

Growth systems for microalgae biomass production

Cultivating of microalgae has led to increasing commercial interest in their use for producing valuable substances for food, feed, cosmetics, pharmaceuticals, and biodiesel et al., as well as for mitigation of environmental pollution and CO₂ emissions. Some technical barriers exist on the commercialization of microalgal biomass and products thereof. These are mostly related to the cultivation of large quantities of microalgal biomass to meet energy demands, which is limited by the light-to-biomass conversion efficiency and harvesting systems as well.

Microalgae growth strongly requires light energy and CO₂ for photosynthetic production of biomass. Hence the design and use of effective cultivation system that allows light penetration and an efficient supply of CO₂ is an important requirement for the rapid cultivation of microalgae and their further commercial use. Microalgae can be cultivated generally in two different aquaculture systems, namely open pond and closed photobioreactors (PBR). The open ponds are the simplest systems, while closed (PBR) could be in form of plates or tubes. Microalgae receive sunlight directly through the transparent container walls or through light fibers or tubes that channel it from light collectors.

As compared with open-air systems, there are distinct advantages to using closed systems, but technical challenges remain. Enclosed systems are advantageous for algae which are prone to contamination while open systems are suitable for robust microalgae, which can resist high pH or salinity when cultivated e. g. in marine water. For most of these cultivation methods, the production processes are economically viable and technical improvements are still in progress. Recently there have been various approaches for cultivation and biomass harvesting developed. However, for effective and sustainable microalgae biomass production further development of more controllable, cost-efficient systems and manufacturing devices is required to maximize productivity, especially for large scale industrial use.

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