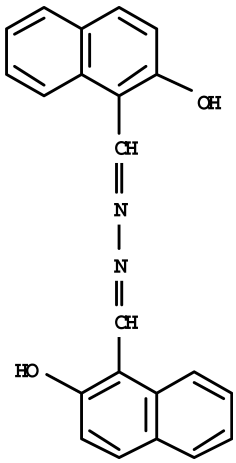
UV-Coating
Line Scan and Area Sensors

Introduction

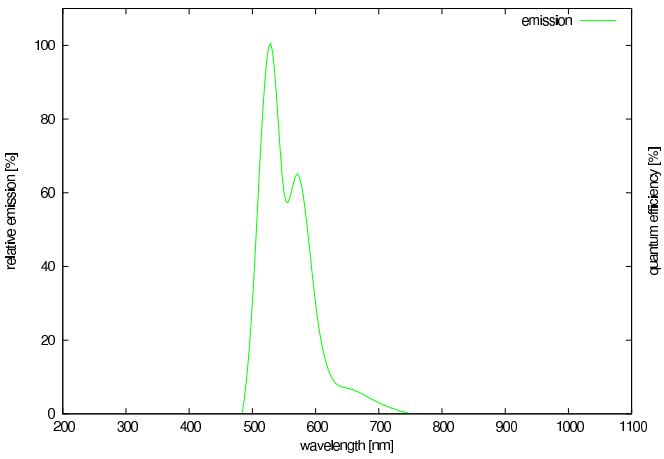
Eureca Messtechnik GmbH provides UV-coatings for optical devices as a special service. The coating extends the sensitive spectral range of optical detectors into the deep UV. The coating can be attached onto most surfaces, even on CCD- and CMOS-sensors with on chip micro lenses. We will be glad to assist you in choosing the right sensor, coating and accessories for your individual application.

Specification

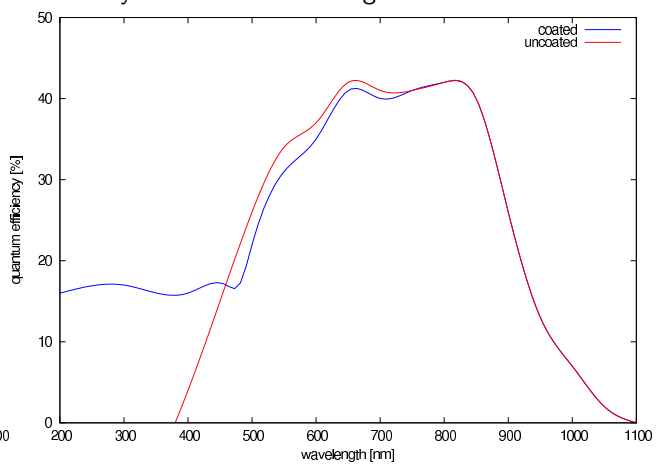
The coating is a thin film of 1-Naphthalenecarboxaldehyde, 2-hydroxy-, [(2-hydroxy-1-naphthalenyl)methylene]hydrazone (9CI) applied via physical vapour deposition. The material shows an excellent quantum yield of nearly 100 % for wavelengths below 450 nm and down to 100 nm. In contrast there is a high transparency of the material for wavelengths above 480 nm which gives a very good response even in the visual and near infrared range. As for all crystaline coatings the modulation transfer function is slightly reduced for high spatial frequencies.



useable range of exitation:	150 nm to 450 nm
range of emission:	500 nm to 650 nm
peak emission:	530 nm
fluorescence decay time:	some ns
phosphorescence:	not significant
thickness of coating:	typically about $1\,\mu m$, other values on request
MTF reduction:	MTF at 250 lp/mm is reduced by 50 %
aging:	aging is affected by four parameters: 1. wavelength of illumination 2. intensity of illumination 3. temperature (can be reduced by pre-aging) 4. atmosphere
pre-aging:	available on request
effective quantum efficiency:	typically the effective quantum efficiency for the useable range of exitation is about 40 % of the quantum efficiency at 530 nm of the original device



typical emission



example for effective quantum efficiency of a front side illuminated CCD

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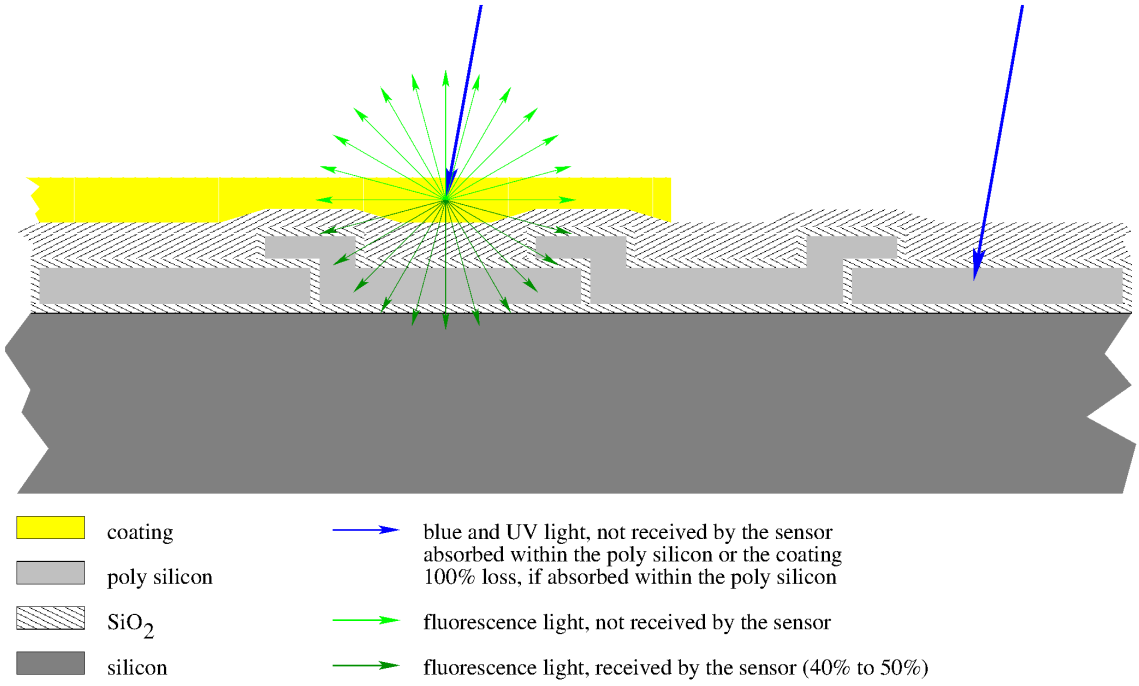
Theory of Operation

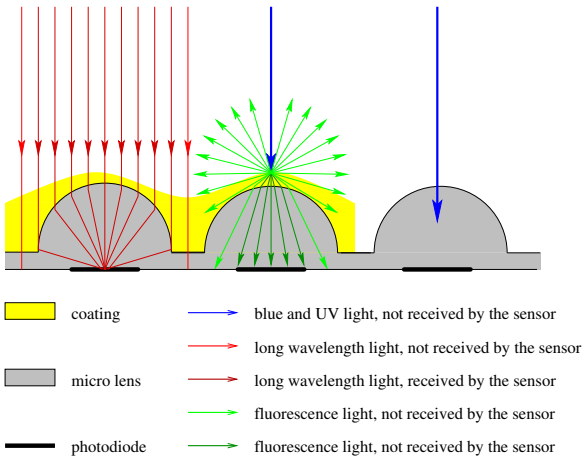
A typical limitation of CCD and CMOS sensors is that light with short wavelengths, such as deep blue or UV, is absorbed by the very first structures of the sensor and is not recognized as a signal. The shorter the wavelength is, the less the sensors output signal is affected by illumination. There are two ways of producing UV sensitive sensors:

1. Back side illuminated sensors where the silicon substrate is thinned down to the epitaxial surface. This is a very expensive way, but gives best results and resolution.
2. UV to VIS converting coatings. Here the sensor is covered by a thin layer of a material which absorbs UV light and emmits visual light instead. Nearly each impinged UV photon is converted into one visual photon, but as the direction of emission is randomized, only about half of these photons will be recieved by the sensor.



Attention:

When using a sensor with attached micro lenses the amount of received fluorescence light is reduced, as the sensors efficiency has a high dependence on the direction of illumination. In this case the typical effective quantum efficiency for the useable range of exitation is between 15 % and 40 % of the quantum efficiency at 530 nm of the original device, depending on the geometry of the micro lenses and the thickness of the coating.



ZIM Zentrales Innovationsprogramm Mittelstand