

Nanotechnology Brings Privacy to Transparent Displays

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Nanotechnology specialist NextGen Nano has achieved results at a scale suitable for commercial development for its transparent organic light-emitting diode (TOLED) device.

The technology takes conventional TOLED displays to the next level by adding a privacy feature where users can only view content from one side, while the other remains transparent, similar to a two-way mirror.

This innovation brings new possible applications, such as allowing cameras to be placed behind displays and keeping them at eye level, which would reduce the equipment needed for teleprompting and allow for more natural conversations in video conferencing. It can also be used in heads-up displays in cars.

TOLED technology is a variant of OLED, which uses self-illuminating LEDs to display an image, eliminating the need for a backlight. Making an OLED screen transparent allows it to be used in more interactive display applications where users need to see through the other side of the screen. These applications vary from architectural windows in smart homes to self-driving cars to heads-up displays in aeroplane cockpits.

Conventional TOLED displays have exclusively transparent components, consisting of a substrate, a cathode and an anode. When turned on, they allow light to pass in both directions, meaning any images or text displayed can be seen from both sides. Being able to see information displayed on both sides can present some security issues for certain applications, such as smart glasses.

The team working on [NextGen Nano](#)'s NanOLED Project has added a privacy feature to TOLEDs for users. Professor Franky So, Chief Technology Officer at Nextgen Nano, said:

“Single-sided emission transparent displays have been realised by suppressing the light emitted from the top electrode while simultaneously maximising the light emitted from the bottom electrode.”

These displays appear transparent to a viewer from one side, while the viewer on the other can see the display on the transparent glass.

Other sectors that will benefit from this technology are the aeronautical and automotive industries, where the use of heads-up displays is becoming more popular. With the use of TOLED, the display is clear when no power is present, so the driver/pilot can still see through in the event of failure.

Single-sided light emission has been achieved using a systematic optical device design using simulations. Dr Hossein Ardekani, Research Scientist at Next GenNano, said: “Our optical simulation and experimental results reveal that TOLEDs with the privacy feature added show bottom-to-top emission ratios as high as ten.

“This means the light emitted from the bottom electrode is ten times higher than the top, making one-sided emission possible. Our next task is to further enhance the emission ratio by directionally extracting trapped modes from the bottom electrode,” continued Ardekani.

OLEDs are the next-generation eco-friendly technology for displays and general lighting. Compared with conventional VFD, LED and LCDs, the OLED display allows for wider viewing angles and has higher contrast with response times of less than 0.1ms. This is because the organic material allows the displays to be self-illuminating, eliminating the need for a backlight.

The research into TOLED technology is conducted by the company’s NanoLED division, a team tasked with increasing efficiencies and scale-up for commercial development of its display technologies.

NextGen Nano is also known for its patented organic semi-transparent solar cells, PolyPower and innovative quantum technologies.

Read the [original article](#) on DPA Magazine.