Photodetector/Photodiode/Photoreceiver Frequency Response Tester: PD-RS

Introduction

This system measures and analyzes the responsive behavior of optoelectronic devices (detectors or photovoltaic devices) in the photoelectric conversion process. After continuous pulse or periodic light intensity modulation with monochromatic (single wavelength) light source,=the optoelectronic device is irradiated to generate photo-generated current or photo-generated voltage signal as well as measured and analyzed in frequency domain or time domain. Thus we can get the important parameters of the photoelectric conversion process of the photoelectric device. The parameters include: Response Time, Rise/Fall time, Linearity Dynamic Range (LDR), TPV, TPC etc. It is used to understand the relationship between the internal structure/composition of optoelectronic devices and carrier dynamics. This information can be as a reference for the evaluation of optoelectronic device characteristics and performance improvement.

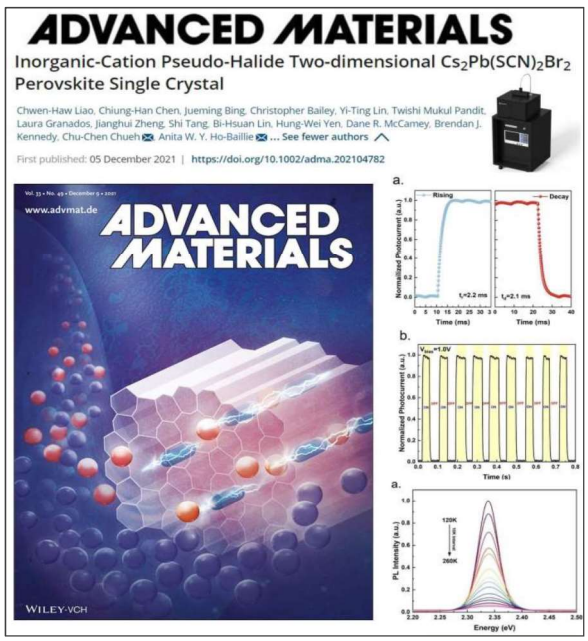
Application

- OPD (Organic Photodiode)
- PPD (Perovskite Photodiode)
- QDPD (Quantum Dots Photodiode)
- New generation Photodiode

Specification

- Linearity Measurement and Analysis of Light Intensity
- Frequency response measurement and analysis (0~40MHz)
- Optional laser module wavelength
- Laser modulation & control
- Cut Frequency Calculation & Analysis
- Rise/Fall time measurement and analysis
- TPC/TPV measurement and analysis
- High dynamic light intensity modulation module, which can automatically adjust the intensity by 6 orders of magnitude
- Laser Wavelength:

Model	Wavelength
RS-405	405 nm
RS-940	940 nm
RS-520	520 nm

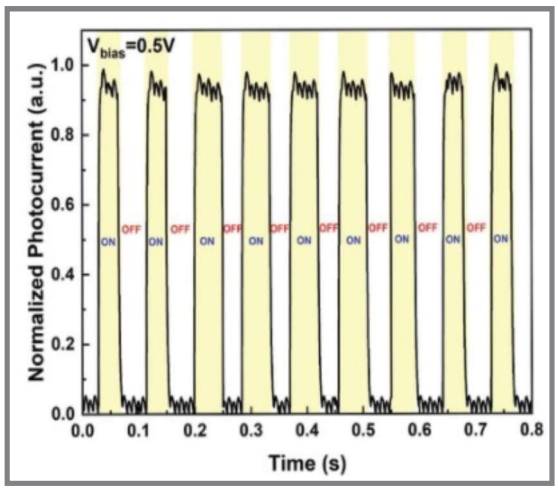


Characterization of single crystal optoelectronic devices of $Cs_2Pb(SCN)_2Br_2$

Advanced Materials journal reported the first inorganic cationic pseudohalide 2D phase perovskite single crystal Cs2Pb(SCN)2Br2 in 2021. The author used the PD-RS system to measure and analyze various photoelectric conversion response behaviors of single crystal optoelectronic devices. These included:

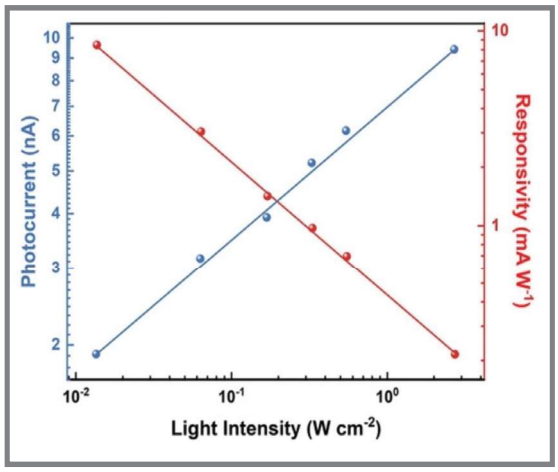
1. Linearity Measurement and Analysis of Light Intensity
2. Spectral responsivity
3. Rise/Fall time measurement and analysis
4. Response Time
5. TPC/TPV measurement and analysis

Testing Results / Publications



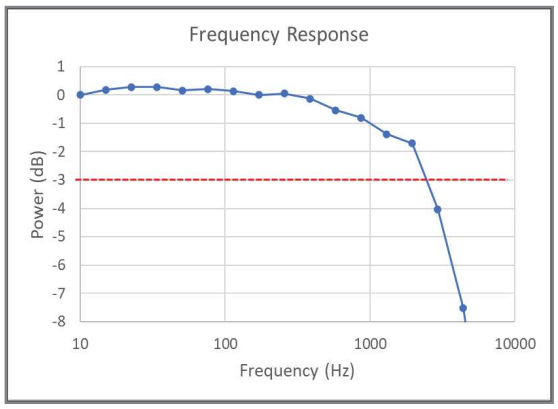
Response Time of Constant-Intensity Pulsed Light

PD-RS equips a laser with high-speed modulation capabilities (Rise/Fall time < 5ns). Under the constant light intensity pulse, PD-RS can measure and analyze the response time and rise/fall time of the devices. Thus, we can understand the fastest time response limit of optoelectronic devices.



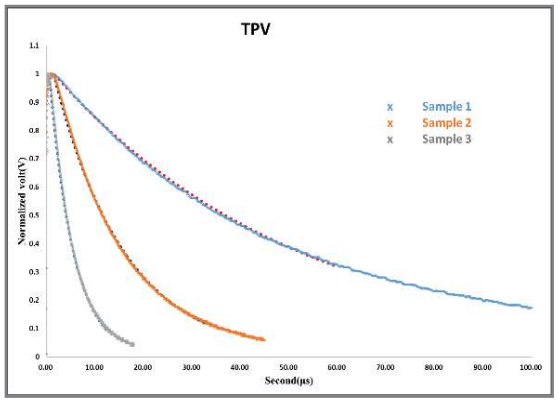
LDR & responsivity test

PD-RS is able to measure the dynamic light intensity range of 120 dB. The change of photocurrent is automatically recorded by the software, and the linearity dynamic range response diagram (LDR) of the device is drawn. LDR is an important indicator for evaluating the characteristics of optoelectronic devices. The change of response (mA/W) can be obtained from the test of photocurrent and light intensity, which is a parameter commonly used to characterize the quality of optoelectronic devices.



-3dB Frequency Response

PD-RS equips a laser with high-speed modulation capability. The system can automatically modulate the frequency of the output beam, detect the photocurrent, draw a frequency response graph and analyze the -3 dB frequency characteristics. The -3 dB point refers to the frequency that means the performance when the modulation frequency of the light source increases, the device cannot respond to the switching change of the light source, and the response photocurrent decreases accordingly, finally reaching an intensity of -3 dB.



TPC/TPV Test

TPC/TPV is a measurement technique commonly used in thin-film optoelectronic devices to study the physical behavior of carrier transport and recombination in the device. The light source of PD-RS has high-speed rise and fall time (< 5 ns). Besides, it can perform transient photocurrent (TPC) and transient photovoltage (TPV) tests.

More Information ▶