## Nathawut Choengchan

Assistant Professor, Flow Innovation-Research for Science and Technology Laboratories (FIRST Labs) and Applied Analytical Chemistry Research Unit (AACRU), Department of Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, THAILAND.


**Born:** 1977; **Qualifications:** BSc (Chemistry), Mahidol University (1999); MSc (Applied Analytical and Inorganic Chemistry), Mahidol University (2002); PhD (Analytical Chemistry), Mahidol University (2006).
**Academic grants:** The Higher Education Development Project, Postgraduate Education and Research Program in Chemistry (PERCH) (2002); The Project on Faculty Development in the Shortage Area, Commission on Higher Education (2006); The Royal Golden Jubilee (RGJ) PhD Program (2006).
**Positions:** Lecturer, Department of Chemistry, KMITL (2007-2015); Assistant Professor, Department of Chemistry, KMITL (2015-present).
**Research/Academic experiences:** Research student, Department of Chemistry, Faculty of Science, Okayama University, Okayama, Japan (2005-2006); Vice chairperson, Beauty Sport and Health Sciences, The 34th Congress on Science and Technology of Thailand (2008); Organizing Committee, the 16th International Conference on Flow Injection Analysis, including Related Techniques, Pattaya, Thailand (2010).

### Cross Injection Analysis: Concept and Application for 'Single' or 'Multi-analyte' Determination

'Cross Injection Analysis' or 'CIA' is a recent flow based-technique first presented in 2013 [1]. Concept of CIA is based on the use of a small acrylic platform with dimension of 5 cm x 3 cm x 1.5 cm (*x* x *y* x *z*). The acrylic platform is drilled to give cylindrical channels with two or more y-channels running perpendicularly to the x-channel. The y-channel is used as the inlet and the outlet ports for either sample or reagents. The x-channel is the analytical flow path that connects to the detection flow cell. Liquid handling in CIA requires only peristaltic pumps with an electronic board for controlling the pumps. CIA is in a way similar to sequential injection analysis (SIA) in term of insertion of sample and reagents into the analytical flow path. The difference is that zone insertion in CIA are performed simultaneously not sequentially as in SIA. The technique of cross-flow in CIA can promote the mixing between the samples and reagents, leading to the sensitivity enhancement [1].

The CIA technique has been applied to 'single' or 'multi-analyte' measurements. For the first generation of CIA, one platform was used for determination of a single analyte. The system was applied to the determination of iron (II) in multivitamin tablets [1]. The detection was based on use of 1,10-ortho-phenanthroline as the complexing agent to form red-colored product. The second application of CIA was presented for 'tandem measurement' of two analytes. The system comprised two platforms connected in series and was applied to the measurement of iron (III) and creatinine in urine of thalassemic patients [2]. Monitoring of iron in patient's urine indicates the iron overload status and the measurement of creatinine is used to correct for the variation in the volume of the urine collected. Iron (III) was prior reduced to iron (II) by ascorbic acid and was then chelated with 2-(5-bromo-2-pyridylazo)-5-(N-propyl-N-(3-sulfopropyl) amino) aniline. Creatinine was detected using the Jaffé method. We also demonstrated the simultaneous determination of 'two analytes' using 'single' CIA platform. By means of chemometrics, the developed CIA system was successfully applied for simultaneous monitoring of phosphate and silicate contents in water samples [3]. Recently, CIA was developed for 'simultaneous multi-determination' of three analytes. The system has three platforms connected in parallel for the analyses of glucose, albumin and creatinine [4]. Glucose was colorimetric detected based on a non-enzymatic assay using 3,5-dinitrosalicylic acid as a chromogenic reagent while albumin and creatinine were monitored after their reactions with tetrabromophenolphthalein ethyl ester (in the presence of triton X-100) and alkaline picrate, respectively. The method was successfully applied to urine samples collected from diabetic patients.


### Acknowledgements

Financial supports from the Thailand Research Fund, and from Faculty of Science, KMITL are gratefully acknowledged. All valuable comments and encouragements from mentors of the CIA projects, namely Prof. Duangjai Nacapricha and Prof. Prapin Wilairat, Department of Chemistry, Faculty of Science, Mahidol University, are also appreciated.


### Selected publications on the above exploitations:


[1]. D. Nacapricha, P. Sastranurak, T. Mantim, N. Amornthammarong, K. Uraisin, C. Boonpanaid, C. Chuyprasartwattana, P. Wilairat, *Talanta* 110 (2013) 89–95.
[2]. N. Choengchan, T. Mantim, P. Inpota, D. Nacapricha, P. Wilairat, P. Jittangprasert, W. Waiyawat, S. Fucharoen, P. Sirankpracha, N. Phumala Morales, *Talanta* 133 (2015) 52-58.
[3]. S. Janya, C. Phechkrajang, N. Choengchan, W. Tiyapongpattana, D. Nacapricha, *Int. J. Environ. An. Ch.*, 96 (2015) 886-903.
[4]. P. Inpota, M. Sc. Thesis, Department of Chemistry, Faculty of Science, KMITL.