Abstract

Closed photobioreactors offer a number of potential advantages over open ponds for the mass cultivation of microalgae. These advantages can include higher biomass densities, decreased contamination, better process control, and more efficient use of $CO_2$. In addition, closed systems are a necessity for applications such as the photobiological production of hydrogen. However, a major constraint in photobioreactor design is the need for adequate gas exchange ($O_2$ desorption and $CO_2$ supply). For applications such as hydrogen production, issues of cost and scalability must also be addressed.

Two 225-liter multitubular photobioreactors, of an inclined bubble column design, have been constructed and tested at the University of Hawaii’s Bioresources Laboratory as part of ongoing studies of photobiological hydrogen production. This design, developed in Italy by Tredici, offers a number of potential advantages in terms of cost, scalability, and gas exchange. A basic performance evaluation of the system was performed using the cyanobacterium *Arthrospira* (formerly *Spirulina*). Results illustrate the system’s potential, under the favorable temperature and insolation conditions of Hawaii, for the sustainable production of cyanobacteria.