



# LIGHTING EUROPE

THE VOICE OF THE LIGHTING INDUSTRY

Öko-Institut e.V.  
Merzhauser Str. 173  
79100 Freiburg  
Germany

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Subject: support letter on Exemption 39 ("Cadmium in colour converting II-VI LEDs (< 10 µg Cd per mm<sup>2</sup> of light-emitting area) for use in solid state illumination or display systems")

Dear Sir/Madame,

In light of the ongoing re-assessment<sup>1</sup> of the request for renewal of exemption 39<sup>2</sup> of Annex III of Directive 2011/65/EU, as requested by the European Parliament<sup>3</sup>, we take this opportunity to reconfirm our support to this request for renewal.

## Argumentation

1. The argumentation provided in our support letter<sup>4</sup> dated November 11, 2013 in response to Oeko Institute's call to stakeholders to comment on the exemption request remains valid as of today. Moreover, this can be further backed up with recent external research<sup>5</sup> confirming significant luminous efficacy improvements compared with other alternatives available on the market (standard phosphor conversions or cadmium-free quantum dots)<sup>6</sup>. The main reason for this improvement is the efficiency gain of cadmium-containing quantum dots because of its high quantum efficiency and its ideal emission spectrum which is narrow and flexible in spectral position.

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1 <http://rohs.exemptions.oeko.info/index.php?id=127>; News update September 23, 2015

2 "CADMIUM in colour converting II-VI LEDs (< 10 µg Cd per mm<sup>2</sup> of light-emitting area) for use in solid state illumination or display systems

3 Paragraph AB of European Parliament resolution of 20 May 2015 on the Commission delegated directive of 30 January 2015 amending Annex III to Directive 2011/65/EU of the European Parliament and of the Council (C(2015)00383 – 2015/2542(DEA))

4 [http://rohs.exemptions.oeko.info/fileadmin/user\\_upload/RoHS\\_IX/Request\\_2013-](http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IX/Request_2013-2/20131111_Lighting_Europe_WG_Material_support_letter_RoHSexemption39_Ex_Re_2013-2-5_final.pdf)

2/20131111\_Lighting\_Europe\_WG\_Material\_support\_letter\_RoHSexemption39\_Ex\_Re\_2013-2-5\_final.pdf

5 "Phosphors & Quantum Dots 2015: LED Downconverters for Lighting & Displays" p. 212, and p. 242 "A red Q Dot mix with standard yellow phosphor delivers 30% higher efficiency than standard warm light LED package"; April 2015, Yole Development

6 <http://www.nature.com/nmat/journal/v13/n9/abs/nmat4012.html>; this paper explains that the narrower (~50nm FWHM) Red nitride is limited to the non-optimized, longer wavelength red at 650nm (as in ref 7). Therefore the real efficiency gain of this alternative mentioned in the Yole report is less since the emission position is not optimal.

2. Given the share of approximately 17 % of Lighting in global electricity consumption, and the global challenge of climate change, the focus of the Lighting Industry is on developing energy efficient lighting with a high quality colour spectrum<sup>7</sup>. The European Commission recognizes that “energy efficiency has a fundamental role to play in the transition towards a more competitive, secure and sustainable energy system”<sup>8</sup> and the EU DG Energy stresses that Lighting plays a key role in achieving this goal<sup>9</sup>. We refer to the life cycle analysis (LCA)<sup>10</sup> provided by the exemption applicants demonstrating that the environmental advantage due to energy efficiency outweighs by far the much smaller impact of the exceedingly small amount of cadmium used in the product, which is fully contained inside the product. The EU recognizes that this trade-off is required. Very similar exemptions for other technologies exist<sup>11</sup>.
3. That being said, the Lighting Industry recognizes the general concerns on cadmium, and is committed to phase out cadmium when reliable cadmium-free alternatives become available on the market. As lighting industry, we are committed to generating high quality, efficient lighting independent of light conversion technology. Cadmium-containing quantum dot technology should be regarded as a stepping-stone in the chase for energy efficiency and colour quality, bridging the gap until the current performance problems with cadmium-free alternatives have been overcome. Until then, it is critical that the (EU) lighting industry leverages its investment in cadmium-containing quantum dot technology.
4. As of today cadmium-free and cadmium-containing quantum dot LEDs are not comparable regarding their performance in terms of energy efficiency and reliability. Cadmium-free quantum dot LED for solid state lighting (SSL) hardly reach the efficiency of conventional high performance LED. Investigations and measurements of cadmium-free quantum dot LED show that so far colour stability requirements during lifetime are not met.
5. Cadmium-containing quantum dot technology for displays is currently available on the European market, and the technology is expected to be introduced for LED lighting in 2016. Renewing RoHS exemption 39 until 2020 will stimulate that LED light sources with quantum dot technology enter the EU market by giving manufacturers sufficient certainty that the R&D effort is justified. These cadmium containing quantum dot LEDs will be an important stepping-stone once cadmium

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7 The need for good colour quality is recognized by the EU as it will lead to faster adoption of the technology (c.f. DG JRC: <http://iet.jrc.ec.europa.eu/energyefficiency/residential-lighting/european-led-quality-charter>) and is already required by certain regulation, e.g. 1194/2012 which required a minimum Ra of 80.

8 Energy Efficiency Communication [COM(2014)520]

9 <https://ec.europa.eu/energy/en/topics/energy-efficiency>

10 [http://rohs.exemptions.oeko.info/fileadmin/user\\_upload/RoHS\\_IX/Request\\_2013-2/20132301\\_NON-CONFIDENTIAL\\_Request\\_for\\_renewal\\_of\\_exemption\\_39.pdf](http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_IX/Request_2013-2/20132301_NON-CONFIDENTIAL_Request_for_renewal_of_exemption_39.pdf);

11 Solar cells are exempted from the scope of RoHS (2011/65/EU Article 2 Paragraph 4 Item i), thus enabling the use of cadmium telluride photovoltaics.

free alternatives are commercially available. Once cadmium free alternatives exist, the current exemption for cadmium can be revoked. If, during that time, cadmium based quantum dot LEDs do not become available then the EU will not benefit from the possible improvements, but there will also be no harm done as no cadmium will have entered the market (under that exemption).

## Conclusion

LightingEurope is committed to innovation, sustainability, quality and leadership. Based on the argumentation provided we believe cadmium-containing quantum dots provide for the highest net positive total environmental, energy, health and consumer safety impact as long as the reliability of substitutes (read cadmium-free quantum dot) is not ensured.

Therefore, we welcome the re-assessment commissioned by the Commission and look forward to provide an industry broad and technology objective input in the consultation process, underpinning our view with additional data while taking into account the current status of the R&D and commercialization of both cadmium-containing and cadmium-free quantum dots on the market.

As the advantages (colour + energy) are the same for displays and LED Lighting we believe the criteria for justification of the exemption are similar for displays and LED lighting. As in the technical details underpinning these criteria there are differences between display and LED Lighting we request the Commission to allow the Lighting Industry to have a more active role in the re-assessment process, next to the original applicants.

Kind regards,



Diederik de Stoppelaar

## ABOUT LIGHTINGEUROPE

LightingEurope is an industry association of 33 European lighting manufacturers, national associations, and companies producing materials. LightingEurope members represent over 1,000 European companies, a majority of which are SMEs; a total workforce of over 100,000 people in Europe; and an annual turnover estimated to exceed 20 billion euros. LightingEurope is dedicated to promoting efficient lighting practices for the benefit of the global environment, human comfort, and the health and safety of consumers.