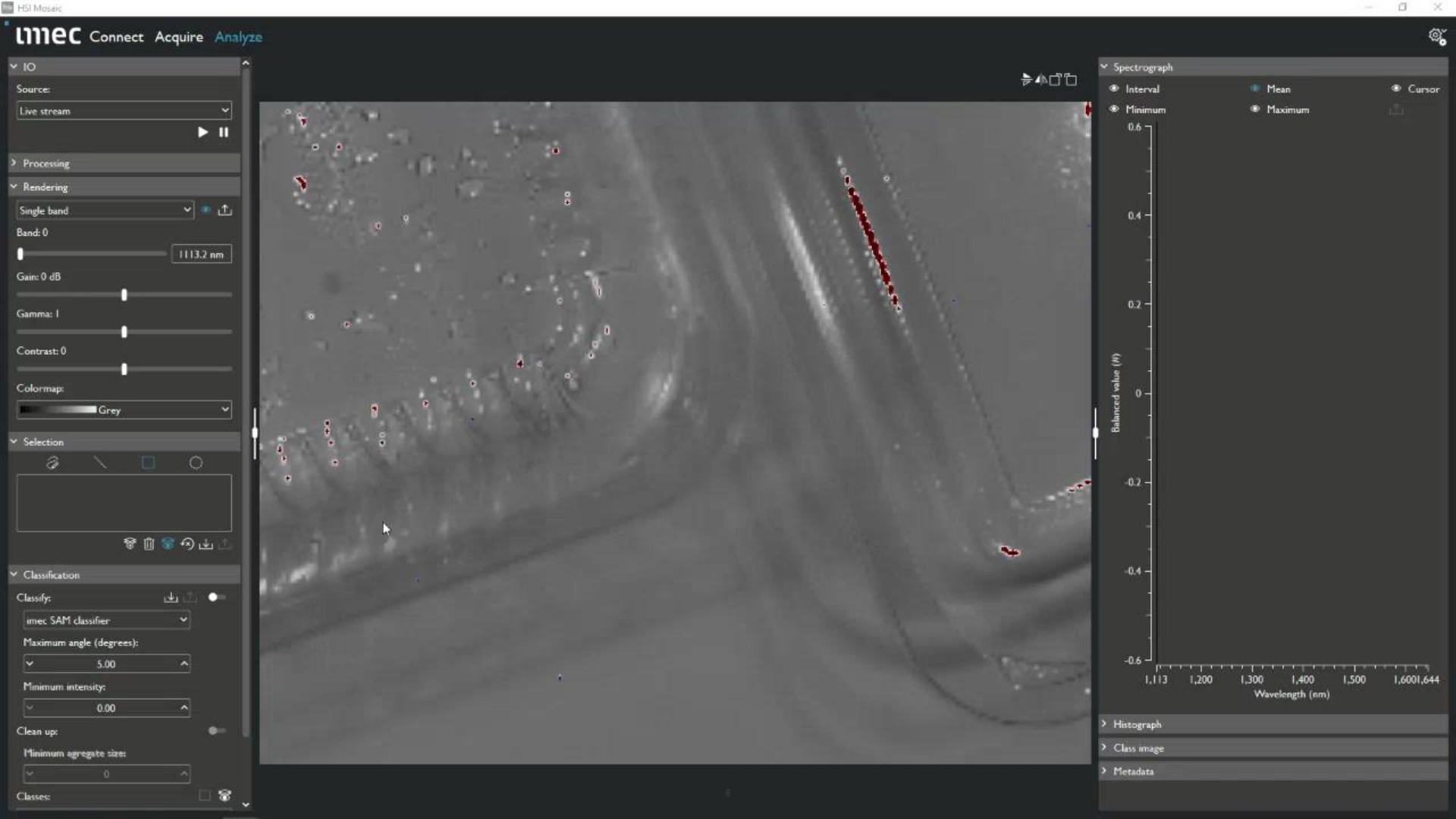
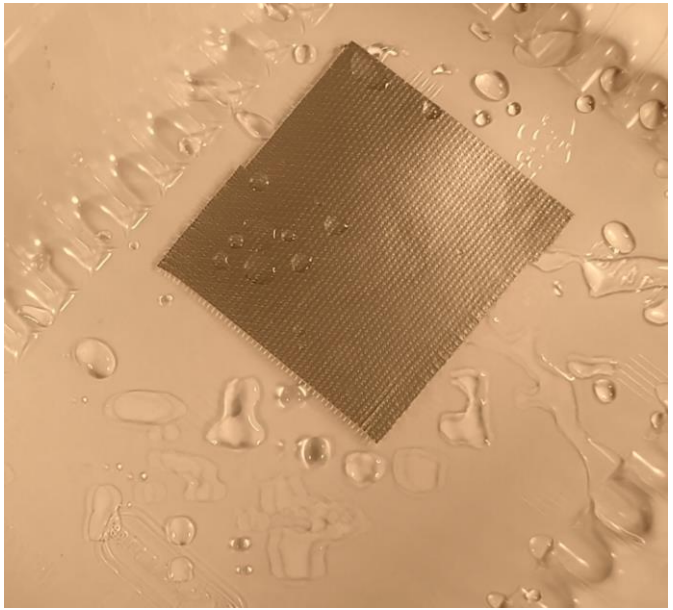

HSI Mosaic
imec Connect Acquire Analyze
IO
Source:
Live stream
Processing
Rendering
Single band
Band: 0
1113.2 nm
Gain: 0 dB
Gamma: 1
Contrast: 0
Colormap:
Grey
Selection
Classification
Classify:
imec SAM classifier
Maximum angle (degrees):
5.00
Minimum intensity:
0.00
Clean up:
Minimum agregate size:
0
Classes:
Spectrograph
Interval
Mean
Cursor
Minimum
Maximum
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Balanced value (#)
1,113
1,200
1,300
1,400
1,500
1,600
1,644
Wavelength (nm)
Histograph
Class image
Metadata

Application examples

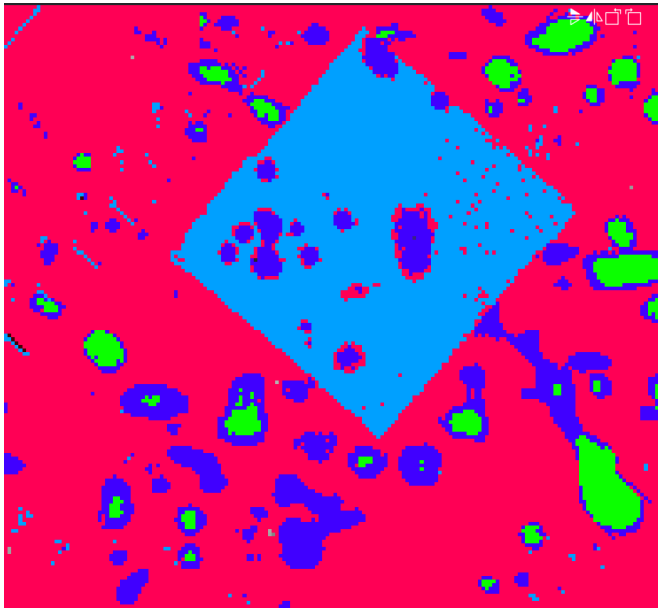
Plastic tray inspection

- Some traces of water are not visible using an RGB camera.
- Imec's SWIR hypserspectral snapshot camera can discriminate between the different materials in the scene

RGB color image



Classified (SAM classifier)



Plastic tray

tape

thin water

thick water

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Conclusions

- Various recycling applications compatible with Snapshot SWIR 9 (1100-1650 nm)
- Textile, plastic, paper and other material discriminated with high accuracy (>90%)
- Advantages imec snapshot imaging:
  - lower cost
  - compact
  - high speed (up to 120 cubes/s)
  - easy to integrate
- Compatible with unconstrained environments
  - Bin picking, robotization, unmanned vehicles, etc.

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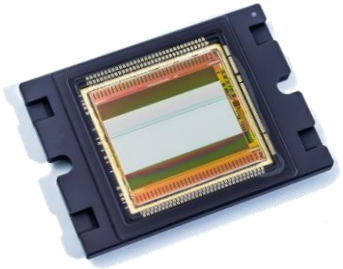

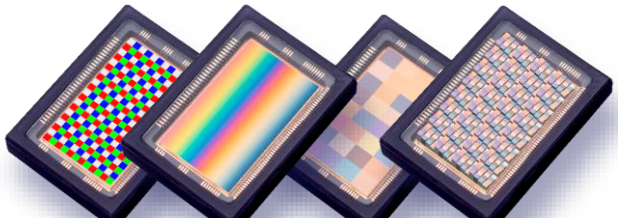

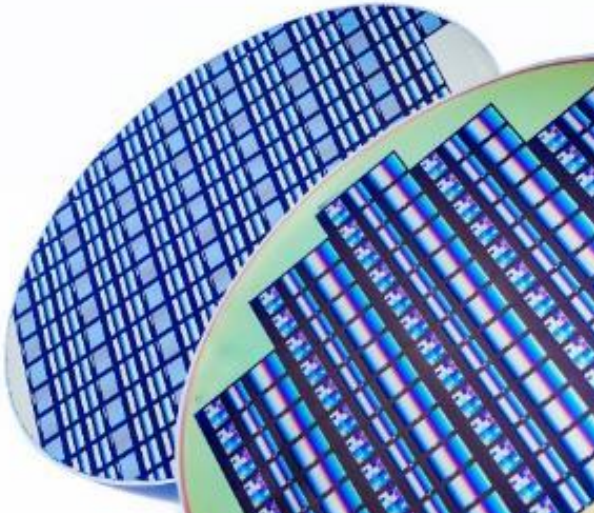

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