APPENDIX A

Instruments of SIA amperometric system

Pictures of the instruments of SIA amperometric system are shown in Figure 5.1 - 5.8.

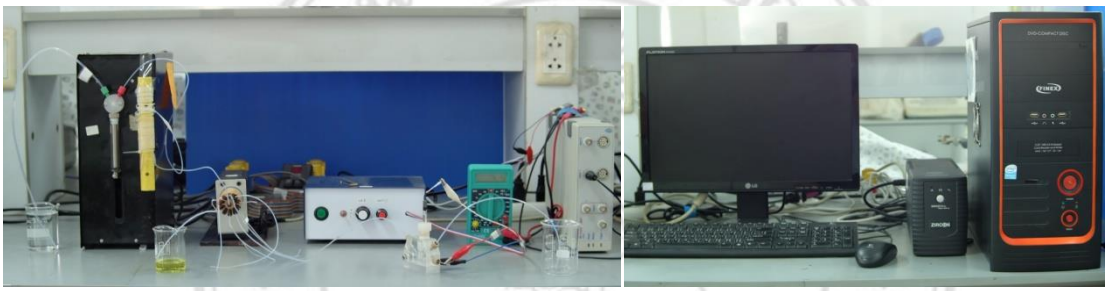

Figure 5.1 Complete setup of instruments of SIA amperometric system

Figure 5.2 Syringe pump and holding coil

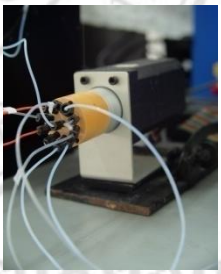

Figure 5.3 Selection valve

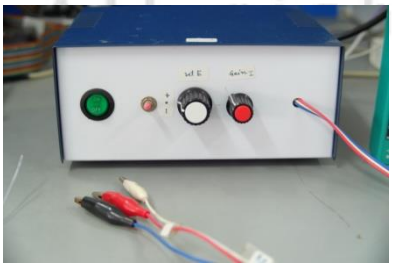

Figure 5.4 Home-made amperometric detector

Figure 5.5 Digital multimeter

Figure 5.6 E-corder 210

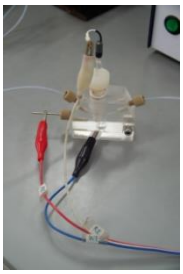

Figure 5.7 Electrochemical cell

Figure 5.8 Computer

APPENDIX B

Signal profiles on optimization of parameters and real sample analysis

1. Optimization of parameters

Parameters of SIA amperometric system were optimized. The peak current signal obtained from a current to voltage circuit was evaluated and the results are shown in Figure 5.9 - 5.16.

1.1 Flow rate

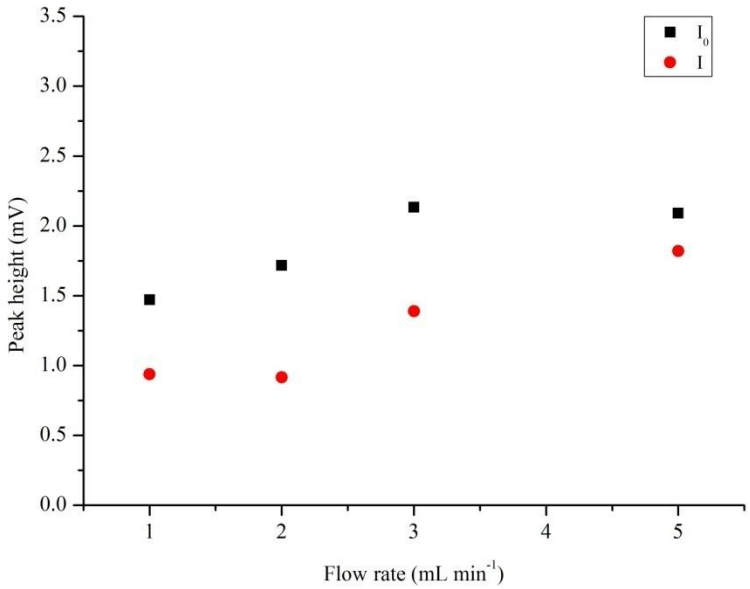

Figure 5.9 Optimization of flow rate in the range of 1 - 5 mL min^{-1}.

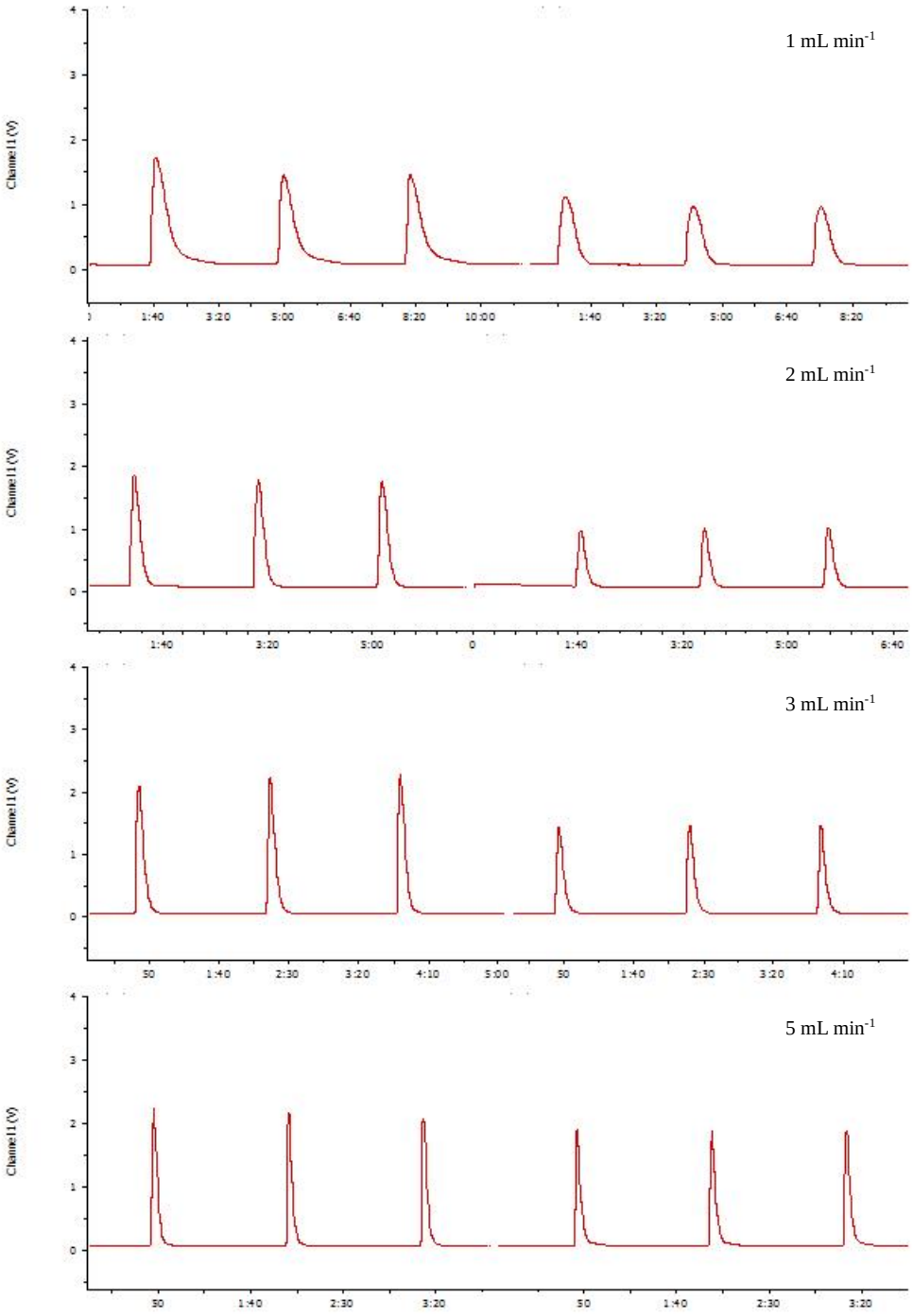

Figure 5.10 Signal profiles on the study of flow rate in the range of 1 - 5 mL min^{-1}.

1.2 Applied potential

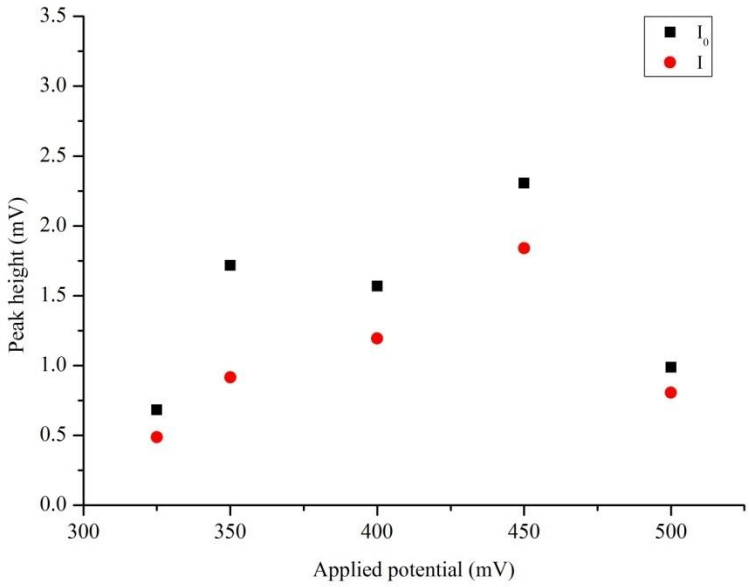

Figure 5.11 Optimization of applied potential in the range of 325 - 500 mV.

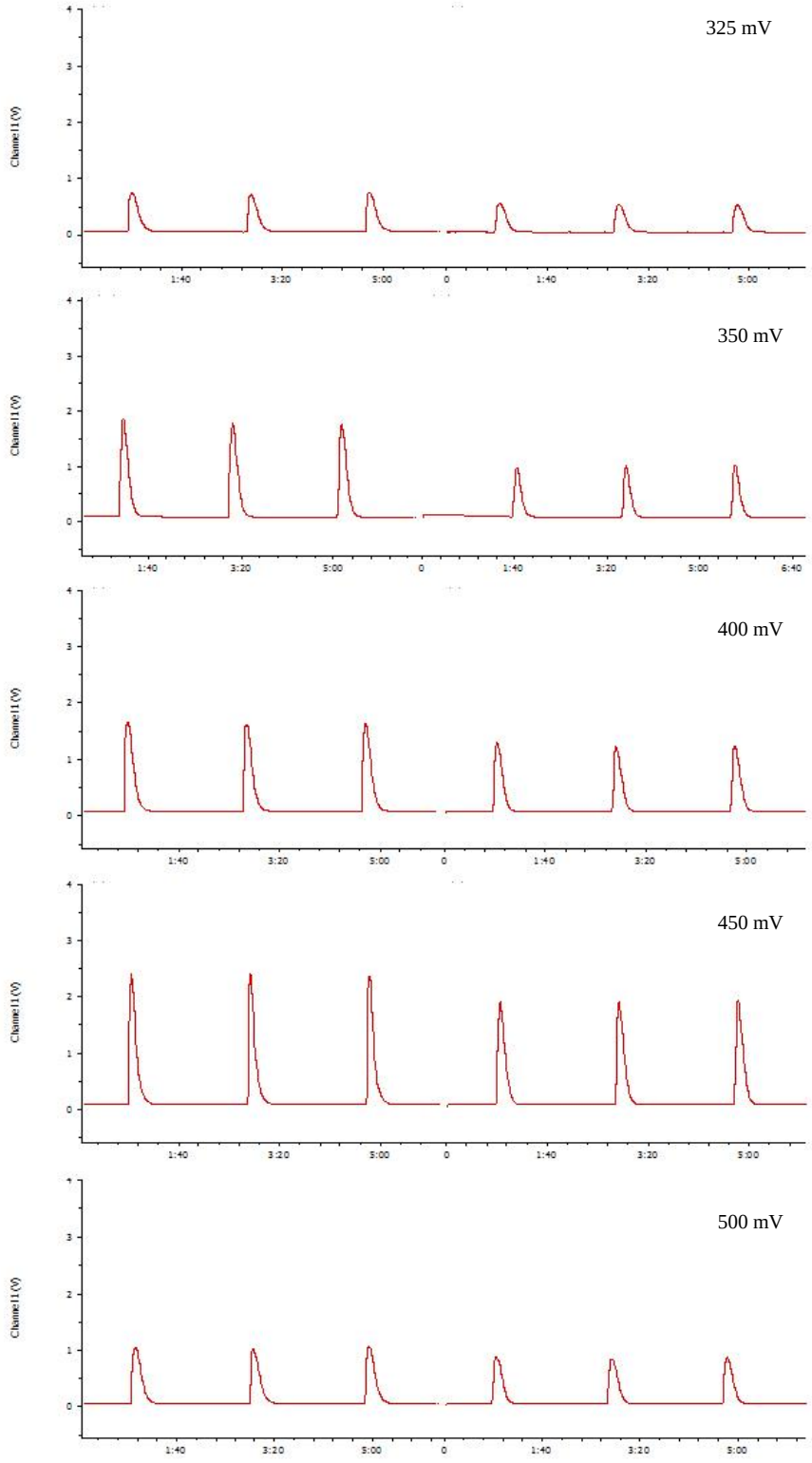

Figure 5.12 Signal profiles on applied potential in the range of 325 - 500 mV.

1.3 Concentration of $[Fe(CN)_6^{3-/4-}]$

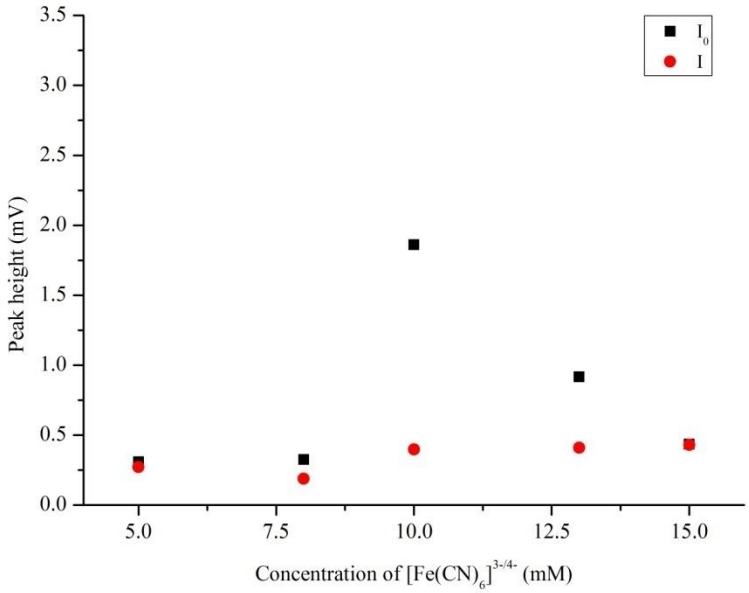

Figure 5.13 Optimization of concentration of $[Fe(CN)_6^{3-/4-}]$ in the range of 5 - 15 mM.

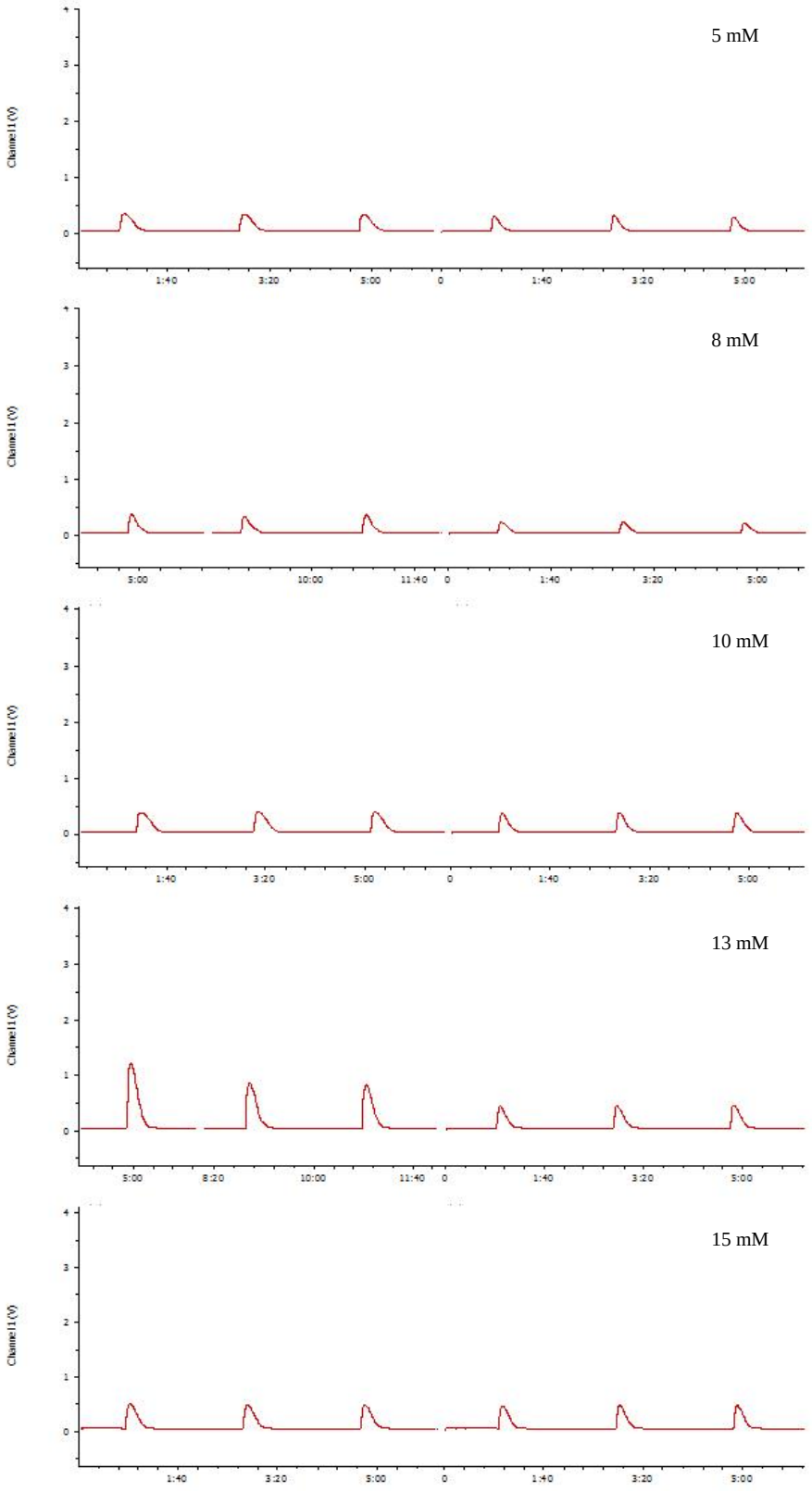

Figure 5.14 Signal profiles on concentration of $[Fe(CN)_6^{3-/4-}]$ in the range of 5 - 15 mM.

1.4 Immunointeraction time

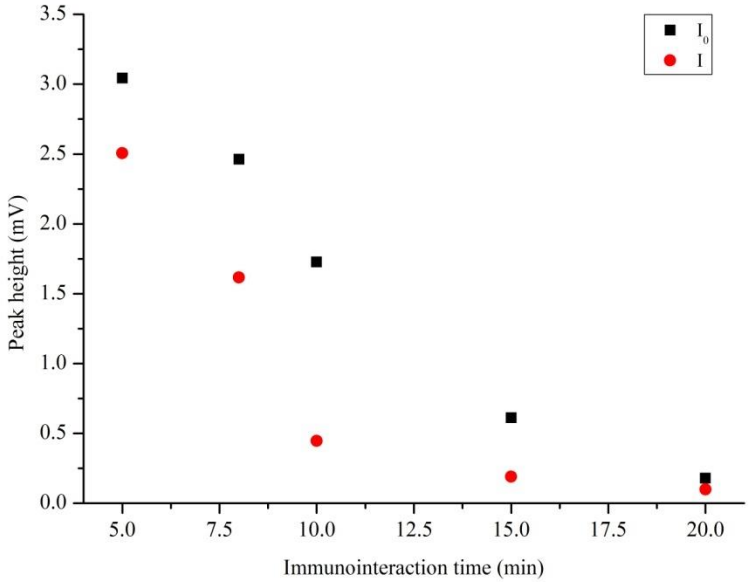

Figure 5.15 Optimization of immunointeraction time in the range of 5 - 20 min.

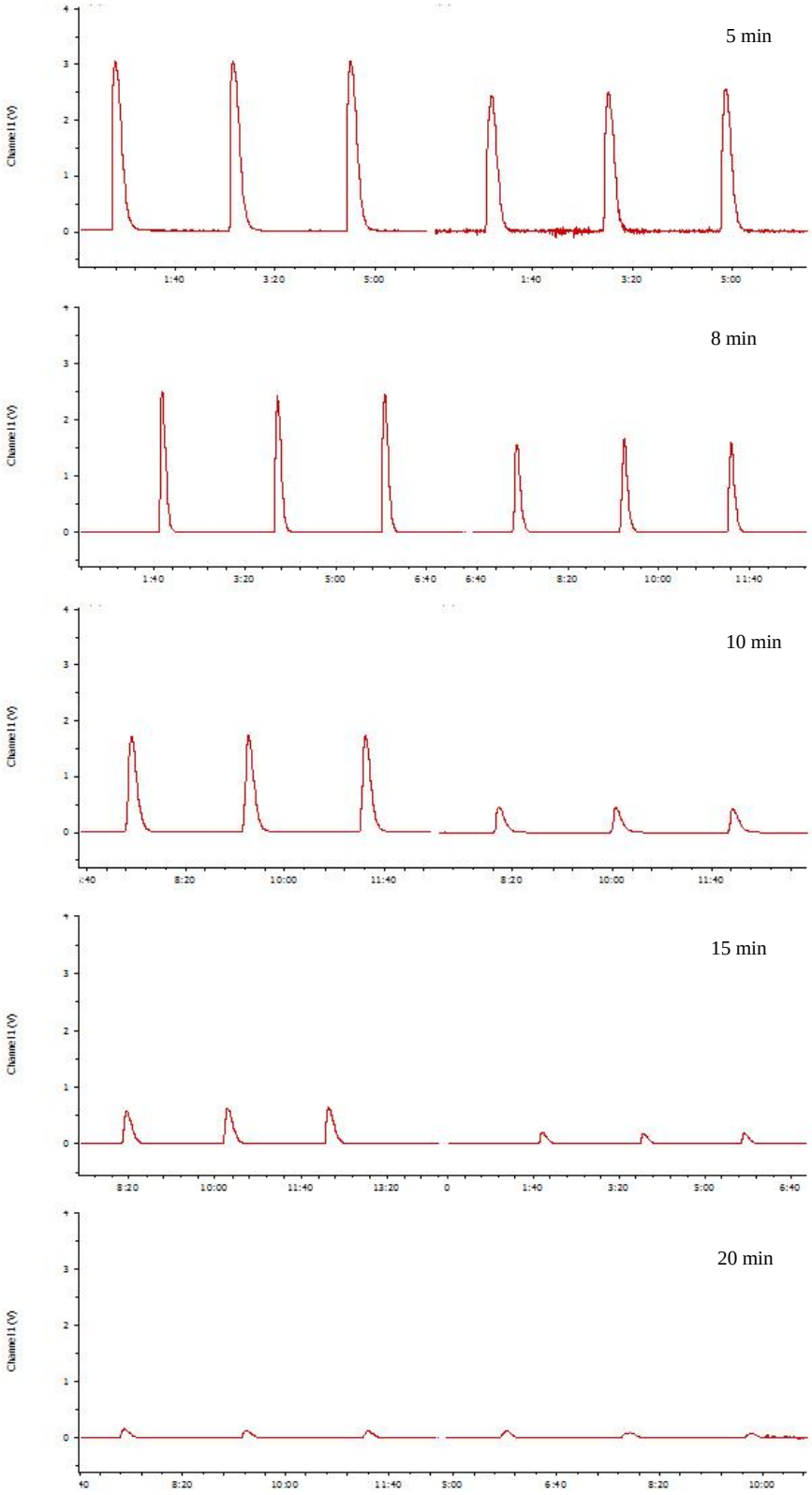

Figure 5.16 Signal profiles on time of immunointeraction in the range of 5 - 20 min.

2. Determination of HIgG percentage recoveries in urine samples of normal people.

2.1 Sample 1 (Spiked 5 ng mL^{-1})

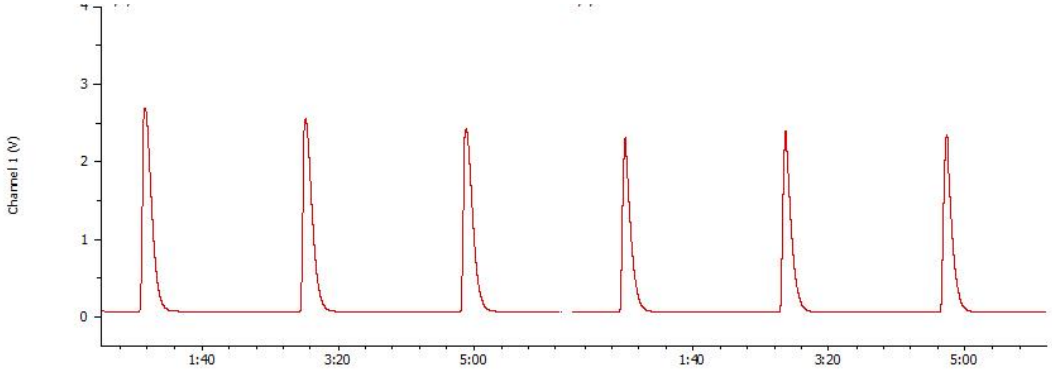

Figure 5.17 Signal profiles of sample 1.

2.2 Sample 2 (Spiked 25 ng mL^{-1})

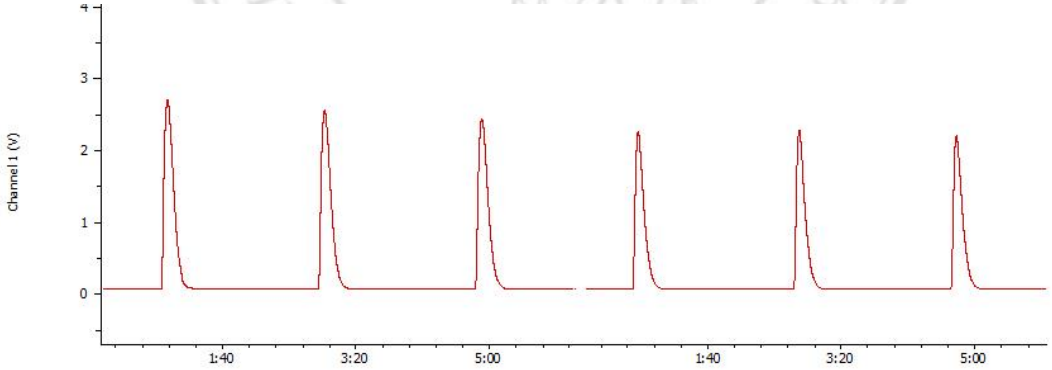

Figure 5.18 Signal profiles of sample 2.

2.3 Sample 3 (Spiked 50 ng mL^{-1})

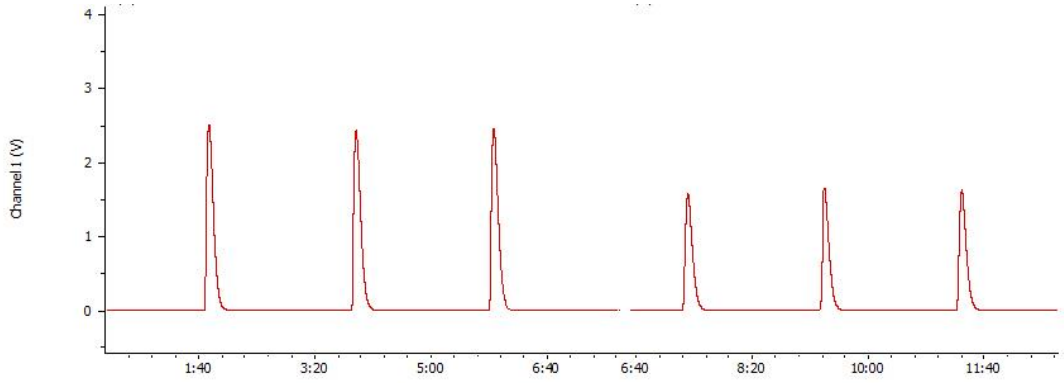

Figure 5.19 Signal profiles of sample 3.

2.4 Sample 4 (Spiked 75 ng mL^{-1})

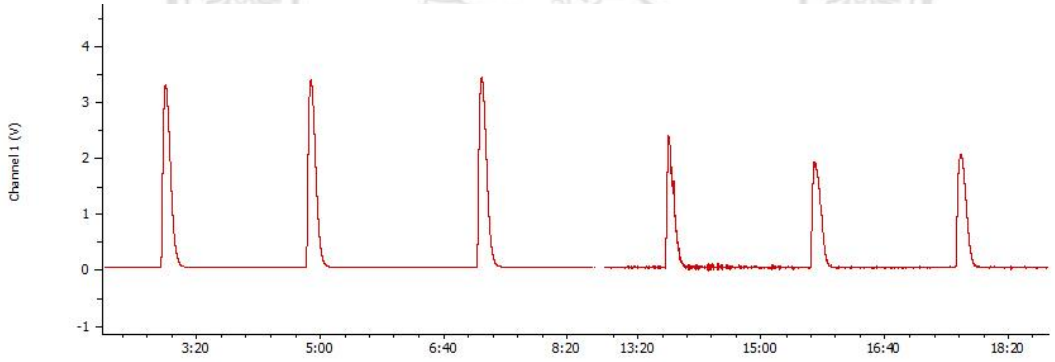

Figure 5.20 Signal profiles of sample 4.

3. Determination of HIgG in urine samples of normal people by standard addition method.

3.1 Sample 1

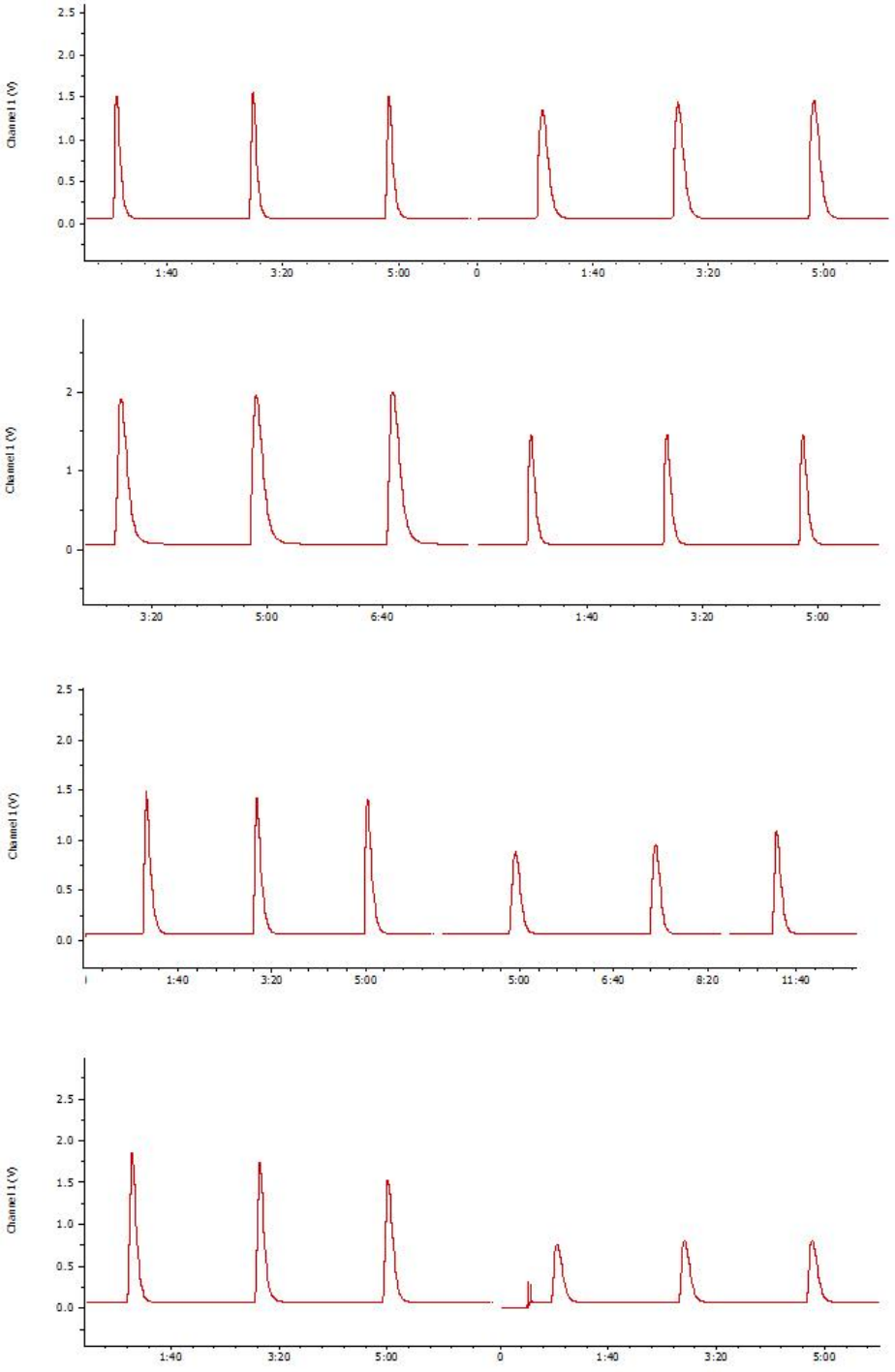

Figure 5.21 Signal profiles of sample 1.

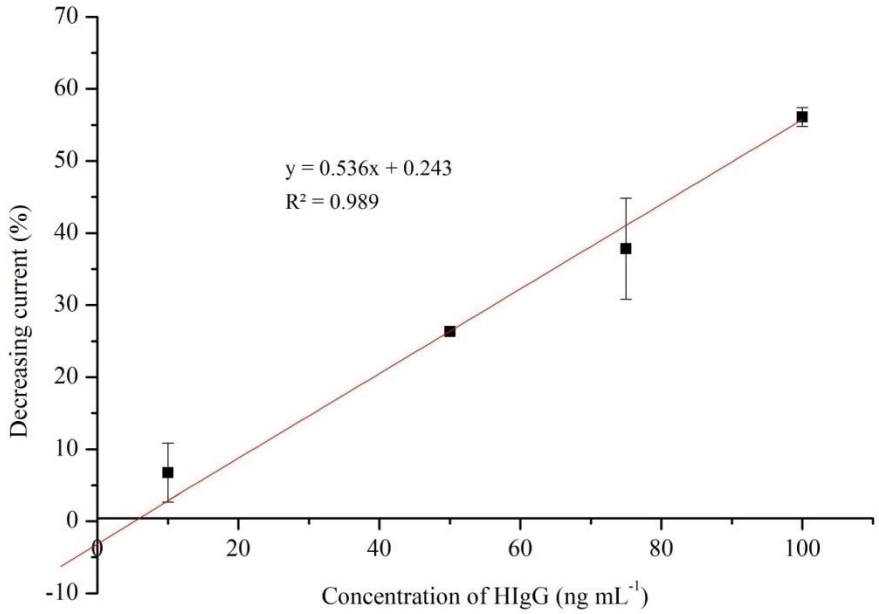

Figure 5.22 Standard addition graph of sample 1.

3.2 Sample 2

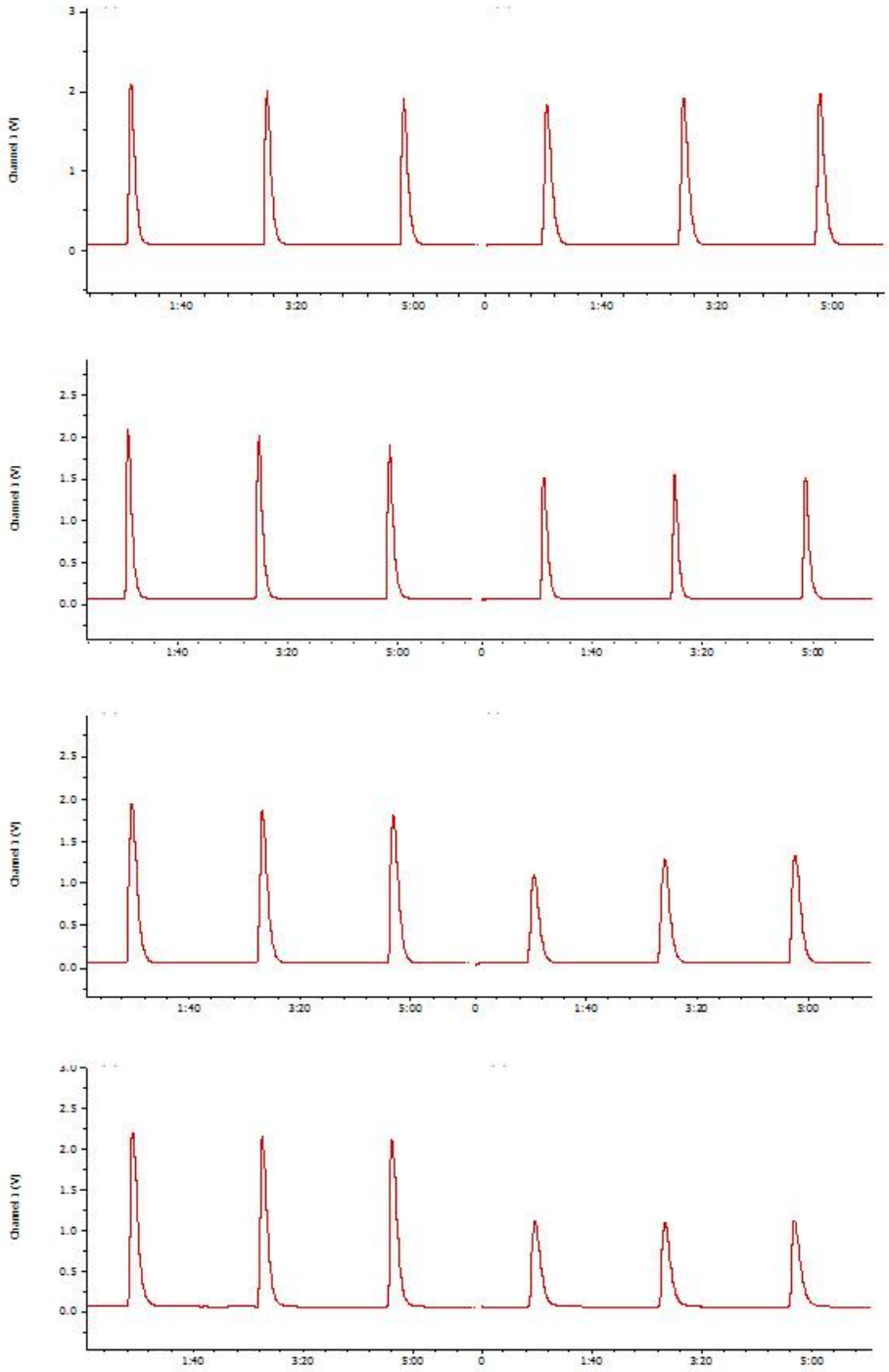

Figure 5.23 Signal profiles of sample 2.

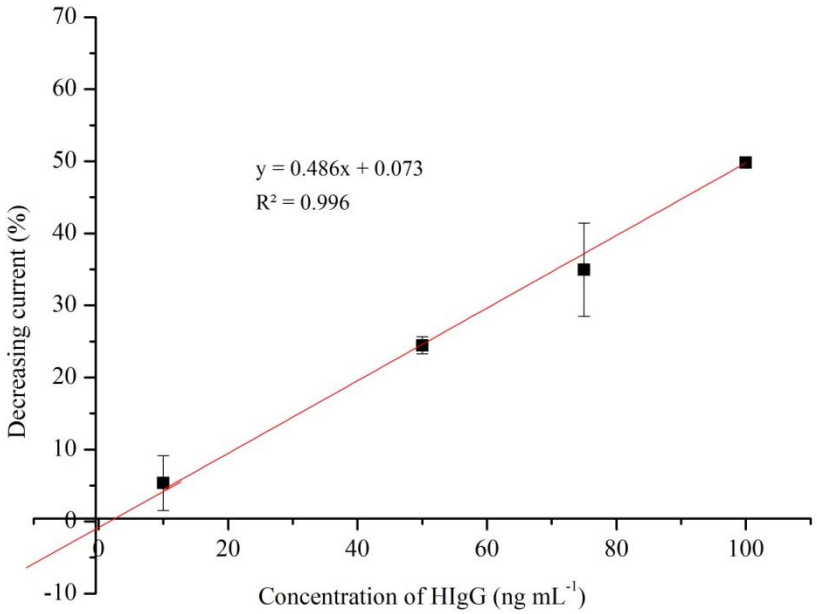

Figure 5.24 Standard addition graph of sample 2.

3.3 Sample 3

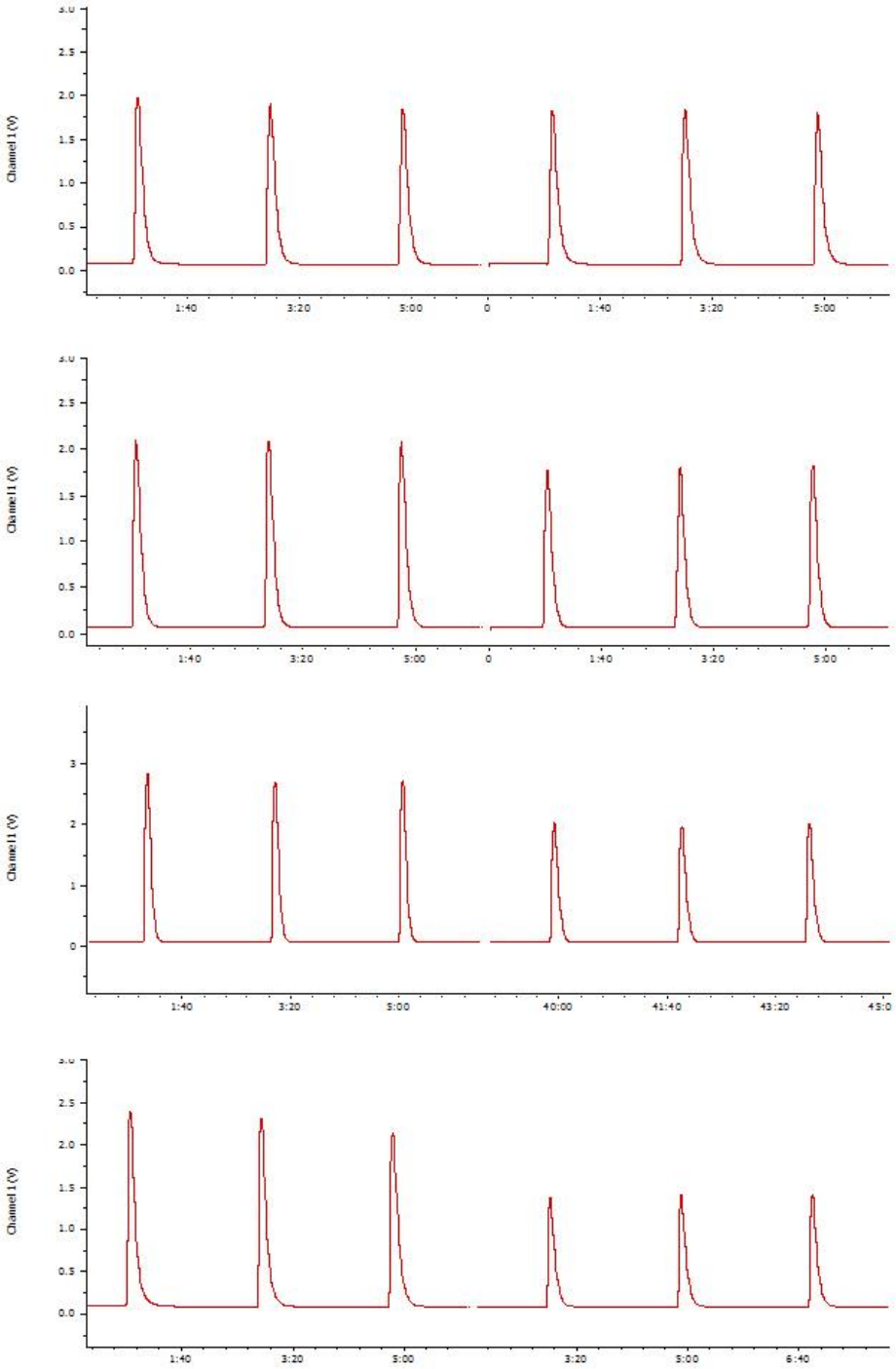

Figure 5.25 Signal profiles of sample 3.

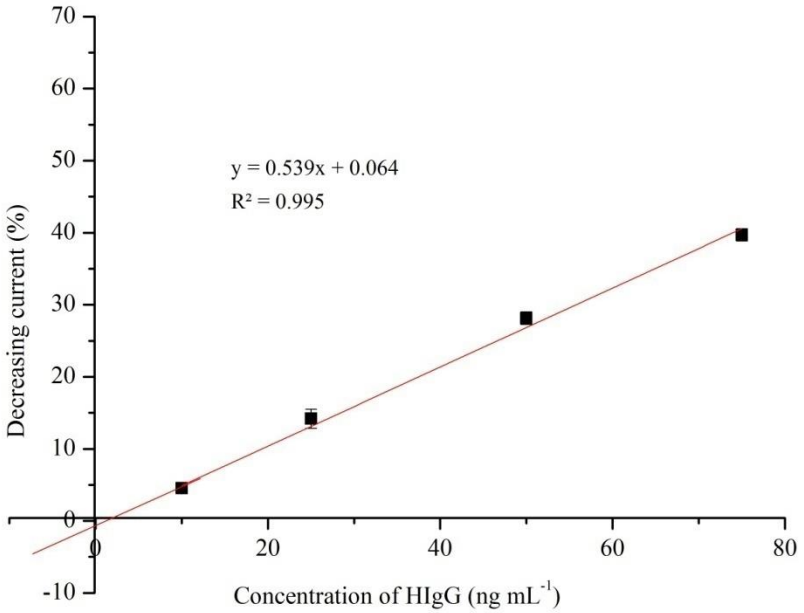

Figure 5.26 Standard addition graph of sample 3.

3.4 Sample 4

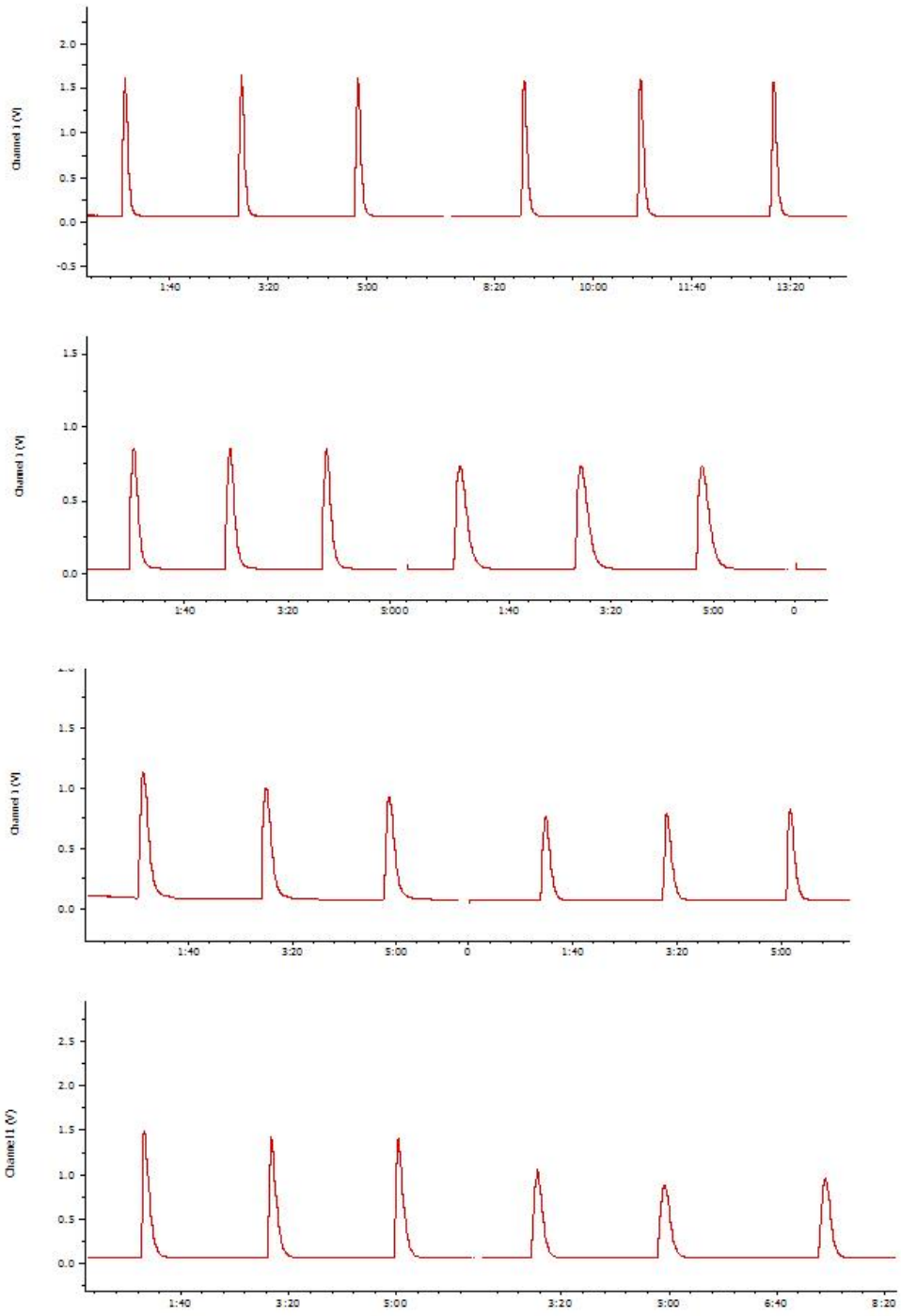

Figure 5.27 Signal profiles of sample 4**.**

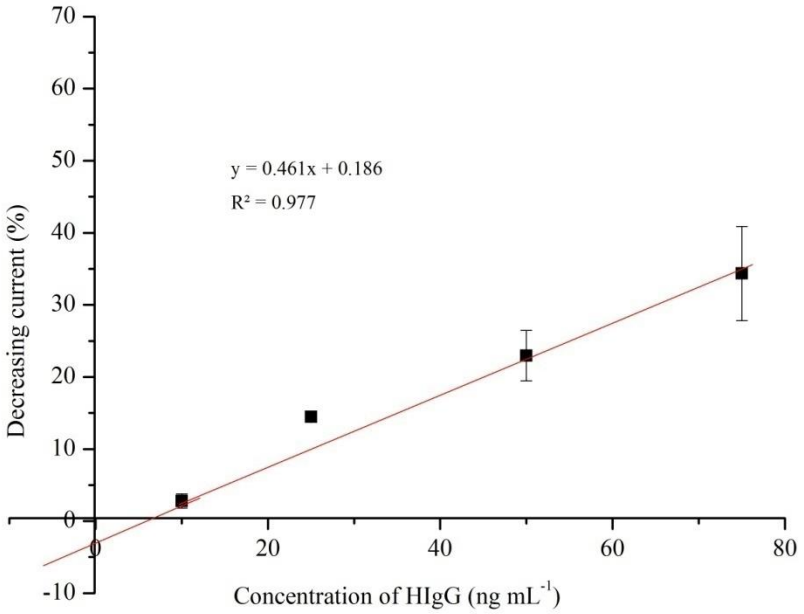

Figure 5.28 Standard addition graph of sample 4.

APPENDIX C

Detection limit calculation

In this work, the detection limit was determined by based on three time of signal to noise ratio as the following equation:

$$LOD_{signal} = 3 \text{ signal / noise}$$

When $\text{signal / noise} = 0.0687$

Thus $LOD_{signal} = 3 \times 0.0687$

$LOD_{signal} = 0.2061$

Then, substituting in linear equation of

$$y = 0.540x - 0.714$$

$$0.2061 = 0.540x - 0.714$$

$$x = 1.703 \text{ ng mL}^{-1}$$

Therefore, LOD is 1.70 ng mL^{-1}.

CURRICULUM VITAE

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Experience	2016	Teaching assistant for Electroanalysis Laboratory course (203732) at Department of Chemistry, Faculty of Science, Chiang Mai University

2016 C. Thunkhamrak, K. Ounnunkad, J.Jakmune, "Sequential injection with electrochemical immunosensor for sensitive determination of human immunoglobulin G (Poster Presentation)", The 20th International Conference on Flow Injection Analysis and Related Techniques (20th ICFIA), Hotel Barceló Pueblo Park, Palma de Mallorca, Spain, 2-7 October 2016.