

PiCOEXPLORER PAS-110-YU

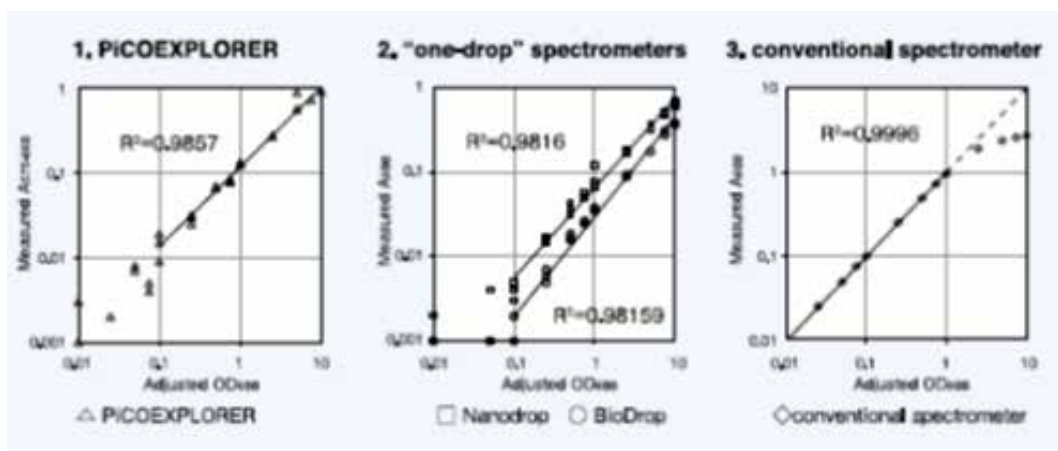
Measuring optical density of microbial culture (*E. coli*) with PiCOEXPLORER

Overview Optical density of microbial culture (*Escherichia coli*, *E. coli*) was measured using PDMS-based portable spectrometer (PiCOEXPLORER), "one-drop" spectrometers (ThermoScientific, Nano Drop 1000 / BERTHOLD TECHNOLOGIES, BioDrop μ Lite.) and conventional spectrometer (SHIMADZU, UV-2450).

- Procedure**
1. *E. coli* SCS1 (Agilent Technologies #200231) was grown in LB medium (10 g/L of tryptone, 5 g/L of yeast extract, 10 g/L of NaCl, pH 7.0) for overnight, then harvested and resuspended in 1 x PBS(-) (140 mM NaCl, 2.7 mM KCl, 8.1 mM Na₂HPO₄, 1.5 mM KH₂PO₄).
 2. The density of cells was adjusted as OD₆₀₀ = 10 using a conventional spectrometer (UV-2450, SHIMADZU; with the length of light path as 1 cm) and then serially diluted to make OD₆₀₀ = 0.01, 0.025, 0.5, 0.75, 0.1, 0.25, 0.5, 0.75, 1, 2.5, 5, 7.5, 10.
 3. From each suspension, 30, 50, and 100 μ L were transferred to single PCR tube (RS-PCR-1 F, RIKAKEN), respectively in triplicates, and optical densities were measured by PiCOEXPLORER with the following parameters: LED output, 20%; sensor integration time, 100 ms; color sensor, Red (575--660 nm, maximum sensitivity at 615 nm).

Result

The measurable range ($0.1 \leq OD_{600} \leq 10$) was almost the same between PiCOEXPLORER (Fig.1) and "one-drop" spectrometers (Fig.2), but R-squared value of PiCOEXPLORER was higher than those of "one-drop" spectrometers. For conventional spectrometer (Fig.3), the linearity greatly decreased for dense suspension ($OD_{600} > 1$) however, it could measure highly dilute suspensions ($OD_{600} < 0.1$). Combining the data described above, it was shown that PiCOEXPLORER is superior to "one-drop" spectrometers in the accuracy, and has an advantage over conventional spectrometer in measuring dense suspension without dilution.



Measured by

Yurika Takahashi, Biotechnology Research Center and Department of Biotechnology, Toyama Prefectural University

Features of PiCOEXPLORER

- Boost Lab Productivity. Absorbance measurement with PiCOEXPLORER. Wavelength range: 400 - 660 nm
- Your portable, personal tool for Lab work and Field work. Analyze directly in unopened PCR tube (0.2 ml). No sample loss, easy to dispose.
- Free app for quick results and calibration curves on your smartphone, tablets. Save raw data (absorbance, concentration, intensity) in Excel file on your PC.

Measuring optical density (OD) is routine work for life science in general. Because conventional spectrometer require relatively large volume (~1 ml) for one measurement, researchers often use flasks, instead of daily used test tubes, to secure enough volume for monitoring growth of culture. Also it cannot be moved where researchers wish to do measurements (e.g. inside of clean bench). I was interested in PiCOEXPLORER because of its portability and its small sample volume, and thought this would provide to comfort routine work. Since PCR tube has short light path, I inferred that it would be able to measure dense suspension. Hypothesis was proved, that PiCOEXPLORER had an advantage over conventional spectrometer in measuring dense suspension, and it was superior to "one-drop" spectrometers in the accuracy. This motivated me to write a paper.

Reference: Takahashi Y (2016) Application of polydimethylsiloxane-based optical system for measuring optical density of microbial culture. Bioscience, Biotechnology, and Biochemistry 80, 2486-2489