University of Central Florida

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Transparent Electrode is Clearly Better

UCF researchers have developed a new means of electrode transparency for solid-state optical devices, optical modulation devices, optical power conversion devices, optoelectronic conversion devices including PV devices, and others that require both high optical transmission and electrical access. When conventional electrodes are used in an optical detector, the physical properties of the conductor used and the spatial requirements of some applications can block incident light leading to losses caused by shadowing.

The new invention can enhance detector performance by improving optical transmission in those that need electrical contacts in the optical path. The technology works over a broad range of wavelengths, UV through IR, and is compatible with common interdigitated electrode layouts. Using this method for electrode transparency enables an increase the amount of electrode material used while retaining relatively little loss in transmission, for low resistance and potential, allowing faster detector performance.

For small (diffraction regime) electrodes, the new method makes use of surface plasmons on the electrode surfaces to further concentrate optical energy near the electrode gap. Small electrodes and instances of small electrode spacing can also benefit from further optimized light redirection achieved by using diffractive effects from regular electrode placement.

Technical Details

The electrode's shape improves light transmission compared to standard electrode designs that involve flat geometries, by using total internal reflection. Redirecting incident light by a tilted or shaped contact, or material added on the contact provides the light that would have been reflected in an unusable way to an open surface region that may have previously been shadowed by the presence of the electrode.

With this technology, optical detectors can be fabricated using materials with low carrier recombination lengths, which require the use of small electrode gaps. The new method for transparent electrodes increases signal transmission through the small open detector area, improving detector sensitivity and speed.

UCF Inventor

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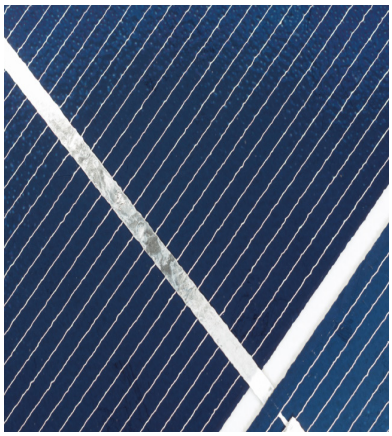

Benefits

- Improves transmission by redirecting incident light
- Can be applied to straight or curved electrodes
- No regular placement needed
- Low electrode resistance enables faster detector performance

Applications

- Optical devices requiring both high transmission and electrical access, including:
  - Solid state optical devices
  - Optical modulation devices
  - Optical power conversion devices
  - Optoelectronic conversion devices

Tech Fields

Optics & Lasers

Keywords

optics, electrode, transparency

If you or your company are interested in this opportunity, Contact:

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