



## TECHNOLOGY

# Illuminated-Kelvin probe force microscopy for imaging open-circuit voltage in optoelectronic devices with nanoscale spatial resolution

## OVERVIEW

### Background:

Imaging methods based on atomic force microscopy (AFM) techniques have been extensively used to characterize the structural and electrical properties of PV materials and full devices. In particular, Kelvin probe force microscopy (KPFM) has been implemented to probe the electrical characteristics of a variety of PV materials and devices, ranging from organic materials, and oxides to III-V semiconductors for multijunction designs and polycrystalline thin-films. The local optoelectronic properties and changes in material composition have also been mapped using near-field scanning optical microscopy (NSOM) probes as local sources of excitation. Very recently, photoluminescence has emerged as a promising tool to map charge recombination and carriers diffusion with high spatial resolution. Nevertheless, none of these imaging techniques provide a direct measurement of Voc within the material. A straightforward, universal, and accurate method to measure the Voc (and hence non-radiative recombination processes) with high spatial resolution in PV materials is still missing.

### Innovation:

Researchers at the University of Maryland have developed a new method to spatially resolve and image the open circuit voltage (Voc) in partially and fully processed optoelectronic devices with nanoscale resolution,

## APPLICATIONS

Nanoscale Voc image analysis

## ADVANTAGES

Applicable to any optoelectronic device

Does not require full device processing

Non-destructive

## CONTACT INFO

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## Additional Information

## INSTITUTION

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**PATENT STATUS**

Pending

**EXTERNAL RESOURCES**

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