AGRICULTURAL SENSOR SYSTEM USING SEE-THROUGH ORGANIC THIN FILM SOLAR MODULES

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Recently, solar-sharing has been proposed as a means for achieving both the power generation and food production. (1) When you use Si solar panels to farmlands, the solar panels cast a shadow underneath the panels. Therefore, there is a problem that the installation areas are limited. Our laboratory propose "solar matching" to solve this problem. In the solar matching, we use see-through organic thin film solar cells which transmit the lights of wavelength necessary for photosynthesis. (2) In this work, we have demonstrated an agricultural sensor system using solar matching method.

Figure 1 shows a see-through organic thin film solar module developed in this work. The device geometry was ITO/ZnO nanoparticle (Aldrich)/P3HT:PC₆₀BM (Aldrich)/PEDOT:PSS(PH1000, Heraeus)/Ag grid. It is so called inverted geometry. This module shows high transmittance of red light, which is essential for photosynthesis. The organic solar modules were passivated with parylene, and were sealed with gas barrier film by a thermal lamination (PECF-HM01, Peccell Technologies). These processes enhance durability of the module. Figure 2 shows a picture of agricultural sensor system. The organic solar modules were mounted to commercial hydroponics kit (greenfarm, U-ING). These modules generate power from the LEDs in the hydroponics kit. Temperature of the hydroponics kit was observed by a digital thermometer, then the records data was transferred to PC by radio transmitter (TWE-LITE, Monowireless). All devices were powered by the organic solar modules.

We expected that the agricultural sensor system developed in this work is effective especially for the application to greenhouses without power lines.

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References