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**Innovations I**

**Consumer electronics: OLED encapsulation with unique barrier tapes from tesa**

Four letters are currently electrifying the electronics industry: OLED, the abbreviation for “organic light-emitting diodes” (see info box). OLED technology is outstandingly suited to use in screens, including those in smartphones, tablets, and TVs, as well as other displays. Experts also view large-surface room lighting as another field of application with practically limitless possibilities. In the near future, for example, these compact industrially produced lighting components could be used to light entire sections of wallpaper or substitute for windows, and in bathrooms as well, a combination of mirror and lamp is likely to become standard in the medium term.

**Considerable growth potential in the OLED segment**

According to market research institute DisplaySearch, the global market for OLED displays alone is expected to reach a volume of more than 30 billion euros as early as 2019. Experts forecast average annual growth of 35 percent in this segment until then. A study of worldwide sales of OLED-based TVs predicts sales in excess of 10 billion euros for 2014, and the figure for 2017 is even higher, at about 12.6 billion euros. Last year, this segment posted global sales volume of just 365 million euros (source: Statista, 2014).

**High costs and susceptibility to humidity**

At this year’s Consumer Electronics Show (CES), in Las Vegas, “curved OLED TVs” from manufacturers Samsung and LG, both based in Korea, were an absolute eye-catcher in two ways. The curved screens offer a completely new TV watching experience, but they also caused eyes to widen when potential buyers took a look at the price tag: The top-of-the-line LG model, with a screen measuring 77 inches, comes at a recommended retail price of 30,000 dollars.

One key problem in OLED technology is that for these components to be used on a broad basis in the electronics industry, two factors are crucial: Material costs must be as low as possible, and the entire process flow during the device manufacturing must be highly efficient. Since OLEDs have the big disadvantage of being extremely susceptible to environmental influences, the sensitive substrates require encapsulation with superior precision. Otherwise, small “black holes” can be the result later on.

**Customer tests in production processes**

Technologically sophisticated specialty adhesive tapes have proven their value as a method for effectively protecting OLEDs from oxygen and humidity. In December 2013, tesa SE introduced a new generation of barrier tapes that are currently undergoing customer testing in the production processes of electronics industry equipment manufacturers and suppliers, including a large number of global players. The transparent adhesive tapes fully encapsulate the OLED material, which is vapor-deposited in a vacuum. The tapes are subjected to extreme requirements, as a simple comparison illustrates: The water vapor transmission rate (WVTR) for OLED encapsulation is 100,000 times lower than the rate required in the food industry for milk cartons, for example. In practice, that means that at room temperature, no humidity penetrates into the OLEDs sealed off with tesa barrier tapes, and the barrier function lasts many years.

**New technology with dual effects**

Keeping oxygen and water vapor out is one thing. But what about the “internal” moisture that remains in any adhesive mass? To meet customer requirements for extremely dry adhesive tapes, tesa developed its unique DrySeal® Liner Technology at the tesa research center. This patented technology contains an innovative system that acts like a sponge. As early as during transportation of the tapes, which are welded into aluminum containers, a liner wicks remaining moisture out of the double-sided tapes. During OLED encapsulation in the customer’s production process, this liner is removed, taking the tiny amounts of liquid given off by the tape with it.

The thin double-sided tesa barrier tapes are suitable for all OLED display applications of the present day, for example in mobile phones, but they can also be used for screens. “Our market-ready adhesive tapes are keeping pace with evolution in the electronics industry. Their product characteristics make them perfect for use in flexible OLED components soon, in addition to their other applications,” explains Dr. Robert Gereke, the member of the tesa Executive Board responsible for industry. “The field of lighting is also opening up completely new growth opportunities for us,” he adds.

**Two tapes for efficient production processes**

The new tesa adhesive tapes are offered on reels, at thicknesses of 25 or 50 micrometers (1 µm = 1/1000 mm). These optically clear tapes can be used quickly and securely in both “rigid” production processes and in roll-to-roll methods; there are no interactions between OLED materials and the barrier tape. During the further development of new barrier tapes for various fields of application, tesa works closely with partners, including leading consumer electronics and display producers in Asia.

**INFO BOX**

**About OLEDs**

An organic light-emitting diode (OLED) consists of a thin organic layer system (approximately 200–400 nanometers) located between two electrodes – the anode and cathode. Applied to a flexible film or metal substrate under vacuum conditions, this light-emitting surface is less than two millimeters thick in total. When electrical current is applied, light is generated within the layers and emitted by one of the electrodes. Unlike conventional “spot”-type sources of light, OLED modules provide “warm,” diffuse light with excellent color quality that is very pleasant to the eye, and without causing glare. OLEDs also use significantly less electricity than other light sources, such as LEDs, and unlike LCDs, they do not require any background lighting – making them one of the most efficient sources of light available.

This press release, along with image and photo materials, is available online at www.tesa.com/press.

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