# Next-Generation OLEDs

April 25 2005

***Georgia Tech and Albemarle Corp. to Develop New Polymer Precursor Materials for Aluminum-based OLEDs***

The Georgia Institute of Technology and Virginia-based Albemarle Corp. have signed a collaborative research agreement to develop new polymer precursor materials for use in next-generation aluminum-based organic light-emitting diodes (OLEDs).

*Image: Vials containing dilute solutions of polymers with functionalized Alq3 show the ability of the system to be tuned to different wavelengths. Georgia Tech Photo: Gary Meek*

A global supplier of specialty chemicals and chemical intermediates, Albemarle will support research on new polymer precursor materials that

could lower the cost of producing OLEDs based on aluminum tris(8-hydroxyquinoline), also known as $Alq_3$. The research is being done in the laboratory of Marcus Weck, an assistant professor in Georgia Tech's School of Chemistry and Biochemistry.

$Alq_3$ is one of the most stable and fluorescent solid-state materials, which makes it attractive for use in the emission and electron-transport layers of OLEDs used in equipment such as computer displays. Weck and his colleagues have developed improved polymeric materials that will allow $Alq_3$ to be applied onto substrate materials using simple solution processing techniques. Previously, the material had to be applied using costly vacuum deposition equipment.

The researchers recently demonstrated that their $Alq_3$-functionalized polymer system can be tuned to produce yellow emissions at a wavelength of 560 nanometers, in addition to blue (440 nanometer) emissions. This proof-of-principle shows that the system can be modified to provide the selection of colors needed for next-generation display systems, Weck said.

The Albemarle funding will support further development of the polymer system, which could help facilitate production of low-cost OLED devices. "Using this system, the industry will be able to fabricate the devices without expensive equipment," Weck said. "We could potentially print our materials with ink-jet printers."

As part of the effort to drive down production costs, Weck's team has recently developed what is believed to be the first poly(styrene)-functionalized system for $Alq_3$. "This material will certainly be of interest to the industry from a price standpoint," he noted. "We have a fully-controlled system for which we have good characterization data."

Weck said the relationship with Albemarle will be collaborative, with the company's scientists working closely with Georgia Tech researchers. The company is pursuing new applications for its aluminum materials and offers custom synthesis and process development services to the OLED industry.

"We are pleased to be working with Georgia Tech to develop new materials for the OLED industry," said David Clary, director of fine chemicals R&D at Albemarle. "Georgia Tech's novel approach to solution processable $Alq_3$ is a natural complement to our unique sublimation technology for purifying small molecules."

Headquartered in Richmond, Va., Albemarle Corporation is a leading global developer, manufacturer and marketer of highly-engineered specialty chemicals for consumer electronics, petroleum and petrochemical processing, transportation and industrial products, pharmaceuticals, agricultural products, construction and packaging materials.

Weck said Albemarle's connections with leading display companies will help scale up production of the new materials and move them rapidly into real-world applications.

"We look forward to working with Albemarle to make new materials that can be applied to the industrial market," he said. "Together, we will develop new strategies for materials that can be used in the next generation of organic light-emitting diodes."

Source: Georgia Institute of Technology

https://phys.org/news/2005-04-next-generation-oleds.html