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Reference: Response to 2015 Consultation 3: Joint Revaluation of Two Requests for Exemption, First reviewed in 2013-2014, Related to Cadmium Quantum Dot Applications

Dear Mr Baron,

I have been working as an engineer, scientist, investor, journalist and consultant within the photonics and lighting sector for over 15 years and have previously provided consultation services to both the UK Government and the European Commission on Lighting and Display technologies.

Europe has been a global innovations leader in the development of chemical framework policy through iterations of both REACH and RoHS Directives that have had a significant impact on the distribution of hazardous materials and the inherent improvements in a healthy environment for all within its community.

It can be clearly understood when vested interests of incumbent actors with the supply chain engaged in the manufacture and supply of hazardous materials are faced with the termination of their market revenue through the banning of their materials to lobby for exemptions however there are several aspects that need to be considered and evaluated before any agreement to an exemption should be even considered. A small selection of such questions to be reviewed could include:

- The reasons why were the original RoHS and REACH directives put in place?
    - To remove and regulate hazardous materials from the European environment
    - Improve future health of the European citizen
    - Reduce toxic legacies for the next generations of European citizens
- How commercially significant would the exemption of the hazardous material be?
    - Would the exclusion of Cadmium QDs be catastrophic to a significant EU marketplace?

    - Would an EU market failure occur?
- Are there viable non-hazardous alternatives available (now or the near future)?
    - Can the alternatives be more environmentally friendly than Cadmium based products
    - How secure is the supply chain of new alternatives, made in EU?
- Is there an opportunity for Europe to be a global leader in environmentally friendly alternatives?
    - Is or can Europe become a leader in safe Quantum Dot materials and supply chain.
    - What opportunities for sustainable and responsible innovation exist within the supply chain and how can a new market be created/exploited for the benefit of Europe.
- Is it economically viable to recycle Cadmium QDs at the end of life?
    - How will manufacturers of products containing Cadmium provide guarantees of recycling?
    - How easily is it to remove cadmium from built products at the end of life to ensure it doesn't enter the environment.

In my view Quantum Dots are not a new technology and have been available for over a decade in many applications and industrial sectors. There are a significant number of questions that still need to be answered in regards to nanomaterials (both Cadmium and Cadmium free) suitability for the wider environment especially in terms of health impacts however it is clear that heavy-metal based Quantum Dots cannot be good for the environment and EU Citizens health in the long term. It is a known fact that Cadmium and other heavy metals may cause serious illnesses and present a severe danger to the environment, throughout the production chain.

The aims of the original RoHS and REACH directives were to limit and remove hazardous materials within Europe and exemptions are a method of last resort to allow a market to transition itself responsibly to alternative and environmentally symbiotic alternatives. The previous exemptions for Cadmium-based Quantum Dots has provided ample time for the Industry to make that transition and I would strongly argue that the market for Cadmium based Quantum Dots within the Display and Lighting Industry has failed due to technology performance and consumer concerns. The number of units shipped in the display and lighting markets that contain Cadmium Quantum Dots is less than negligible and therefore an outright ban would not impact the general market through restricted supply chain or consumer choice and provides a strong commercial case to reject the proposed exemption extension.

Indeed, by rejecting the exemption extension there is a positive political driver to stimulate and innovate the supply chain within the European Union through Research and Development of alternatives that are free from hazardous materials and provide improved

performances than those being replaced. Europe has a long pedigree in materials research and contributes a large GVA in terms of the material supply chain for both displays and lighting.

In my view Exemption 39 cannot be justified because:

- Cadmium-free QD alternatives are already widely available within the market with commercially acceptable high performance, reliability and costs.
- A further exemption discourages sustainable and responsible innovation and places Europe in a technology-follower role globally.
- An exemption would most probably reduce and essentially eliminate R&D and industrial investment in the supply chain of new Quantum Dot materials development.
- The EU Parliament had made it clear the EU consumers do NOT want toxic materials within the supply chain.
- Commercially available cadmium-free Quantum Dots displays exist within Europe and therefore these materials must already meet technical and commercial market requirements.
- The market penetration of Quantum Dot based lighting products are close to 0% and there is therefore a natural opportunity to focus the EU supply chain on the next generation cadmium-free Quantum Dots as there is no incumbent technology to displace.
- The health of EU citizens should be the highest priority and we must remember that cadmium is singled out as particularly hazardous material with permitted levels that are 10 times lower than lead or mercury.

I fully support the European Parliament's vote to reject the Delegated Act by the European Commission extending the use of toxic cadmium in televisions and other displays until July 2018.

Yours sincerely

Dr Geoffrey Archenhold