Organic life savers

Sensors made of printed electronics will help to avoid accidents

It is a tragic number – more than 12 000 pedestrians and cyclists are killed and almost 300 000 are seriously injured in accidents with cars in the EU every year. Further statistics show that accidents involving pedestrians are far more frequent at night than during the day. Around 30% of severe road accidents occur at night, although less than 30% of all journeys are undertaken during night time.

The French company NikkoIA SAS, which was founded in the Grenoble area in 2011, is working on reducing this number significantly with its products. "We design, manufacture and sell image sensors based on organic materials and thin film semiconductor technologies, sensitive in the visible and near/short-wave infrared spectrum between 0.4 and 3μm," explains David Richard, vice president sales and marketing at NikkoIA.

"This innovative technology was originally developed by Siemens Corporate Technology and we signed a worldwide and exclusive license agreement on a broad portfolio of patents and associated know-how developed by Siemens."

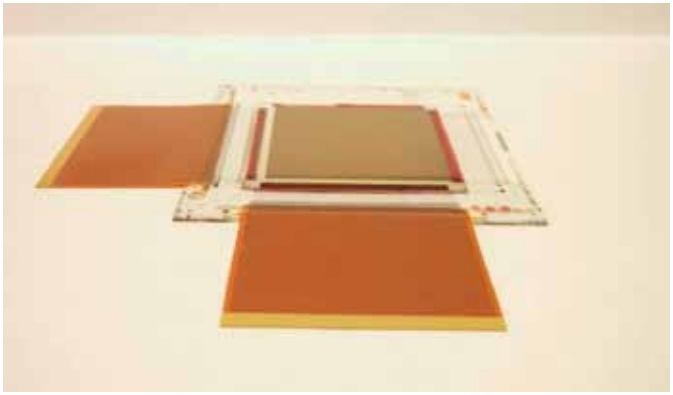
Seeing what man can't see

One application these sensors seem to be perfectly suited for are advanced driver assistance systems (ADAS), which can increase the detection range and distance of pedestrians even under hazardous meteorological conditions like fog, heavy rain or while driving at night. Importantly, they enable the driver to see objects even beyond the range of the headlights.

Such detection systems have started to appear on high-end vehicles, using available technologies. These include active, near infrared systems, using InGaAs sensors, which require an infrared source to give a complete picture of the scene in front of the driver. They also embrace passive, far infrared (thermal) systems, using microbolometers, which do not need an infrared source but only enhance relatively warm objects (such as people and animals).

"These technologies demonstrate significant drawbacks, either technical or economical, when enabling large scale deployment of ADAS systems onto low end vehicles," states Richard. "Other technologies, like LIDAR or RADAR, do not provide a great solution either."

"Due to the variety of clothing that pedestrians may wear, a LIDAR system may not reliably detect dark clothing and, while ultra wideband radars are capable of detecting pedestrians, there are limitations on their use in Europe after 2013. In addition, these systems can not differentiate between pedestrians and other moving objects." Richard is confident that NikkoIA's technology offers a valuable alternative.



An early version of the sensors made on Si TFT substrates (not CMOS), with arrays of 256x256 pixels of 98μm size

Simplified manufacturing

The basis of this technology is the deposition of organic photo-detection layers onto industry standard reading substrates. In this process the organic materials are sometimes combined with inorganic nanoparticles, the so-called quantum dots. The sensitivity of the sensor is defined by the nature and combination of the materials and can thereby be focused on specific wavelengths in the visible and/or near infrared spectrum, or in the broadband sensitivity range.

"We deposit the materials as thin film layers, which are only a few hundreds of nanometres thick, onto industry standard electronic reading substrates to form high performance and cost optimised sensors," explains Richard.

"The substrates can be made of a CMOS active matrix of transistors, amorphous silicon thin-film transistor backplanes or printed electronics in the future. The process compatibility with any reading substrates also ensures the leverage with the latest technical developments and the best market costs."

The benefit this technology offers, according to Richard, includes the great versatility in sensor size, shape, sensitivity and resolution, as well as an operation at ambient temperature with no need for cooling or temperature stabilisation. "In addition, the simplified manufacturing process and the use of reading substrates already available in volumes provides a much lower manufacturing cost compared to other existing technologies," boasts Richard.

"Low-cost large area sensors of up to several hundreds of square inches, and near infrared high resolution/small pixels sensors with a cost structure of a classic CMOS sensor, are thus two of the most promising product ranges the technology enables in our opinion."

The company hopes that this will open up new opportunities in additional high-volume/fast growing markets such as medical imaging, security and human-machine interfaces.