Kinetic Modeling of Microalgal Photosynthetic Activity Depending on Light Intensity and Quality

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In the present work, the photosynthetic activity measurement system was developed and used to precisely monitor the O_2 evolution rate depending upon the photon flux density and spectra of light sources. Under simulated sun-light condition, the photosynthetic activity can be more accurately described using the models based on local photon flux density (LPFD) and local photon absorption rate (LPAR) hypotheses than traditional approaches like average photon flux density (APFD) and average photon absorption rate (APAR) models. However, the microalgal photosynthesis under green light spectra has a lower activity than that under sun light, even when the photon flux densities were the same. The green light can be easily transferred into the algal suspension and the algal cells are exposed to high photon flux density. However, the major light-harvesting pigment (Chl *a*) of green algae can not absorb the green light as an energy source. These aspects were well incorporated in the LPAR hypothesis. Consequently, it can be noted the LPAR model is on the basis on the mechanism for algal response to light intensity and quality and can be used for prediction and analysis of photobioreaction systems.