LIGHTINGEUROPE
THE VOICE OF THE LIGHTING INDUSTRY

Öko-Institut e.V.
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Brussels, 11 November, 2013

Dear Dr. Carl-Otto Gensch,

I am sending you below our reply to your call to stakeholders to comment the exemption request for

- Request no. 2013-5: "Cadmium in light control materials used for display devices" and
- Request no. 2013-2: "Cadmium in color converting II-VI LEDs (< 10 µg Cd per mm2 of light-emitting area) for use in solid state illumination or display systems" (Request for Renewal of Exemption 39 of Annex III of Directive 2011/65/EU)

Yours sincerely,

Jürgen Sturm
secretary general

Submission to Stakeholder Consultation regarding exemption request no. 2013-2 & 2013-5

Support letter on Cadmium in LED Lighting

Introduction

LightingEurope is committed to innovation, sustainability, quality and leadership. Therefore, we support the request for renewal of the exemption 39 of Annex III of Directive 2011/65/EU, request No 2013-2, by QD vision: Cadmium II-VI color converting material (< 10 µg Cd per mm2 of light-emitting area) for LEDs used in solid state illumination or display systems and also the related request 2013-5, by MMM.

Argumentation

1. Lighting accounts for approximately 17 % of global electricity consumption[1]. This is a significant contribution and therefore strongly related to climate change and the emissions of electricity plants and to energy saving potential. Therefore, the main focus of the lighting industry is on developing energy efficient lighting with a high quality color spectrum.

2. According to a life cycle analysis (LCA) analysis of lighting products, energy use is the main environmental impact of the product which takes approximately. 90% share from the total negative lifecycle impact. The environmental advantage due to energy efficiency outweighs by far the much smaller impact of the materials used in the product.[2]

3. Therefore, LightingEurope strongly supports the use of innovative materials to increase efficiency and improve color quality of lighting.

4. In the case of both exemption requests (2013-2 QD vision and 2013-5 MMM), the main claimed advantages are a substantial increase in energy efficiency of the LED - more than 20% - and an improved color rendering in applications for lighting and displays. Cadmium is contained inside the product, and will not be released in the normal use phase.

5. LightingEurope members have extensive expertise in the field of phosphor materials and lighting products and our experience is that the use of Cadmium II-VI color converting materials will lead to improved color rendering (CRI > 90), luminous efficacy (improvements over 20%) and lower overall system cost for LED lamps and luminaires. The described material can be used on a LED chip, in a separate color converting film or in a remote phosphor layer in any lighting device. The color-tunable nature

[1] Department of Energy: SSL MYPP report 2013
[2] see CFL long life exemption request dossier, Dec 2011

of the II-VI nanostructured phosphors and the considerable luminous efficiency upside offer flexibility to improve color quality or system efficiency or total cost and can be catered to the needs for each application of high quality lighting. For example, these materials will allow meeting the requirements set by the California Energy Commission for CRI > 90 at LED luminaire without sacrificing luminous efficacy compared to 80CRI offerings with present day phosphors, "*To meet the specification, LED lamps shall have a minimum color rendering index (CRI) of 90. The CPUC decision requires the utilities to rebate only LED lamps that are compliant with the California Specification.*"[3].

Moreover, in the display market, the same materials can lead to very high efficiency in the recent Amazon Kindle tablet or to very high color gamut representation in the Sony LCD televisions.[4, 5]

6. For general lighting applications, an alternative to Cadmium II-VI color converting materials is the current use of AlInGaP red LEDs. These are already common place in automotive backlights and also in LED light bulbs. Unfortunately, the red LEDs suffer from severe efficiency loss as the temperature increases. This limits the applications for use and increases the total cost as expensive drivers and heat sinks are necessary to correct for these ill-effects.[6] In the display market, the green InGaN LED is insufficient to meet the efficiency requirements. Cost and complexity also negate the practical use of RGB LEDs in comparison to a color converting material that can provide the same color output. The II-VI nanostructured semiconductor materials are the only known technology that can achieve the combination of high efficiency and wide color gamut in display and light panel applications with LED backlights. We are unaware of alternative luminescent materials that can replace the Cadmium II-VI materials that have sufficient performance to be useful.

[3] http://www.energy.ca.gov/2012publications/CEC-400-2012-016/CEC-400-2012-016-SF.pdf
[4] http://www.sony.co.uk/product/tv-139-55-lcd/kd-55x9005a/features?cpint=15044703#tab
[5] http://www.sony.co.uk/product/tv-139-55-lcd/kdl-55w905a#tab
[6] http://www.usa.lighting.philips.com/lightcommunity/trends/l-prize/about.wpd

7. Lighting accounts for around 17% of global electricity consumption and one third of this usage is to operate incandescent light sources.[7] Cadmium II-VI color converting material offers to reduce this energy consumption further by improving the already high efficiency and improve the color quality to increase the adoption rate of LED lighting. With respect to the environmental impact of using cadmium, we concur with the worksheet provided by QD vision where the energy saving in the LED with cadmium II-VI converting material would result in a net reduction of cadmium released from coal fired power plants.

Questions and comments

Finally, we believe that it is worthy to ask the following questions in order to be able to formulate a well working, sustainable exemption. Our first question is: which part of the LED is to be considered as a homogeneous material. Our second question is, what is the experience of market surveillance authorities with regard to testing of LEDs, and complying with this exemption. Getting to the details, we are wondering whether market authorities have built up knowledge and experience in the course of the past years with regard to sample preparation of the related homogeneous material, and are able to conclude unambiguously measurement results with the current threshold value of 10 µg/mm^2?

We are asking these questions, because we belive that cadmium containing material used on a LED chip cannot be disjointed or separated by mechanical actions in a reliable repetitive manner, thus resulting in ambiguous and inaccurate analysis results. Related to this, we question whether there is a reliable unambiguous and clear analysis method to determine whether the maximum level of e.g. 10 µgr/mm^2 will be met as the target is a surface area parameter and not a concentration parameter. The above concerns, create a problem of market surveillance for both authorities and for companies who need to show “proof of compliance”. This situation createslegal uncertainty for the industry. In case the mentioned materials cannot be interpreted as a homogeneous material, it should be clarified which part is the homogeneous material inside a LED, to be analyzed and resulting in unambiguous and repetitive measurement values.

In relation to the above questions, we would like to mention also, that the quantity of cadmium used in LED applications is based on the optimization of the needed light spectrum and energy efficiency. An excess quantity of cadmium would negatively impact both the performance parameters and also the production cost of the LED. Therefore, technologically an excess amount of cadmium is to be avoided. In case of this application, the principle of ALARA (as less as reasonably achievable) is valid. This manufacturing principle assures a limited impact on the environment.

Considering all the above mentioned, we believe that setting a maximum cadmium content level for this RoHS exemption would have the following implications:

[7] Department of Energy: SSL MYPP report 2013

- additional administrative costs for industry and market surveillance authorities, as the non-trespassing of the maximum concentration level has to be proven with test results
- additional dispute whether the repeated experiences have enough confidence
- questionable environmental advantage considering that the amount of cadmium should be not more or less than technologically needed (ALARA principle)

Therefore, LightingEurope is asking, whether it would be a better solution not to have limit value. As mentioned above, a threshold would create legal uncertainty due to uncertainties in interpretation of homogeneous material samples and also for variations in measurements of cadmium content using state of the art measuring and mechanical disjointing techniques.

Conclusion

In conclusion, LightingEurope supports the renewal requests (2013-2, 2013-5) and proposes to combine both requests using the following wording:

"**Cadmium in light control materials used for lighting- and display devices"**