

Emerging Tech

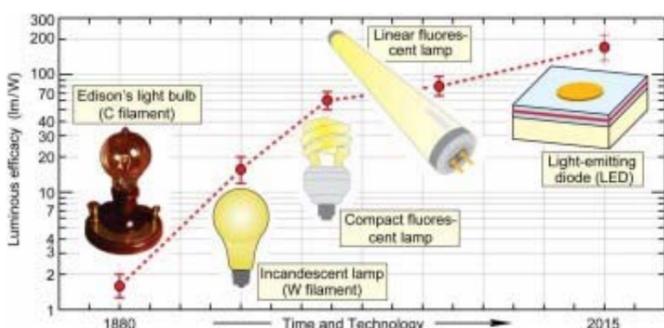
Chris Jablonski

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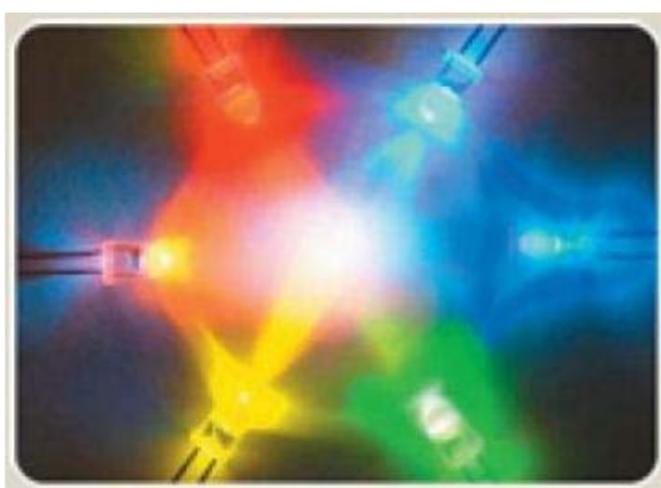
Is the LED revolution coming?

Posted by Roland Piquepaille @ 9:51 am

According to two professors at Rensselaer Polytechnic Institute (RPI), light-emitting diodes (LEDs) and smart lighting could save trillions of dollars worldwide in the next ten years. They claim that innovations in photonics and solid state lighting could also lead to 'a massive reduction in the amount of energy required to light homes and businesses around the globe.' Of course, I would be happy to fully agree with the researchers, but these benefits will only be achieved if all of the world's light bulbs are replaced with LEDs. I seriously doubt it can happen. Still, it's certain that a new generation of lighting devices based on LEDs will become available and reduce our carbon dioxide emissions. ...



You can see above a figure comparing "the luminous efficacy (source efficacy) of conventional lighting technologies with the potential of light-emitting diode technology." (Credit: RPI, details below)



And you can see above an image illustrating "color mixing and the creation of white light using several LEDs. A specific spectrum can be attained by a suitable intensity ratio of LEDs." (Credit: RPI) This image has been extracted from *Smart Lighting*, an article published by the Rensselaer Research Quarterly in its Summer 2004 issue. ((PDF format, 4 pages, 390 KB).

This study has been conducted by E. Fred Schubert, professor at the Future Chips Constellation (FCC) at RPI and Director of the new Smart Lighting Engineering Research Center (ERC). Schubert worked with Jong Kyu Kim, a research assistant professor in the Department of Electrical, Computer, & Systems Engineering at RPI.

Here is a first quote about this study. "A new generation of lighting devices based on light-emitting diodes (LEDs) will supplant the common light bulb in coming years, the paper suggests. In addition to the environmental and cost benefits of LEDs, the technology is expected to enable a wide range of advances in areas as diverse as healthcare, transportation systems, digital displays, and computer networking. 'What the transistor meant to the development of electronics, the LED means to the field of photonics. This core device has the potential to revolutionize how we use light,' wrote the co-authors."

The team added that LEDs require 20 times less power than today's conventional light bulbs, and five times less power than 'green' compact fluorescent bulbs. According to them and "if all of the world's light bulbs were replaced with LEDs for a period of 10 years," we could save \$1.83 trillion and reduce our carbon dioxide emissions by 10.68 gigatons.

I'm often suspicious of reports giving details like this. The researchers probably are just guessing what will be the benefits of using LEDs in our homes and elsewhere. So why do they write 10.68 gigatons? Why not 2 or 20?

For more information, this research work has been published in *Optics Express* under the name "Transcending the replacement paradigm of solid-state lighting" (Volume 16, Issue 26, Pages 21835-21842). Here is the beginning of the abstract. "The field of photonics starts with the efficient generation of light. The generation of efficient yet highly controllable light can indeed be accomplished with light-emitting diodes (LEDs), which are, in principle, capable of generating white light with a 20 times greater efficiency than conventional light bulbs. Deployed on a global scale to replace conventional sources, such solid-state light sources will result in enormous benefits."

From the above link, you'll be able to read the full paper from which the top image of this post has been extracted. (I'm not including a direct link because it's really too long). Anyway, here is the last paragraph of the conclusion of this paper. "Future, 'smart' light sources fulfill the true promise of solid-state lighting by harnessing the huge potential of LEDs by using multi-dimensional controllability in a wide range of applications that include optical microscopy, imaging, display technologies, communications, networking, and transportation systems."

Finally, you might want read a previous post about another Schubert's previous work, The world's most anti-reflective coating.

Sources: *Rensselaer Polytechnic Institute News, December 18, 2008; and various websites*

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