



Microfluidic system incorporating to optical sensor for determination of acetaminophen

Panumas Yaemmak^{1*}, Thuan Hoa Nguyen¹ and Napaporn Youngvises¹

¹*Department of Chemistry and Innovative Green Chemistry Research Unit,
Faculty of Science and Technology, Thammasat University, Pathum Thani 12120, Thailand*

*e-mail: panumasyammak@gmail.com

Microfluidic system incorporating to optical sensor has been designed and constructed for determination of acetaminophen based on reaction with potassium permanganate in sulfuric acid. The micro- channels network, 200 μm i.d. x 100 μm depth, was fabricated on poly-methylmethacrylate (PMMA) using CO₂ laser and covered with PMMA cover plate. The flow-cell in a chip was 2 mm i.d. with pathlength of 10 mm. The laboratory-made optical sensor consists of light emitting diode and photodiode. The peristaltic pump was used to flow sample in the microfluidic system, then 40 μL of reagent was injected in the chip by syringe pump. The colour change of permanganate was monitored by lab made optical sensor (LED/photodiode) at wavelength of 520 nm. The calibration curve was constructed between $-\log[\text{acetaminophen}]$ vs. relative signal, and it was linear in the range of 0.07-0.56 mg mL^{-1} with R^2 0.9921. The limit of detection (3σ) was 0.04 mg mL^{-1} and percentage relative standard deviation (%RSD, n=5) was 4.5%. The system will be further developed for quality control of acetaminophen tablets not only in the assay but also in content uniformity and dissolution test with simple preparation and low reagent consumption.

Keywords: Acetaminophen; optical sensor; microfluidic