Extending the limits

The demand for bigger displays and higher resolutions can only be satisfied with novel materials

When establishing organic and printed electronics in mass markets it is very important to improve the properties of the available materials and find novel alternatives. As one of the leading companies in specialty chemicals, the German Evonik Industries is actively working on this. OPE journal talked to Dr Ralf Anselmann, head of Electronic Solutions at Evonik, to get some insight on the company’s plans and activities.

OPE journal: Dr Anselmann, your company has been active in printed electronics for quite some time. How did that come about?

Dr Ralf Anselmann: The first contacts in this field were established by Creavis, the strategic research unit of Evonik Industries, which identified the area as a potential growth field in 2004. After several years of research, the activity was transferred in 2012 into the business unit Coatings and Additives where we are currently in the phase of implementation with selected customers.

OPE: What convinced you to take on that field and what potential do you see?

Dr R. Anselmann: We are convinced that solution-processed specialty materials will change the way how displays and other electronic devices are made in the future. We also believe that the electronic industry will sooner or later change into a printing industry. Yet we know that coating is the first important logical step towards printed electronics so we developed a new innovative semiconductor material for TFTs – iXsenic S.

In parallel we are constantly working on the optimisation of the printing process with our material. The introduction of a coating and later-on printing technology replacing the widely spread production in vacuum environments means nothing less than a revolution for the FPD industry.

OPE: Displays are among the most rapidly growing industry fields right now. What is special about this area from a producer of materials’ point of view?

Dr R. Anselmann: Concerning displays, the market is pushing for larger and larger products with higher and higher resolution – 4k2k or even 8k4k. Due to the limitations of amorphous silica, new semiconductor concepts are a necessity. There are advanced semiconductor materials such as the low temperature polysilicon, which can meet the demanded technical requirements. Yet, due to high production costs, price expectations of the end customers cannot be met. We have found a way to overcome this dilemma. By using our semiconductor material in a solvent-based coating process the performance is perfect to drive high resolution LCD and OLED displays. It offers high homogeneity also on large substrates and the process does not require a vacuum environment.

OPE: What is the current stage of development of these materials?

Dr R. Anselmann: At the moment our Asian customers and co-operation partners are working on LC and OLED demonstration displays, some of them being flexible. We are in the process of transferring our products to mass production lines. Also our products are used for new applications such as the printing of advanced circuitry but, for the time being, we can’t disclose any more information about this.

OPE: What other applications in organic and printed electronics are you working on?

Dr R. Anselmann: In several projects we have demonstrated RFID tags with our novel n-type metal-oxide semiconductor on PET and PI flexible plastic substrates.

We participated in the MaDrIX project. After three years of intensive research, supported by the German Federal Ministry of Education and Research, the project successfully developed new printable materials for printed RFID tags with highly complex functionality.

Along with our university and industry partners we formed a basis for the development of novel printable semiconductor and dielectric materials. Furthermore, our R&D staff could show for the first time how to produce printable oxide semiconductor ink with high electronic-grade quality at production scale.

With ORICLA, an EU-funded project, we moved one step closer to fulfilling the vision of printed RFID tags. Together with our partners IMEC, Holst Centre and PolyIC, we introduced for the first time a new RFID chip-production process with EPC-like performance, based on complementary logic with organic and metal oxide semiconductors.