Abstract
Development and application of a system for real-time quantitative assessment of individual cell activities in a mixed culture system was investigated. This was based on a concept that the activities of individual cells in a mixed culture can be assessed if the cells are physically separated (in separate compartments) in a vessel while the culture conditions, including the broth components, are maintained the same in all the compartments during the cultivation. On this basis, three different apparatus (M-1, M-2, and M-3) were constructed using various types of membranes. In terms of mass transfer characteristics and membrane fouling, the M-3 apparatus was the most effective system for analysis of mixed cultures at high cell densities. With the M-3 apparatus, the interrelationships between two alcohol-producing strains (Saccharomyces cerevisiae and Zymomonas mobilis) under anaerobic and aerobic conditions were studied. Under anaerobic condition, except for possible competition for nutrients, there were no significant effects of the activities of one microorganism on the other. However, under aerobic condition, amensalism was observed because acetaldehyde that was produced by Z. mobilis inhibited the growth of S. cerevisiae.