

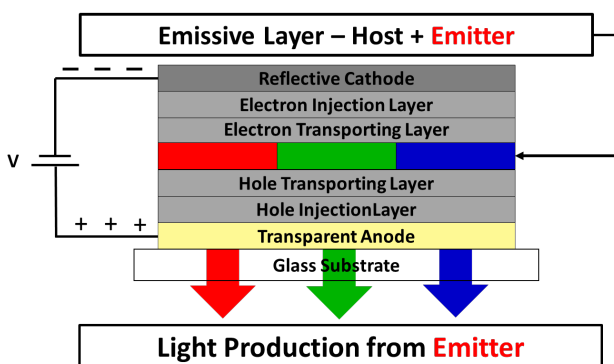
October 10, 2023 - ACS MEDIA RELEASE: Dr. Tommie L. Royster Jr., Founder of R-Display & Lighting Selected as 2023 *Entrepreneur of the Year* by the Rochester Section of the American Chemical Society



Dr. Tommie L. Royster Jr., founder and CEO of R-Display and Lighting (RDL) has been selected as the 2023 *Entrepreneur of the Year* by the Rochester Section of the American Chemical Society. Dr. Royster, who is a native of Buffalo, received his B.S. degree in Chemistry from the State University of New York at Buffalo (SUNY Buffalo) and a Ph.D. in Inorganic / Organometallic chemistry also from SUNY Buffalo. He started his industrial career in the Eastman Kodak Company (EKC) Research Laboratories (KRL) in the early 1990's where his research supported traditional photographic film technology before refocusing his work on the development of electronic materials and thin-film device fabrication processes. In 2001 he joined a research group that was developing EKC's Organic Light Emitting Diode (OLED) technology as a new disruptive technology for electronic display applications.

His work in the Eastman Kodak OLED group centered on developing new materials that directly emit light, called dopants or emitters, and electron transporting materials. In 2009, EKC sold its OLED intellectual property to LG Display. This initiated Dr. Royster leaving EKC and accepting the position of Chief Technology Officer for OLED Technologies and Solutions (a Netherlands based Company) to develop OLED materials for solution processed printed displays. He worked in the CTO role for two years before making the decision to leverage his training as a synthetic chemist along with his broad background in OLED materials technology and his understanding of the material properties required to address the known technology gaps and market opportunities. The company R-Display & Lighting was then founded in 2011 to participate in delivering market solutions for improved OLED materials. Although this journey has been long with many challenges, through perseverance and hard work R-Display & Lighting under the leadership of Dr. Royster has delivered a major technology breakthrough for OLED emitter materials which has generated excitement across the OLED industry.

The company's mission is to "Deliver high market value OLED materials with a strong intellectual property platform." More specifically, the company has focused on delivering high performance emitter materials with improved color, high efficiency and photophysical properties that provide extended OLED device lifetime. Highlighting the emissive layer which is comprised of the emitter material (i.e., dopant) and a host material, the following schematic diagram shows the structure and operation of a multilayer thin-film OLED device.



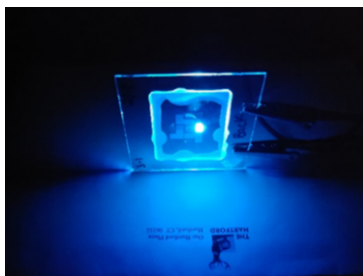
Schematic diagram of operating OLED device

The thin-film organic layers, formed through controlled thermal vapor deposition processes, are positioned between electrodes (cathode and anode) and are typically less than 50 nanometers (nm) in thickness. Applying a voltage across the device promotes current flow with the injection of positive and negative charges into the organic layers. Recombination of the charges in the center

emissive layer releases energy in the form of light. The light is directly generated from the emitter materials considered the “Jewels” of OLED technology. The low voltage requirement (3-7 volts) provides a very energy efficient device.

Starting out, access to resources at universities was critical for early proof of concept work. Raising initial funding to execute such work can be a major challenge and obstacle for startup chemical-based operations. The first emitter material was isolated and characterized using laboratory resources at Rochester Institute of Technology, with assistance from Professor Thomas Smith in the RIT Chemistry Department. These results were used to apply for a New York State Energy Research and Development Authority (NYSERDA) proof of concept grant as part of their Building Energy Efficiency Program. Funds from the NYSERDA research grant allowed the setup of a laboratory at Eastman Business Park in 2014. With additional support through NYSERDA, a new class of highly efficient phosphorescent emitter materials that covered the full range of visible light was developed. Third party performance validation was carried out through the New York State Green Technology Accelerator NYSP21 program. The novelty of these emitter materials and their demonstrated high performance have generated interest from OLED panel manufacturers.

Based on the critical market need for high performance blue OLED emitters, and the competitive landscape of red and green emitter materials, resources were redirected to deliver a market solution for blue emitter materials. The efficiency and operational lifetime of current blue light generated from OLED devices fall short relative to the performance of red and green emitters. With a focus on this market opportunity and support from a Department of Energy SBIR grant, RDL has identified a solution for this performance gap and market. Typically there is a tradeoff between achieving pure blue color and high device efficiency. R-Display & Lighting has solved this long-standing problem which was confirmed through third party validation by a major OLED material company. Testing demonstrated that RDL’s blue emitter material produces pure blue color with very high peak efficiency (state-of-the-art). In addition, the novel hybrid material shows photophysical properties ideal for establishing extended device lifetime. The image of an early prototype display that incorporates the new blue emitter material is shown below. These breakthrough results have generated significant interest from major companies that produce OLED materials, panels and the final electronic products. The following quote was communicated from a lead engineer representing one of the major OLED display panel manufacturers: “R-Display & Lighting is one of the companies with the most outstanding research results.” Next steps towards commercialization will include the scale up of material at Eastman Business Park for customer qualification work.



Prototype OLED display incorporates RDL Blue Emitter Material

This award is in recognition of Dr. Royster’s founding of RDL and his impressive business and technical leadership of the company in designing and synthesizing improved breakthrough materials for use in OLED display and lighting products. He will be recognized with this award at the Section’s Annual Awards Dinner that will be held on Tuesday, October 24 at the Brook House in Greece, NY. This award also highlights the continuing central role of chemistry in the economic development of the Rochester area, specifically the role of Rochester in OLED materials technology. In 2021 Drs. John Hamer and Michael Boroson, also former EKC scientists and founders of OLEDWorks, a Rochester company that manufactures OLED lighting products, were co-recipients of this ACS Rochester Section award. A strong OLED presence in Rochester is the legacy of the inventors, Dr. Ching Tang and Mr. Steven Van Slyke, from their work in the Research Laboratories at EKC in the 1970’s.

The future for the OLED industry is very bright. The global OLED display market size was estimated at \$38.4 billion in 2022 and is expected to be worth close to \$214.8 billion by 2030, poised to grow at a CAGR of 21.37% over the projection period 2022 to 2030 according to Precedence Research. Growth will continue over the next five years for the dominant smartphone market with increasingly greater market traction for HDTV’s taking hold. Today, with an impressive portfolio of improved patented OLED materials, R-Display & Lighting is being recognized by leading OLED device manufacturers as a “go-to” company to improve their products, fittingly in Rochester where OLED was invented.

The Rochester Section of the American Chemical Society is the professional organization of some 750 chemists, biochemists, and material scientists in the six county Rochester area. For further information see: www.Rochester.sites.ACS.org.