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TECHNICAL SPECIFICATION

Nanomanufacturing – Product specification – Part 4-4: Nanophotonic products – Blank detail specification: Quantum dot enabled light conversion films

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NANOMANUFACTURING – PRODUCT SPECIFICATION –

Part 4-4: Nanophotonic products – Blank detail specification: Quantum dot enabled light conversion films

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IEC TS 62565-4-4 has been prepared by IEC technical committee 113: Nanotechnology for electrotechnical products and systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
113/822/DTS	113/888/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62565 series, published under the general title *Nanomanufacturing – Product specification*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

This document specifies how to report the various key control characteristics of quantum dot (QD) enabled light conversion film (Q-LCF) for industrial use in nano-enabled optoelectrical display, and how to incorporate these into a bilateral detail specification between vendor and user.

QDs are a kind of typical luminescent nanomaterial, which exhibit unique optical properties including narrow emission spectrum, tunable emission wavelength, high peak energy and high quantum efficiency. Q-LCF are optical films with QDs embedded in the polymer matrix. The major function of Q-LCF is converting short wavelength light (such as blue light) to longer wavelength light (green light, red light, etc.); this critical optical characteristic originates from QDs. A type of novel display technique by assembling Q-LCF into traditional LCD devices, QD-LCDs for short, has developed rapidly in recent years. The QD-LCD technique can improve greatly display colour gamut and chromaticity coordinates. These excellent properties are due to QDs in Q-LCF, which make high quality tricolour (red, green, blue) for realizing full-colour display to achieve much better image quality.

Comparing with the display performance of traditional LCD techniques, the outstanding advantage of QD-LCDs is unique display colour, which exhibits high colour gamut and colour contrast, this characteristic is decided by the optical and physicochemical performance of QDs and optical physical, mechanical and stability performance of Q-LCF. To enable large-scale mass production of QD-LCDs, a reliable, affordable means of preparing Q-LCF is necessary, so it is significant to build up a BDS by specifying crucial parameters.

This document provides crucial characteristics influencing the key performance of Q-LCF, and also provides information about measurement methods and existing standards concerning the correct determination of key control characteristics.

NANOMANUFACTURING – PRODUCT SPECIFICATION –

Part 4-4: Nanophotonic products – Blank detail specification: Quantum dot enabled light conversion films

1 Scope

This part of IEC 62565, which is a Technical Specification, establishes a standardized method to determine a blank detail specification (BDS) for

- quantum dot enabled light conversion film (Q-LCF).

This document is intended to be used for nano-enabled photoelectric display, based on liquid crystal display (LCD).

The relevant key control characteristics (KCC) of Q-LCF are listed, including physical, mechanical and optical properties, and stability. For each KCC, measurement methods and existing standards are reported.

Numeric values for the KCCs are left blank as they will be specified between customer and supplier in the detail specification (DS). In the DS KCCs can be added or removed if agreed between customer and supplier.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62595-2-1:2016, *Display lighting unit – Part 2-1: Electro-optical measuring methods of LED backlight unit*

IEC 62631-3-2:2023, *Dielectric and resistive properties of solid insulating materials – Part 3-2: Determination of resistive properties (DC methods) – Surface resistance and surface resistivity*

ISO 527-1:2019, *Plastics – Determination of tensile properties – Part 1: General principles*

ISO 527-3:2018, *Plastics – Determination of tensile properties – Part 3: Test conditions for films and sheets*

ISO 4593:1993, *Plastics – Film and sheeting – Determination of thickness by mechanical scanning*

ISO 8510-2:2006, *Adhesives – Peel test for a flexible-bonded-to-rigid test specimen assembly – Part 2: 180° peel*

ISO 11359-2:2021, *Plastics – Thermomechanical analysis (TMA) – Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 11501:1995, *Plastics – Film and sheeting – Determination of dimensional change on heating*

ISO 13468-1:2019, *Plastics – Determination of the total luminous transmittance of transparent materials – Part 1: Single-beam instrument*

ISO 13468-2:2021, *Plastics – Determination of the total luminous transmittance of transparent materials – Part 2: Double-beam instrument*

ISO 14782:2021, *Plastics – Determination of haze for transparent materials*

ISO 15184:2020, *Paints and varnishes – Determination of film hardness by pencil test*