

## Development of Photovoltaic Conductive AFM combined with Fine Wavelength-Tunable Light Source

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Amorphous Si solar cell is one candidate of the most possible sustainable-energy-source since the lower cost of fabrication. This is because the amorphous Si thin film can be deposited in large area with high-speed on glass substrate at lower temperature, and these properties are more advantageous than those in single-crystal Si solar cell. However, the efficiency and durability of amorphous Si solar cell are slightly lower than single-crystal Si solar cell because the dangling bond, defects, and lower long-range order within the amorphous Si thin film. These two disadvantages are an obstacle to use the amorphous Si solar cell as main stream of sustainable-energy-source. Therefore, the improvement in efficiency and durability of amorphous Si solar cell has been continued.

In excitation spectrum of photoelectromotive force of an amorphous Si solar cell, some unknown peaks (648 nm, 711 nm) and a tail (Urbach's energy tail) have found near threshold wavelength at about 675 nm. To reveal the origin of these peaks, it is useful that we excite the peaks individually, and observe the distribution of photoelectromotive force. Since the FWHMs of the peaks are about 7 nm, we should use the light source in which FWHM is 7 nm or smaller than it, and the wavelength should be tunable with 1 nm scale. Here, we have developed Photovoltaic Conductive AFM (PV C-AFM) system combined with fine wavelength-tunable light source. The light source has "tunable long-pass edge filter" and "tunable short-pass edge filter" within it, and those are aligned on optical axis. The filters are rotatable around the orthogonal axis of optical axis to control the wavelength of transmitted light. The wavelength range is 630 to 712 nm, and the minimum limit of bandwidth is 1 nm. The distribution of photoelectromotive force image has observed on cross sectional surface of cleaved edge of specimen, and the AFM image has observed simultaneously.

Reference Site: [http://www.deltaoptics.co.jp/products/index.html#prod\\_3](http://www.deltaoptics.co.jp/products/index.html#prod_3) (Movie and Japanese Comments)

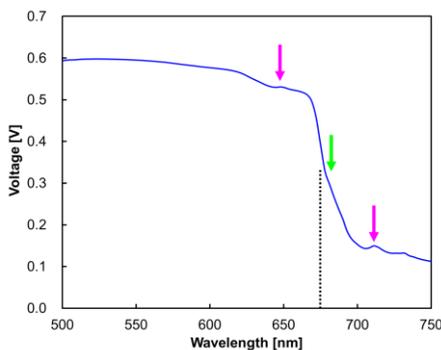


Fig.1: Excitation spectrum of photoelectromotive force of an amorphous Si solar cell.

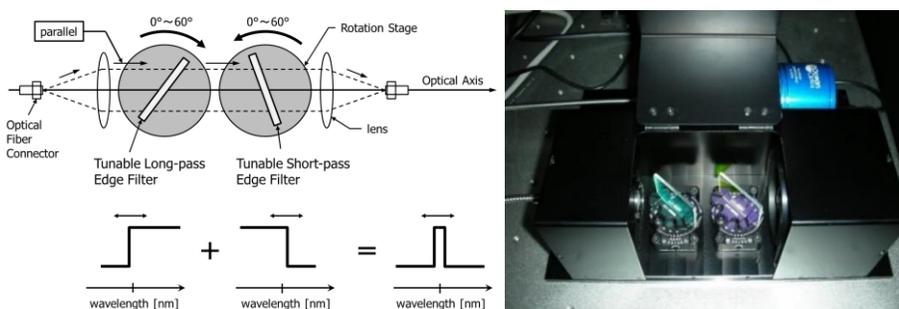


Fig.2: Fine Wavelength-tunable Light Source. (Left) Schematic Illustration, (Right) Side View Image.