APPENDICES

APPENDIX A

The AOAC Official Method 942.15 [19]

Acidity (Titratable) of Fruit Products

(a) *Colorless or Slightly colored solutions.*

Dilute to ca 250 ml, with neutralized or recently boiled H_2O, 10 g prepared juice or 25 ml prepared solution. Titrate with 0.1N alkali, using 0.3 ml phenolphthalein for each 100 ml solution being titrated, to pink persisting 30 s. Report as ml 0.1N alkali/100 g or 100 ml original material.

(b) *Highly colored solutions.*

Dilute sample of known weight with neutralized H_2O and titrate to just before end point with 0.1N alkali, using 0.3 ml phenolphthalein for each 100 ml solution being titrated. Transfer measured volume (2 or 3 ml) of solution into ca 20 ml neutral H_2O in small beaker. (In this extra dilution, color of fruit juice becomes so pale that phenolphthalein color is easily seen.) If test shows that end point is not reached, pour extra diluted portion back into original solution, add more alkali, and continue titration to end point. By comparing dilutions in small beakers, differences produced by few drops 0.1N alkali can be easily observed.

APPENDIX B

The FIAlab 5.0 program was used to control all of component of the SIA-LOV system. The programs written for different purposes are listed below.

B.1 *FIAlab 5.0 program used for the determinaiton of citric acid system*

```
Analyte New Sample
Analyte Name blank
Analyte Quantity 1

Syringe Pump Command (?) KOR

Insert File C:\MyDocuments\ahpeaw\07July2003\sub program of air segment
section_reference scan.fia

'Aspiration of air
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 1
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 5
Syringe Pump Delay Until Done

'Aspiration of acid
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 5
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 20
Syringe Pump Delay Until Done

'Aspiration of Indigo carmine
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 3
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 6
Syringe Pump Delay Until Done
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```
' Aspiration of basic
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 4
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 40
Syringe Pump Delay Until Done
Delay (sec) 2

' Aspiration of air for mixing in holding coil
Loop Start (#) 1
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 1
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 200
Syringe Pump Delay Until Done

' Dispensation for mixing
Syringe Pump Delay Until Done
Lab on Valve port 6
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Dispense (µL) 210
Syringe Pump Delay Until Done
Loop End

' Dispensation stack zone to detector
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 2
Syringe Pump Flowrate (µL/sec) 16.66
Spectrometer Absorbance Scanning
Delay (sec) 1
Syringe Pump Dispense (µL) 100
Syringe Pump Delay Until Done
Spectrometer Stop Scanning

Save Data C:\MyDocuments\ahpeaw\10Sept2003\truthsample00with10%sug_1.Dat

Beep
' Section for flow cell cleaned
Loop Start (#) 2
Syringe Pump Valve In
Syringe Pump Delay Until Done
Syringe Pump Flowrate (µL/sec) 300
Syringe Pump Fill
Syringe Pump Delay Until Done
```

```
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 2
Syringe Pump Flowrate (µL/sec) 50
Syringe Pump Dispense (µL) 500
Syringe Pump Delay Until Done
Delay (sec) 1
Syringe Pump Flowrate (µL/sec) 500
Syringe Pump Dispense (µL) 1500
Syringe Pump Delay Until Done
Delay (sec) 1
Lab on Valve port 6
Syringe Pump Flowrate (µL/sec) 50
Syringe Pump Empty
Syringe Pump Delay Until Done
Loop End

' Section for next sample filled
Beep
Delay (sec) 2
Beep
Delay (sec) 2
Peristaltic Pump On
Delay (sec) 5
Peristaltic Pump Off
```

B.2 ***FIAlab 5.0 program used for study the effect of sugar in solution***

```
Analyte New Sample
Analyte Name blank
Analyte Quantity 1

Syringe Pump Command (?) KOR

Insert File C:\MyDocuments\ahpeaw\07July2003\sub program of air segment
section_reference scan.fia

' Aspiration of acid
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 5
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Aspirate (µL) 150
Syringe Pump Delay Until Done
```

' Dispensation of stack zone to detector
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 2
Syringe Pump Flowrate (µL/sec) 8.33
Spectrometer Absorbance Scanning
Delay (sec) 1
Syringe Pump Dispense (µL) 50
Syringe Pump Delay Until Done
Spectrometer Stop Scanning

Save Data C:\MyDocuments\ahpeaw\25July2003\ref water_sam03_1.Dat

Beep
'section flow cell cleaned
Loop Start (#) 2
Syringe Pump Valve In
Syringe Pump Delay Until Done
Syringe Pump Flowrate (µL/sec) 300
Syringe Pump Fill
Syringe Pump Delay Until Done

Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 2
Syringe Pump Flowrate (µL/sec) 50
Syringe Pump Dispense (µL) 500
Syringe Pump Delay Until Done
Delay (sec) 1
Syringe Pump Flowrate (µL/sec) 500
Syringe Pump Dispense (µL) 1500
Syringe Pump Delay Until Done
Delay (sec) 1
Lab on Valve port 6
Syringe Pump Flowrate (µL/sec) 50
Syringe Pump Empty
Syringe Pump Delay Until Done
Loop End

'section for next sample filled
Beep
Delay (sec) 2
Beep
Delay (sec) 2
Peristaltic Pump On
Delay (sec) 5
Peristaltic Pump Off

B.3 ***sub program of air segment section_reference scan.fia***

'load water
Syringe Pump Valve In
Syringe Pump Delay Until Done
Syringe Pump Flowrate (µL/sec) 150
Syringe Pump Aspirate (µL) 100
Syringe Pump Delay Until Done

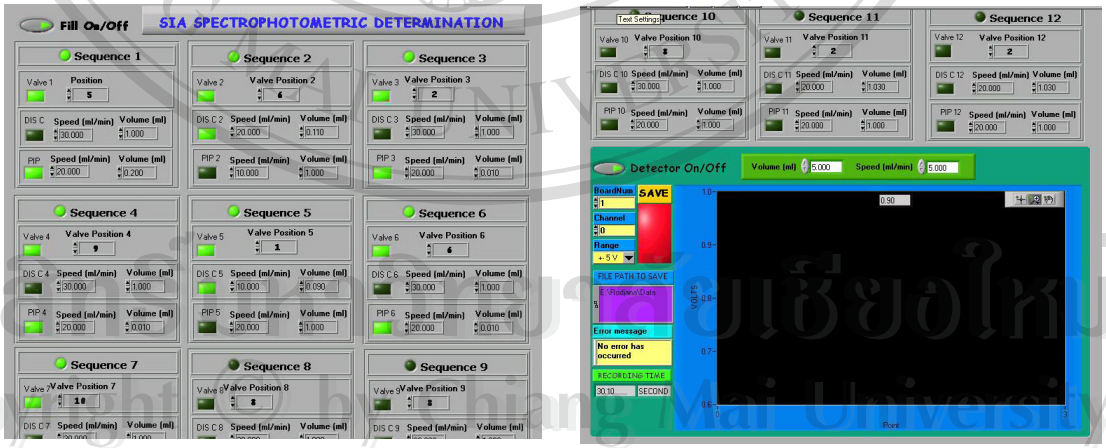
'reference scanning
Syringe Pump Valve Out
Syringe Pump Delay Until Done
Lab on Valve port 2
Syringe Pump Flowrate (µL/sec) 8.33
Syringe Pump Empty
Delay (sec) 5
Spectrometer Reference Scan
Syringe Pump Delay Until Done
Spectrometer Stop Scanning

APPENDIX C

Development of computer programs for automation analytical systems

An automation techniques play important role in today analytical chemistry. They could help to save time for analysis and give a high accuracy and precision of the analysis results. Computerized flow based techniques were developed to increase degree of automation of the techniques.

A computer program was developed for control a pump, a multiposition valve and for signal recording using a computer. The application softwares based on LabVIEW 6.0i were built for sequential injection and flow injection determination of paracetamol by using nitrosation reaction [31]. A CYDAS model 8P as an interface board with a terminal board for analog inputs and outputs was used for analog to digital control. The front panel of the program are shown in Figure C.1.



(a) (b)

Figure C.1 The front panel of the LabVIEW program for automated SIA system (a) The control section and (b) The recorder section.

It was found that, the developed program can be used to automation control the SIA system which provided a more rapid, better precision to the analysis.

Another LabVIEW program was developed for SIA potentiometric system. It was employed to control a pump, a multiposition valve and data acquisition by a computer via a National Instruments interface board model AT-MIO-16X-50 and SCB-68 as a terminal board. The front panel of the program are shown in Figure C.2

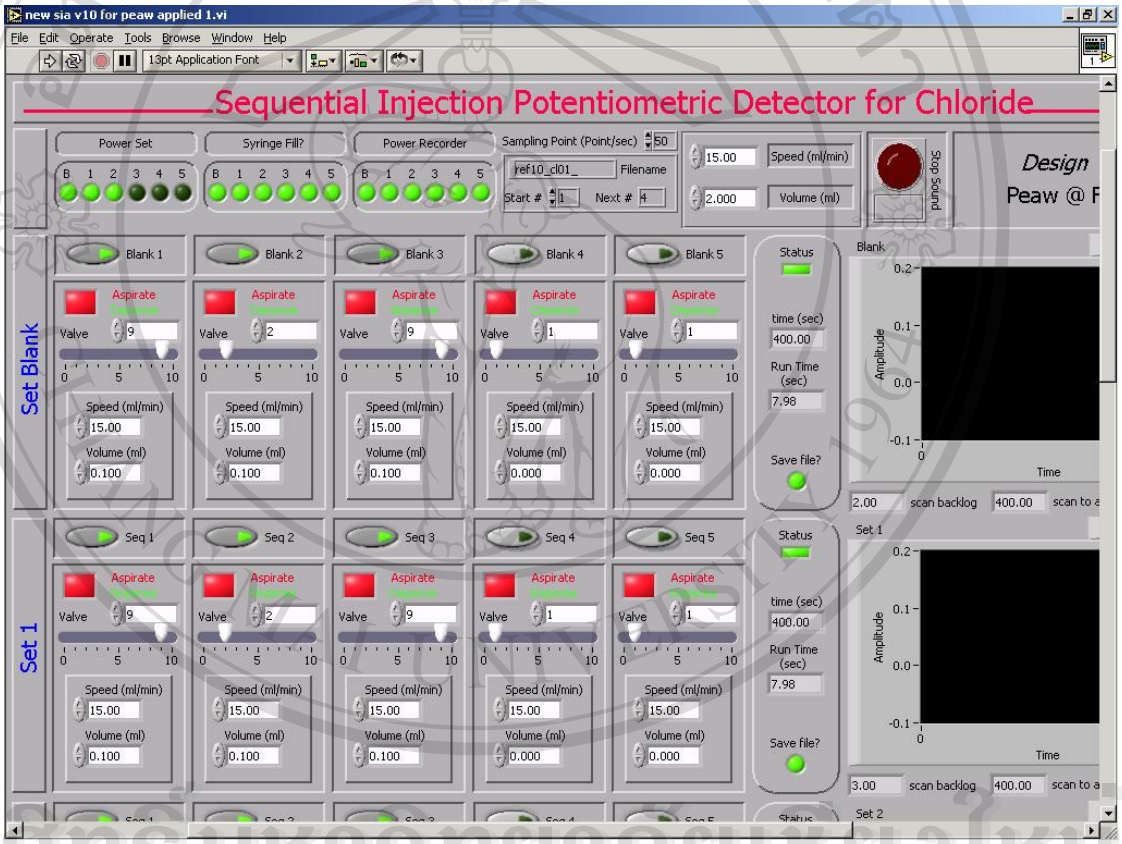


Figure C.2 The front panel of the LabVIEW program for SIA potentiometric system.

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List of Publications:

International conferences

1. L. Patimapornlert, J. Jakmunee and K. Grudpan (2003). "Micro-Titration with Sequential Injection using Lab-on-Valve for acidity in fruit juice". *Flow Analysis IX conference*, Geelong, Australia.

National Conferences

1. L. Patimapornlert, J. Jakmunee and K. Grudpan (2002). "Sequential Injection Titrimetry with Lab-on-Valve for Acidity in Fruit Juice". *The 1st Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis*, Chiang Mai, Thailand.

2 L. Patimapornlert, J. Jakmunee and K. Grudpan (2002). "Lab-on-Valve using Sequential Injection Titrimetry for Acidity in Fruit Juice". *The 28th Congress on Science and Technology of Thailand*, Bangkok, Thailand.

3. L. Patimapornlert, J. Jakmunee, S. Kradtap and K. Grudpan (2003). "Development of Micro-Titration System Using Sequential Injection with Lab-on-Valve for Acidity in Fruit Juice". *The 2nd PERCH Annual Sciencetific Conference*, Chonburi, Thailand.
4. R. Burakham, S. Duangthong, L. Patimapornlert, N. Lenghor, S. Lapanantnoppakhun, J. Jakmunee and K. Grudpan (2003). "Automated System for Paracetamol Assay". *The 2nd Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis*, Chiang Mai, Thailand.