Abstract
Effect of algae movement, as a result of random mixing, between the surface and bottom zones of shallow, moderately deep and deep photobioreactors (incident light intensities per unit volume were 8125, 4062 and 2031 μmol·m−3·s−1, respectively) on the reactor productivity was investigated. The results showed that at low cell concentrations, movement of cells between the surface and bottom zones of shallow and moderately deep reactors had no significant effect on Chlorella pyrenoidosa C-212 growth and productivity. However, as the cell concentration in the reactors increased, cell movement between the two zones resulted in increased productivity of the shallow reactor but decreased productivity of the moderately deep reactor. On the other hand, in the deep reactor, random movement of cells between the two zones resulted in decreased Chlorella growth rate regardless of the cell concentration. This may be attributed to the fact that at high cell concentration or in a deep reactor, if the cells move between the surface and bottom of the reactor, they spend too long a time in the dark part of the reactor where there is no cell growth, and endogenous respiration as well as cell death may lead to a decrease in cell concentration. When Spirulina platensis M-135 cells were cultivated in the deep reactor, even at high cell concentration, movement of cells between the surface and bottom zones of the reactor led to an increase in the reactor productivity. The reasons for the difference in the results obtained with these two strains of algae could be attributed to the difference in their light requirements since it was found that the saturation light intensity and specific decrease in cell concentration when incubated in the dark were lower for Spirulina than for Chlorella cells.