

One-stop shop for printed electronics

Saralon GmbH (Chemnitz, Germany) aims to make traditional printing companies ready for the production of printed electronics. OPE journal presents the start-up in detail

Although printed electronics has been known in the scientific community for the last two decades, only comparatively few products have been introduced into the market. That means, we are still scratching just on the surface of this emerging technology. The technology has huge market potential and can affect each and every aspect of our daily lives. But in order to harness its full potential, traditional colour printing companies must also be involved. In other words, printing companies must become capable of producing printed electronics by using their existing printing machines.

The goal is challenging and requires high efforts by the experts in printed electronics. Saralon GmbH, a start-up from Technical University of Chemnitz, has accepted this challenge and is transforming traditional colour printing companies into PE production facilities. Saralon is training them to make them capable of producing electronics by using their existing printing machines.

Current barriers for printing companies

The conventional electronics industry is based on printed circuit boards (PCB), where different electronic components are picked and placed on a PCB. These different components are produced by different suppliers and assembly is done by an assembly company. Unfortunately, a similar production approach is being applied in printed electronics, i.e. components are produced by different suppliers and then assembly is done by a specialised assembly company. But the actual beauty of PE lies on printing all electronic components directly on a single substrate. To achieve this target, a printing company needs access to all the necessary inks, and these must be compatible to each other. Currently, different inks are manufactured by different companies and as expected these inks are not compatible to each other. Oftentimes it happens that commercially available inks are not suitable



Figure 2: Integrated printing of batteries, electrochromic displays, a push button and graphic colour as a security sticker

to an existing printing setup of a printing company. That means a printing company needs to try different inks from different suppliers to identify a set of suitable inks. Somehow, if the printing company manages to resolve ink related issues, it has to do extensive R&D to create an application by using these inks. All these barriers are keeping printing companies away from PE.

Application-driven R&D for printing companies

Saralon was founded in 2015 with the aim to bring printed electronics to traditional colour printing companies. Keeping the need of colour printing companies in mind, Saralon has developed multiple compatible inks for various PE applications. Apart from selling inks, the company provides complete production know-how to printing companies to make them capable of producing PE applications. As Saralon has full control over ink development and its production, it can easily adjust its inks according to a particular printing setup of a printing company. In other words, Saralon is not only selling inks but also doing application driven R&D for printing companies.

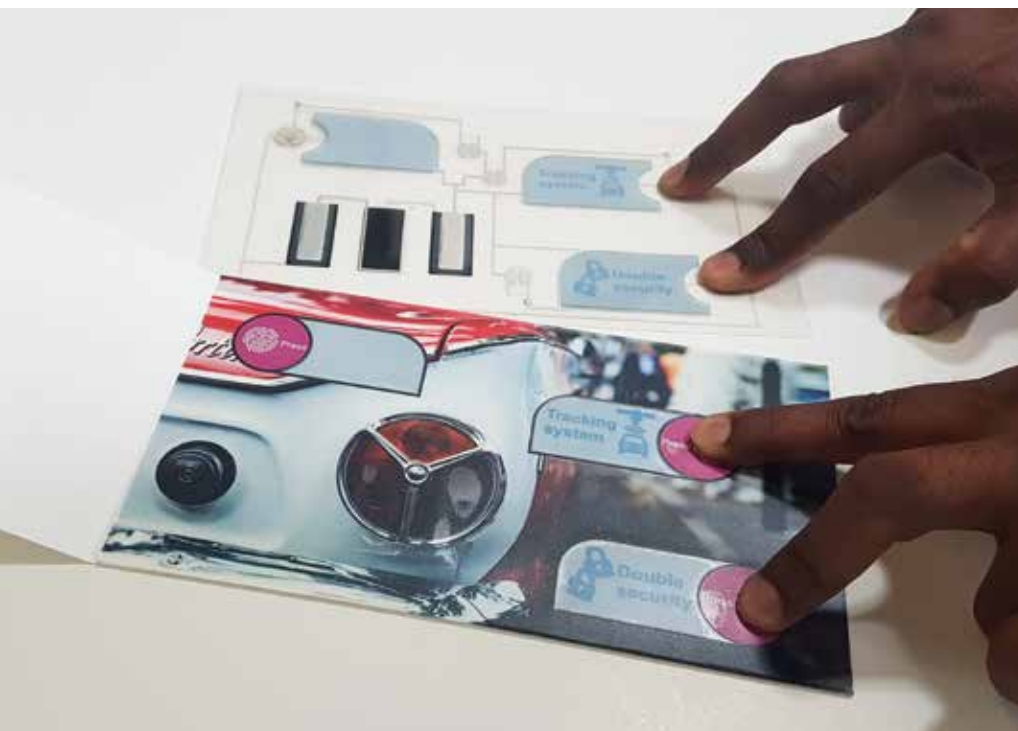


Figure 1: Integrated printing of batteries, electrochromic displays, push buttons and graphic colour as a card



Figure 3: OLEDs powered by a thin printed battery for bottle labels

Some of the applications that Saralon's inks can produce are described here. Figure 1 shows a unique example of integrated printing in which Zn-ZnCl₂-MnO₂ batteries, electrochromic displays, push buttons and graphic colour are printed on a single PET substrate. Around ten different inks, compatible to each other, are printed on a PET substrate by screen printing. Graphic colour is printed digitally. This integrated printing, one may call it "Printegration", can bring multiple applications. Another potential application of this technology can be as a security sticker, as shown in Figure 2. The security sticker is a combination of Zn-ZnCl₂-MnO₂ batteries, electrochromic displays, a push button and graphic colour. Damaging the sticker can indicate to an end user, by pressing a push button, that the box has been opened. This kind of security stickers can also be used in packaging for brand protection.

Changing the packaging industry

Thin and flexible OLEDs are creating huge interest in the packaging industry, specifically as bottle labels. Saralon has developed a very thin and flexible printed battery to power OLEDs, as shown in Figure 3. The flexible battery, based on Zn-ZnCl₂-MnO₂, generates 6V. The battery is completely screen printed, even the paper-based separation layer and the electrolyte layer. Seven screen printing steps are needed to produce the battery. Apart from battery know-how,



Figure 4: Hybrid printed electronics on paper with SMD components for illuminated PoS applications

Saralon provides complete know-how of OLED label production. That means a label manufacturer does not need to do intensive R&D to develop OLED based labels.

Low cost and sustainable technology

In the PE community, it has already been realised that everything cannot be printed, especially efficient transistors. Therefore, hybrid PE is making faster inroads into the market. Saralon has developed a low temperature curing conducting adhesive (<100°C) to affix SMD components on paper substrate, as shown in Figure 4. The advantage of paper electronics is that it can be easily disposed with paper waste. Tiny SMD components can be filtered out while recycling the paper. Another advantage of hybrid PE is that it is a low cost technology, as SMD components are available at low price points. Saralon, together with many printing companies, has already launched multiple products related to this hybrid technology.

NFC technology

The impact of NFC technology is well known. PE has the potential to amplify the impact of NFC on our daily lives. Saralon has developed a printed humidity sensor that can be read by a smartphone through NFC. Similarly, Saralon has developed NFC readable printed temperature sensors. Combining humidity and temperature

sensors with NFC technology can bring huge benefits to the logistics industry. That means, anybody with a smartphone can easily check humidity and/or temperature. Combining this with a printed battery can also convert the device into a temperature/humidity data logger. The combination of PE with NFC technology can substantially lower the cost of products.

Inks for many more applications

Saralon has also developed stretchable silver inks for wearable applications. It is offering two types of stretchable inks: solvent-based and water-based. An advantage of water-based ink is that it can easily be washed out after its intended use. Apart from the above mentioned inks, the start-up from Chemnitz also offers other important inks e.g. UV curable silver, UV curable electroluminescent inks and pressure sensing inks. Saralon also offers different types of conducting adhesives e.g. heat sealable conducting adhesives and pressure sensitive conducting adhesives to connect two conducting surfaces. The innovative company is continuously developing new inks to bring the traditional colour printers into the PE arena.

Image sources: Saralon