



High-priority product: Environmental Sensor

Designation of multi-material multi-functional product:	<i>CMC: Multi-Spectral Camera (CMS-V)</i>
General description of product (3 – 4 sentences):	<i>Environmental sensor based on colour separation using multi-spectral filters for visible/NIR spectrometry and multi-spectral imaging. The camera use the COLOR SHADES[®] technology to produce the required filters. The filters are used with 1D/2D sensors to provide the spretrometers/multi-spectral images.</i>
Multi-materials needed/required:	<i>Please indicate, which different materials are foreseen</i> Electronic thread technology combines textile fibers with electronic components and conductive wires. Embedded components can be either packaged devices (LED with specifically developed glass cover) or bare silicon dies. The electronic thread packaging and assembly combines those dies or chips with external conductive wires. Further processing condition this assembly under the form of a textile thread that can be coated. Materials used in this product range from silicon dies, polymer glues, textile filament, polymer coating.
Multi-functionality needed/required:	<i>The unit needs to be able to operate in a way similar to a digital still camera, have a suitable wavelength range (typically between 400-1000nm) with a spectral resolution <10nm @FWHM. The image resolution needs to be at least wide VGA (480-750 pixels), and all this is controlled by laptops and data stored in standard formats.</i>
Expected improvement:	<i>Hyperspectral imaging has been used in high end uses (such as medical). Expected improvements in the mosaic filters will reduce the size and cost of the filter systems currently in use. The whole system needs to be integrated into handheld units. The manufacturing process is based on the “cumulative etching principle”. Iterative photolithography and etching steps means that N steps allow the production of 2N phase levels profile.</i>
Bottlenecks to overcome for reaching the expected improvement	<i>The main bottleneck has been the size and cost of the filters. The manufacturing process allows for lower cost filters. These then need to be integrated into an imaging unit that can be adapted to view different object sizes and distances (when used as a digital camera would be used). The image sensors are based on CMOS RGB capability.</i>
Functional requirements:	<i>For environmental use the camera wavelength range is 550 to 800nm, with 9 colour bands (8+ B&W). the bandwidth (FWHM) is 20 to 60 nm. Spatial resolution is currently 1280x1024 for the full picture (426x361 per band).</i>
Technical sketch of product (if applicable):	<i>N/A</i>



Advanced Manufacturing of Multi-Material Multi-Functional Products Towards 2020 and Beyond



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Home

Applications

Technologies

Products

Contact

The main materials processed to address a wide range of applications over a large spectrum (UV - VISIBLE - IR) are :

FUSED SILICA SiO₂

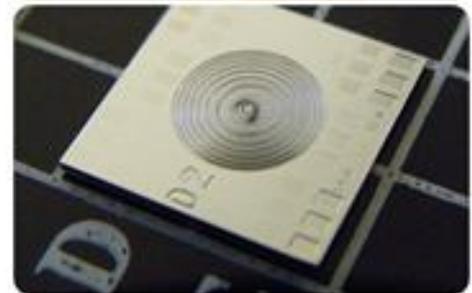
for any transmissive component finding application in the UV (down to 193 nm), Visible and IR (up to 2 microns) domain. Fused Silica has a high transmission and a low dispersion over this spectral range.

SILICON Si

for any application in the IR domain from 2 microns up to 6 microns. Specific Si FZ (Float Zone) provides improved transmission on that range.

GERMANIUM Ge

for any application in the IR range from 2 up to 14 microns. Germanium is of particular interest in the IR3 band (8-14 microns).



Example of priority product

2020