iXsenic®
electronics liquified.
End customers’ expectations regarding performance and size of displays are growing while market prices are predicted to remain stable or even to decrease. In order to respond to this trend, Evonik has developed a new high-performance metal oxide semiconductor ink for the production of thin-film transistors (TFTs) combined with a cost-efficient solution-based process.

Using state-of-the-art laboratories for the development of liquid-phase-processable electronic materials we can test TFT performances of up to 600 formulations per month. In our class 100/10,000 cleanroom, we are even able to simulate production conditions to develop formulations based on the individual customer needs.

Our product series iXsenic® S is a solution-processable oxide semiconductor for high-end displays and other thin-film transistor devices. It is a high-tech material ink that can be deposited via standard coating processes like slot-die coating in a non-vacuum environment. This technology is protected by more than 30 patent families. Furthermore, complementary materials are in research including passivation materials, dielectrics and etch-stoppers, which we are looking forward to develop to our customer’s needs. Flexibility and creativity characterize iXsenic®, and this is why we can provide customer-specific solutions with our products for a wide range of the most difficult problems in display manufacturing.
Semiconductor for Thin-Film Transistors

The semiconductor is the heart of every thin-film transistor (TFT). We have optimized how the semiconductor is applied by combining a solvent-based process with the use of a new metal oxide semiconductor ink. The result is our iXsenic® S technology.

Its cutting-edge performance is perfect to drive high-resolution LCDs and OLED displays. It is easy to integrate in regular TFT production and compatible to all standard materials already in use. It offers high homogeneity even on large substrates. The coating process does not require a vacuum environment. Using coated semiconductors also allows for unrivalled flexibility: By changing the metal oxide composition it is possible to realize a large variety of products to fully adjust to our customer’s needs. Our semiconductor can be processed at temperatures below 350°C which enables production of flexible displays.

Last but not least, the processing from a solvent represents the next logical step towards the printing of electronic circuits. And with our state-of-the-art technology, we are already working on it.

Products
- iXsenic® S series
iXsenic® Coating Technology

With the coating of metal oxide solutions, Evonik has developed an efficient alternative to vapor deposition, one that offers numerous advantages:

- Solution-processed metal oxides can be deposited in ambient conditions, i.e. no vacuum is necessary. As a consequence, the throughput is higher, CAPEX is lower and it saves material & energy. This makes iXsenic® a truly resource-efficient technology.
- The film composition is controlled directly by the formulation. It guarantees stable results (stoichiometric homogeneity) and also allows adjusting to different compositions upon the customer’s request at any time.
- The coating technology is well established in the industry and used for numerous other materials (e.g. photo resist). It allows large area uniformity as well as scalability.
- We can realize a back channel etching (BCE) TFT with one mask less, resulting in huge savings compared to the etch-stop layer (ESL) process.

Evonik is confident that, with the growing market of high-end display applications, solution-processed metal oxides are a real alternative to established technologies.
Besides creating the semiconductor layer, further processing steps to build up a thin-film transistor (TFT) include passivation, dielectrics and often nowadays etch-stopping. In order to guarantee optimal performance and yield in the display backplane, Evonik is developing a comprehensive package of matching materials.

To achieve an optimal insulation effect, we develop iXsenic® D for usage as a gate dielectric and applied via cost- and time-efficient slot-die coating. If necessary, iXsenic® ES, our etch-stopping material, can be used to avoid hydrogenated layers with shortened lifetimes and with a high chemical resistance. In order to seal off the TFT backplane, current R&D product iXsenic® PV can be applied as passivation layer.

To provide an optimal fit for all production conditions, our products are to be adapted according to each customer’s needs.

**Products**
- iXsenic® D series
- iXsenic® ES series
- iXsenic® PV series
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