In this study, we use the dye sensitized solar cell (DSSC) to produce the power at very low light intensity condition, and use the power to excite an energy saving LED light source for a special application of indoor zero energy plant factory. In our experiment, the indoor zero energy plant factory is designed for the cultivation of Pleurotus geesteranus. Pleurotus ostreatus is a mushroom that is now grown commercially for food around the world. Generally, it is incubated in very low light environment and can also be used industrially for mycoremediation purposes. Pleurotus geesteranus is one kind of non-photophilous bacteria that needs appropriate low light stimulation with the light intensity of 110-500Lux and the wavelength ranges 400nm-500nm.

In our experiment, we have designed a cube dark box with dimensions 40cm * 60cm * 30cm as a space for cultivation of the pleurotus geesteranus. Inside the dark box, the upper circulation system to achieve high humidity and low illumination is required for the best Pleurotus geesteranus growth environment. In order to design a low energy plant factory, a conductive device that connected to the roof cover and side walls of the dark box. The light-emitting device (LED) with low power consumption is used to irradiated directly on the cultivation space inside the dark box. We have set several DSSC modules in series on the roof cover of the dark box. The area dimension of each DSSC module one have 10cm * 10cm and the work area of 68cm². The DSSC modules can produce electric power to provide the power more than 6mW to drive 3 blue LED lights (each blue LED requires 4.4mW) to achieve the light intensity about 140lux. We can achieve an indoor zero energy plant factory for plants in very low light environment. The details will be discussed.

Keywords: DSSC; LED; plant factory; Pleurotus geesteranus