Real-time Microbial Tests Using Micro-Respirometer Technology

Y-Ping Hsieh, Center for Water and Air Quality, Florida A&M University, Tallahassee, Florida 32307, USA
Y-H. Peggy Hsieh, Department of Exercise, Nutrition and Food Sciences, Florida State University, Florida State University, Tallahassee, Florida 32307, USA

Abstract

Microbial activity affects quality and safety of foods or food products. Most microbial tests are done by cultural methods. Cultural methods are simple and sensitive but they are not real-time, requiring at least 2 days of analysis. Real-time microbial tests are more desirable but the available technology is limited. We developed a micro-respirometer (MR) technology to do real-time microbial tests a decade ago. The MR method is highly sensitive (DL <1 uLCO2/h), simple (non-instrumental), fast (< 1h) and cost-effective (material<$0.2/test) because it bypasses the traditional instrumental monitoring or exhaustive absorption of CO2 to establish a real-time steady-state, instead, between the CO2 absorption rate of the reagent and the CO2 respiration rate of the sample. While in a steady state, the MR determines the CO2 absorption rate of the reagent to be the respiration rate of the sample. We report here the new development of the MR technology which includes new design of the device, the two-stage steady state method and the conductivity version. Those improvements allow the detection limit to be <0.1 uL CO2/h and the analysis time to be half. The results of the MR method have been verified with those of an IR CO2 respirometer and compared with those of the aerobic plate count cultural method. The MR method, however, detects only total viable microbial activity, indiscriminative of species. How can the MR technology couple with other technologies to achieve a rapid selective microbial test deserves further study.