Shining a Brighter Light

June 14 2005

New lighting technology developed at UC Davis offers quality, cost and environmental benefits compared with existing types of lighting, according to Charles E. Hunt, professor of electrical and computer engineering.
Field emission lamps can match exactly the spectrum of natural daylight, Hunt said. They are up to five times more energy efficient than existing R- and PAR-type lamps and do not contain environmentally hazardous materials, such as the mercury vapor used in fluorescent tubes, he said. They are cheaper and can produce a wider variety of colors than light-emitting diodes (LEDs).

The technology could be used for indoor and outdoor area lighting, specialty applications such as film and video production, and for illuminated displays, traffic signals or technical lighting.

Field emission lamps are based on the same principle as the luminescent phosphor materials used in TV sets. Light is emitted when electrons are driven into the material. Traditional TV sets use a thermal electron gun to fire electrons into a phosphor screen. The new field emission devices use a powerful electric field to extract electrons from the cathode and drive them into the phosphor, which are located close together. The process is dramatically more efficient than the filaments used in electron guns.

"It combines 70-year-old vacuum tube technology with the latest advances in carbon nanomaterials," said Andrei Chakhovskoi, co-inventor of the device.

The UC Davis laboratory has developed materials for field emission cathodes that are inexpensive and simple to make. Lamps based on the material should have a lifetime of up to 30,000 hours, Hunt estimates.

Hunt's group is working with the California Lighting Technology Center at UC Davis and the California Energy Commission on potential applications. The technology is based on inventions at UC Davis and on a collection of patents and intellectual property donated to UC Davis in 2004 by DuPont Corporation. The university is currently negotiating agreements to license the technology for commercial development.

Source: UC Davis

Citation: Shining a Brighter Light (2005, June 14) retrieved 19 April 2024 from https://phys.org/news/2005-06-brighter.html

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