INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

a-Si Photodetectors for Under-Display Fingerprint Sensors and for Gesture Sensors

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Inventor
Lingjie Guo
Qingyu Cui

Further information
Joohee Kim
jooheek@umich.edu

View online page

OVERVIEW

Amorphous silicon (a-Si) photodetectors for use with in-display smartphone fingerprint sensors

- Specially designed a-Si photodiodes with non-semiconductor based electron transport layers
- Reduces manufacturing costs and complexity for integration into a variety of smart devices

BACKGROUND

In-display fingerprint sensors are becoming increasingly popular in smartphones as they allow for a larger screen-to-body ratio and a more seamless user experience. Fingerprint sensors which are built into the screen, rather than set up as separate sensors, provide an opportunity for more screen space. The technology uses optical or ultrasonic sensors to capture an image of the user's fingerprint through the screen, allowing for a quick and secure method of unlocking the device. In-display fingerprint sensors are particularly popular with smartphones that feature full-screen displays, as they allow for a more immersive viewing experience and a sleeker design. Still, the existing technology depends upon crystalline silicon which does not integrate with the traditional backplane control circuitry of phones, adding expense and complexity to phone manufacturing. So, a need exists for an improved mechanism by which to create in-display fingerprint sensors for smartphones.

INNOVATION

Researchers have created a new photoreceptor that uses amorphous silicon (a-Si) which will greatly reduce manufacturing costs to produce in-display fingerprint sensors for smart phones. Amorphous silicon does not have a crystalline structure but exists instead in a disordered

atomic structure more similar to glass. The physical form of a-Si not only has a significantly lower production cost compared to crystalline silicon, but it may also be deposited onto a variety of surfaces such as glass or plastic. This new photodetector combines a-Si combined with metal oxide materials as electron transport carriers to create a narrow conduction band that aligns with the valence band of a-Si. Testing has shown an excellent linear dynamic range of 190 dB with 1 microsecond response time. Beyond its usefulness for smart phones, this photodetector can also be integrated into tablets and other smart devices, such as those associated with entertainment units, gaming consoles, and human-computer interfaces in the delivery of healthcare.

PATENT APPLICATION

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