

## **Abstract**

Exploitation of photosynthetic cells for the production of useful metabolites requires efficient photobioreactors. Many laboratory scale photobioreactors have been reported but most of them are extremely difficult to scale up. Furthermore, the use of open ponds and outdoor tubular photobioreactors is limited by the requirement for large spaces and the difficulty in maintaining sterile conditions. In view of this, we have designed and constructed an internally illuminated stirred tank photobioreactor. The photobioreactor is simple, heat sterilizable and mechanically agitated like the conventional stirred tank bioreactors. Furthermore, it can easily be scaled up while maintaining the light supply coefficient and thus the productivity constant. A device was installed for collecting solar light and distributing it inside the reactor through optical fibers. It was equipped with a light tracking sensor so that the lenses rotate with the position of the sun. This makes it possible to use solar light for photosynthetic cell cultivation in indoor photobioreactors. As a solution to the problems of night biomass loss and low productivity on cloudy days, an artificial light source was coupled with the solar light collecting device. A light intensity sensor monitors the solar light intensity and the artificial light is automatically switched on or off, depending on the solar light intensity. In this way, continuous light supply to the reactor is achieved by using solar light during sunny period, and artificial light at night and on cloudy days.

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