

# White light, less heat

UNT team working on future replacement for incandescent bulb

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By Candace Carlisle / Staff Writer

A bottle of gold-shaving compound glows white under an ultraviolet light.

It may seem like a simple trick, but the glowing compound could change the way people think of lighting in the future.



DRC/Gary Payne

Dr. Mohammad Omary, center, and his research team at the University of North Texas are trying to refine the field of organic light-emitting diodes, which could revolutionize lighting. Pictured with Omary are, from lower left, Nisa Satumtira, Ravi Arvapally, Dr. Oussama Elbjeirami, Gustavo A. Salazar, Sreekar Marpu and Roy McDougald Jr.

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It's a lab version of a new light bulb.

Researchers at the University of North Texas are in the process of refining the field of organic light-emitting diodes, or OLEDs, with more than \$2.3 million from the U.S. Department of Energy.

Lighting consumes a quarter of all electricity produced in the United States, and most of that energy is lost as heat instead of light, said Dr. Mohammad Omary, a chemistry professor at UNT and lead researcher on a 15-member research team of post-doctoral fellows and student researchers.

The team's ultimate goal is to find a new light bulb -- to replace the inefficient incandescent bulb -- that would save billions of dollars and dramatically reduce carbon emissions.

"We know we are in a global energy crisis," Omary said. "Getting rid of old light bulbs and adopting alternative sources of light is one of the most significant ways we can reduce our energy consumption."

And that's why the Department of Energy has invested more than \$100 million over the last several years to find a new OLED solid-state lighting system that can be used in homes by 2015.

OLEDs are ultra-thin organic materials, invisible to the naked eye, sandwiched between two conductors that illuminate when an electrical voltage is applied.

The technology -- developed by Kodak more than 30 years ago -- is already used in televisions and cellphone screens.

If an OLED light bulb were used instead of incandescent light bulbs, it could lead to a 99 percent savings in lighting electricity, Omary said.

"We would get by with a 9-volt battery to light up a lamp, essentially eliminating the lighting portion of the electric bill," Omary said.

Not only would it help the environment, but it could also lead to other technological revolutions.

For example, light-emitting fabric or plastic could be manufactured into wallpaper, or used in screens on a quarterback's football uniform to give him the ability to receive plays, Omary said.



DRC/Gary Payne

Researchers at the University of North Texas created these compounds, which shine blue, red and green when lit by an ultraviolet light. When small amounts of each compound are combined, they produce a white light.

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The Energy Department also charged the research team with making a brilliant white bulb, which is harder than it would seem, Omary said.

Currently, white light comes from three primary colors -- blue, red and green -- all of which have different stability rates, leading to discolored lighting over time.

Often, the blue light will taper off first, leaving an off-white color with a yellow tinge to a light's glow, leading to a problem the research group is investigating, he said.

Instead of using all three colors -- researchers have successfully managed to produce white light all alone without using the primary color scheme, he said.

They have produced a compound of material including metal organic molecules taken from gold, silver, copper or platinum that is capable of producing brilliant white light on its own, he said.

Once the lighting materials are fine-tuned, they are sent to Nigel Shepherd, a materials science and engineering professor at UNT, or Bruce Gnade, vice president for research at the University of Texas at Dallas.

Both Shepherd's and Gnade's groups will design and build the light-emitting devices.

The latest breakthrough on the project come from materials made by graduate students Joyce Chen and Roy McDougald and post-doctoral fellows Chi Yang and Oussama Elbjeirami.

This development in the white light creation process has already entered the patenting process, Omary said.

He said he is proud to report the research team has already surpassed the results required by the Department of Energy in their three-year commitment.

"We now have 100 percent efficiency compared to only 10 percent of incandescent light bulbs," Omary said. "The Department of Energy standards were exceeded, not just met."

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