

Buildings R&D Breakthroughs:

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Advanced Coatings to Improve the Efficiency, Color Rendering, and Life of High-Intensity-Discharge Lamps

Emerging Technology

Advanced Coating Significantly Increases Efficiency of HID Lamps

High-intensity-discharge (HID) lamps are used extensively for large area lighting such as parking lots, streets, and warehouses and are increasingly used for general lighting in stores and homes. HID lamps account for 16% of the lighting energy used in the United States, or about 128 GWh.¹ Based on this HID use, a 20% increase in the efficacy of HID lamps would result in a significant U.S. energy savings of 25 GWh per year.

With funding from a U.S. Department of Energy Small Business Innovation Research grant, Acree Technologies Inc. is developing an inexpensive, robust, single-layer coating that is applied to the outside of an HID lamp. The coating reflects infrared (IR) and ultraviolet (UV) photons back into the lamp, heating the plasma and increasing the lumen output for a given electrical energy input. Measurements demonstrate up to a 22% increase in the efficacy (lumens/watt) between coated and uncoated HID lamps, along with improved color rendering.

This optically selective transmissive coating is unique in that it is a single-layer coating that reflects IR and UV and is less expensive than previous multilayer coatings. The coating developed in this project can be applied for pennies per bulb, and the deposition process is compatible with large-scale production. The thickness of the coating is not critical, making the coating easy to produce. In addition, the coating is robust and lasts throughout the lifetime of the bulb.



HID Lamp with Acree's Optically Selective Transmissive Coating

Technology History

- ◆ Developed by Acree Technologies Inc.
- ◆ Partnering with Venture Lighting, a major HID lamp manufacturer.
- ◆ Currently testing coatings and anticipating that end user testing will continue.

Applications

Can be used on any HID lamp to significantly improve the lamp's efficiency and color rendering.

Capabilities

- ◆ Increases lamp efficacy over 20% compared with uncoated lamps.
- ◆ Offers a simple, inexpensive and adaptable process for retrofitting most HID lamps.
- ◆ Provides compatibility with existing manufacturing processes.

Benefits

Cost Savings

Improves lamp efficacy, significantly reducing lighting cost and energy consumption.

Durability

Provides a robust coating that lasts throughout the lifetime of the HID lamp.

Product Quality

Improves light output and the color rendering index of the lamp.

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¹ 2010 Buildings Energy Data Book (Table 5.6.4), U.S. DOE, March 2011.