

STROBOSCOPIC UNIVERSAL STRUCTURE-ENERGY FLOW CORRELATION SCATTERING MICROSCOPY

Tech ID: 29201 / UC Case 2018-107-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,989,756	04/27/2021	2018-107

BRIEF DESCRIPTION

Flexible semiconductors are far less costly, resource and energy intensive than conventional silicon production. Yet, as an unintended consequence of semiconductor printing, the films produced contain structural heterogeneities, or defects, which can limit their capacity to shuttle energy, or, information, over device-relevant scales. To be able to fully embrace this new, greener process, it is essential to elucidate which physical material properties most influence energy flow and which defects are most deleterious to efficient energy transport so that they can be targeted for elimination at the materials processing stage. Although some rather complex approaches have recently been used to track energy flow, the applicability of each one depends on specifics of the semiconductor properties (bandgap, excitonic vs charge carrier form of excitation, strong absorption or emission). Existing techniques cannot therefore be applied to a broad range of materials, and often necessitate adapting samples to fit the specific requirements of the technique. A broadly applicable approach is therefore needed to non-invasively and simultaneously reveal and correlate material morphology and energy flow patterns across many scales.

Researchers at the University of California, Berkeley have developed a new high-sensitivity, non-invasive, label-free, time-resolved optical scattering microscope able to map the flow of energy in any semiconductor, and correlate it in situ to the semiconductor morphology. This device has been shown as a far simpler approach to spatio-temporally characterize the flow of energy in either charge or exciton form, irrespective of the electronic properties of the material, and with few-nm precision. Furthermore, built into this approach is the unprecedented capability to perform in situ correlation to the underlying physical structure of the material.

SUGGESTED USES

- » targeted improvements to semiconductor materials morphology to improve function in both traditional and next-generation materials
- » identification of the most deleterious defects that can then be targeted for preemptive elimination during material formation

ADVANTAGES

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

- » **Optics and Photonics**
 - » All Optics and Photonics
- » **Research Tools**
 - » Other
- » **Semiconductors**
 - » Design and Fabrication
 - » Processing and Production

RELATED CASES

2018-107-0

» obtain the most mechanistic insights to-date on how local material structure affects its functionality



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