



Determination of creatinine in urine samples using microfluidic paper-based analytical devices

Suphanan Sununta¹, Orawon Chailapakul^{2,3}, Narong Praphairaksit^{2,3*}

¹*Department of Chemistry, Faculty of Science, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand*

²*Electrochemistry and Optical Spectroscopy Research Unit (EOSRU), Department of Chemistry, Faculty of Science, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand*

³*Center of Excellence on Petrochemical and Materials Technology, Chulalongkorn University, Pathumwan, Bangkok 10330, Thailand*

*e-mail: narong.pr@chula.ac.th

Creatinine is one of the key biomarkers used for assessing the kidney function. In this work, the low-cost microfluidic paper-based analytical devices (μ PADs) for colorimetric determination of creatinine in urine samples were developed. The devices are based on Jaffé reaction between creatinine and picric acid in alkaline condition which gives a colorimetric creatinine-alkaline picrate complex. The product yields an orange color which is clearly visible on μ PADs. The color intensity of the complex which is indicative of the concentration of creatinine is then quantitatively determined using ImageJ software. Various experimental parameters were optimized such as concentration of picric acid, concentration of sodium hydroxide, and incubation time, and the best performance was achieved with 0.04 M picric acid, 2 M sodium hydroxide, and 25 minutes of incubation time. Under the optimum conditions, a wide linear range was obtained in the range of 0.2 – 1 mM with a limit of detection (LOD) and limit of quantitation (LOQ) of 0.11 mM and 0.38 mM, respectively. Moreover, this method showed a good reproducibility at a precision of 1.10% (n=7) for the detection of creatinine at 0.6 mM. Finally, this method was successfully applied for the detection of creatinine in the presence of various interferences.

Keywords creatinine; microfluidic paper-based analytical devices; Jaffé reaction; picric acid