FROST & SULLIVAN

2003 Excellence in Technology in Thin Films
Award Recipient: Vitex Systems Inc.

Award Description

The Technical Insights' Excellence in Technology of the Year Award is bestowed upon the company that has pioneered the development and introduction of an innovative technology into the market; a technology that has either impacted or has the potential to impact several market sectors. This award recognizes a company's successful technology development that is expected to bring significant contributions to the industry in terms of adoption, change, and competitive posture. It also recognizes the overall technical excellence of a company and its commitment towards technology innovation.

Research Methodology

To choose the award recipient, the Technical Insights' analyst team tracks technology innovation in key hi-tech markets. The selection process includes primary participant interviews and extensive primary and secondary research via the bottom-up approach. The analyst team shortlists candidates on the basis of a set of qualitative and quantitative measurements. The analyst also considers the pace of technology innovation and the potential relevance or significance of the technology to the overall industry. The ultimate award recipient is chosen after a thorough evaluation of this research.

Measurement Criteria

In addition of the methodology described above, there are specific criteria used to determine the final rankings. The recipient of this award has excelled based on one or more of the following criteria:

- Number of new technologies developed or introduced
- Significance of a technology/technologies in the industry
- Competitive advantage of technology/technologies vis-à-vis competing ones
- Ease of adoption of new technology/technologies
- Potential of technology/technologies to become an industry standard
- General impact of technology in terms of shifting R&D focus

Award Recipient: Vitex Systems, Inc.

The Technical Insights' Award for Excellence in Technology for 2003 has been awarded to Vitex Systems Inc. for developing an outstanding thin film technology that will enable electronic displays based on organic materials to fulfill their promise, even as it reduces the cost of existing systems.

Few breakthrough technologies exist in a vacuum; they require enabling technologies to achieve their promise. This is especially true of organic light-emitting diode (OLED) displays, a radical departure from the inorganic materials that now comprise the heart of the semiconductor industry. Compared with flat panel displays (FPDs) now used on laptop computers, OLEDs behave more like television screens. They

are brighter, faster, more durable, and easily viewable from a wide range of angles. They use far less electricity than the plasma displays used in flat panel televisions.

More importantly, though, OLEDs shift the manufacturing paradigm. Manufacturers hope to apply OLED chemicals like the dyes they resemble: print them onto rolls of paper-thin flexible plastic sheets the way we now imprint logos on plastic bags. This could make OLED displays cheap and ubiquitous.

OLEDs have one critical weakness that stands in the way of realizing this vision: they break down when exposed to oxygen and water vapor. Unprotected, OLEDs lose their ability to emit light within minutes. Existing flexible coatings fail to provide adequate protection. Organic films fail to block moisture. Air and water vapor both penetrate along the grain boundaries of polycrystalline materials. Amorphous films do not densify fully at processing temperatures.

Vitex has overcome this key bottleneck with its Barix moisture barriers, which consist of alternating thin film layers of polymer and transparent alumina ceramic. The polymer serves primarily to provide a perfectly flat surface for deposition of alumina, which acts as the moisture barrier. The combination of materials decouples the defects in any individual layer, eliminating pathways between grains. The more layers in the film, the better the barrier.

These films are applied by sputtering. Vitex's Flexible Glass consists of polyethylene terephthalate (PET) film coated with a Barix moisture barrier. Since sputtering is also widely used in the semiconductor industry, manufacturers can apply Barix to glass substrates on the same vacuum line used to deposit a display's transparent conductor and hardcoat.

Vitex has established a strategic agreement with vacuum coater Techni-Met Inc. to manufacture Flexible Glass at its Windsor, Conn., facility. Vitex also has a partnership with semiconductor equipment maker Tokki Corp. to design Barix deposition equipment for large-scale production.

Vitex has distinguished origins, and is well positioned to commercialize the technology. In reality Battelle Memorial Institute, the world's largest private nonprofit research foundation, developed the technology and in 1999 spun off Vitex as an independent company. In 2001, Japan's Mitsubishi Corp. invested $15 million in the business. Battelle and Mitsubishi have both pledged to provide additional financing.

Meanwhile, Vitex continues to line up development partners. For example, the company is working with DuPont Displays and Universal Display Corp. to demonstrate Barix barriers on flexible OLEDs. Universal recently unveiled a 0.7-millimeter-thick OLED that it can roll up into a tube the size of a golf ball. Recently the company also signed a research deal with Samsung SDI Co., a leading display producer, to develop Barix coatings for use with glass-based OLEDs. In this case, flexibility is not an issue. Instead, Barix would allow Samsung to replace one of the display's two glass plates with a thin film, simplifying production and halving product weight. Vitex's agreements are not exclusive; it hopes to sell its barrier solution throughout the OLED industry.

Over the past two decades, microelectronics has made information ubiquitous. OLEDs promise to make that information cheap to display. Vitex Systems' Barix films will play an essential role in realizing that vision. In all, the Technical Insights' Excellence in Technology Award recognizes Vitex's outstanding contributions to the display industry and reaffirms the company's bright future.