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APPENDICES

Appendix A Supplemental Materials for PANI-PSS/PDADMAC Multilayer Film Fabrication

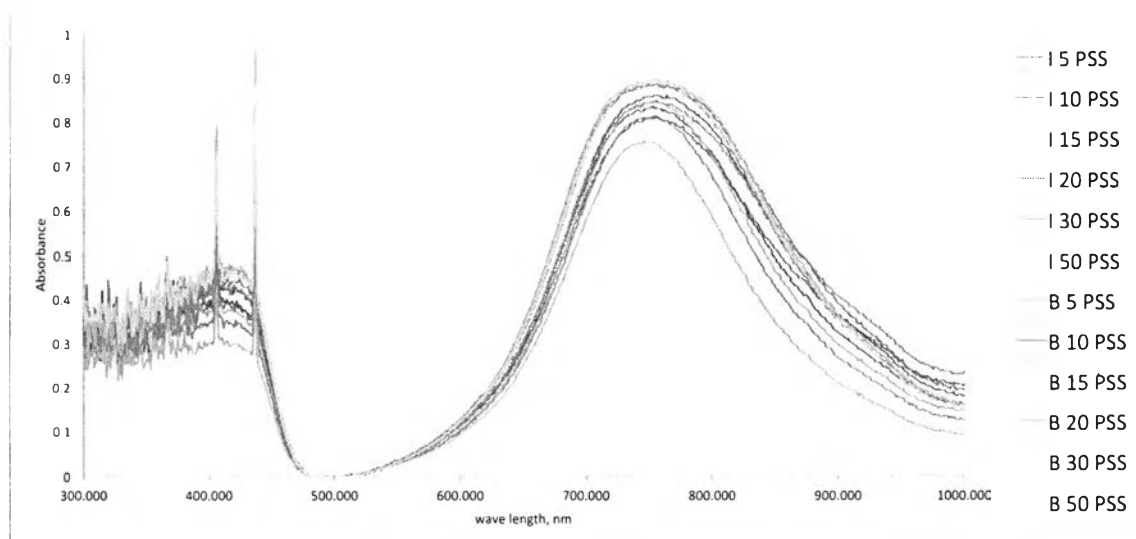


Figure A1 UV spectrum of aqueous phase after interfacial and bulk polymerization at different PSS concentration.

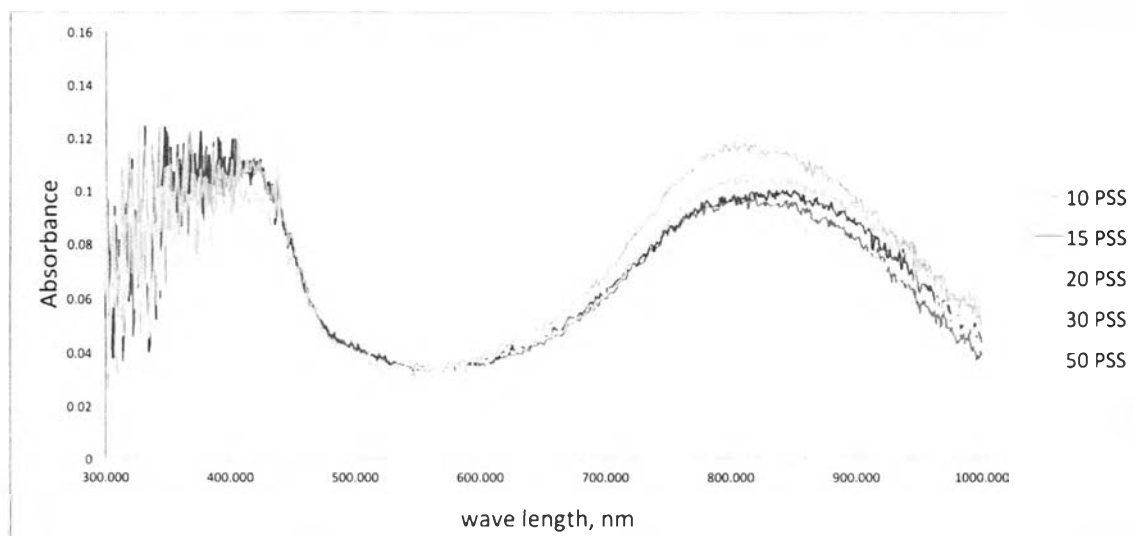


Figure A2 UV spectrum of monolayer of interfacial polymerized PANI-PSS on glass slide.

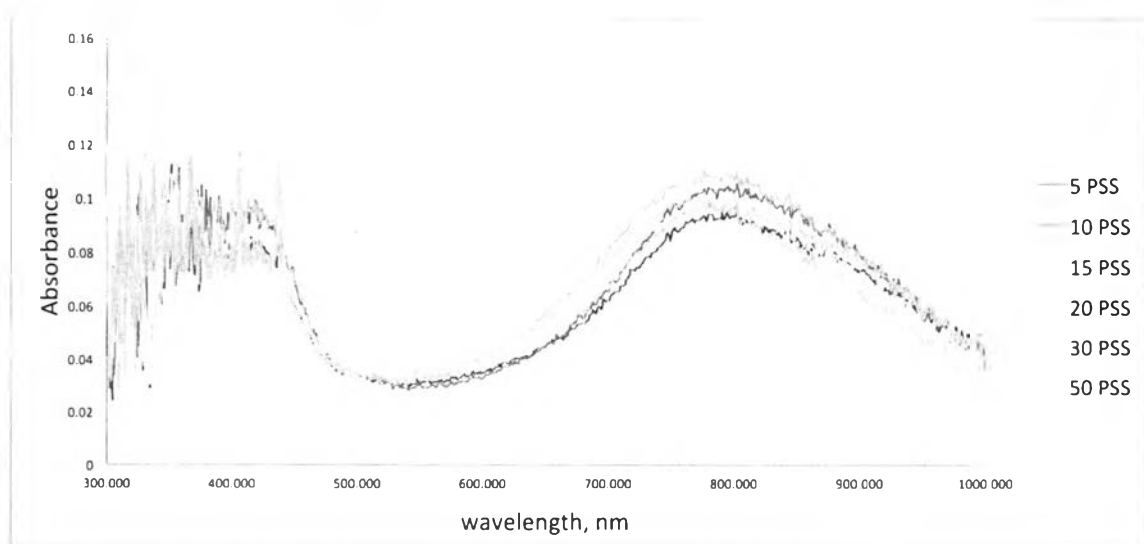


Figure A3 UV spectrum of monolayer of bulk polymerized PANI-PSS on glass slide.

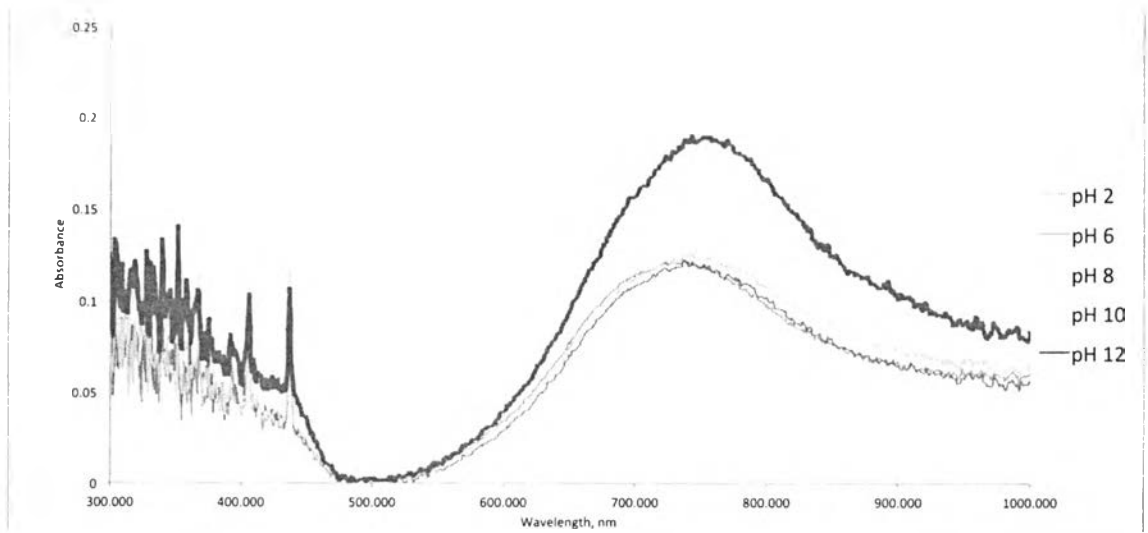


Figure A4 UV spectrum of monolayer of interfacial polymerized PANI-PSS on glass slide.

**Appendix B Supplemental Materials for Optical Properties of PANI-PSS/
PDADMAC and PANI-PSS/PDADMAC/Silver Multilayer Film**

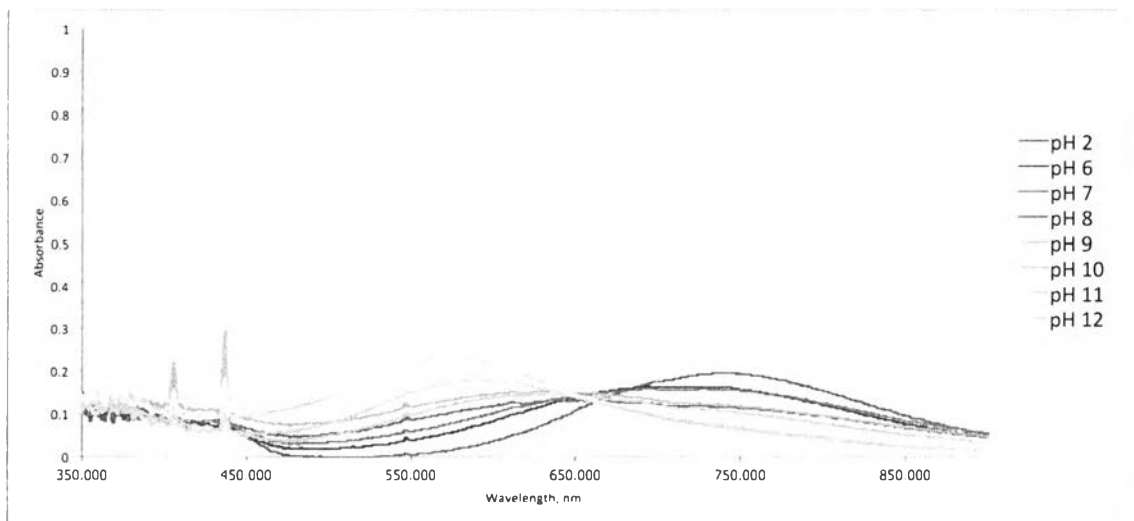


Figure B1 UV spectrum of PANI-PSS/PDADMAC multilayer film after immersed in varied pH buffer solution.

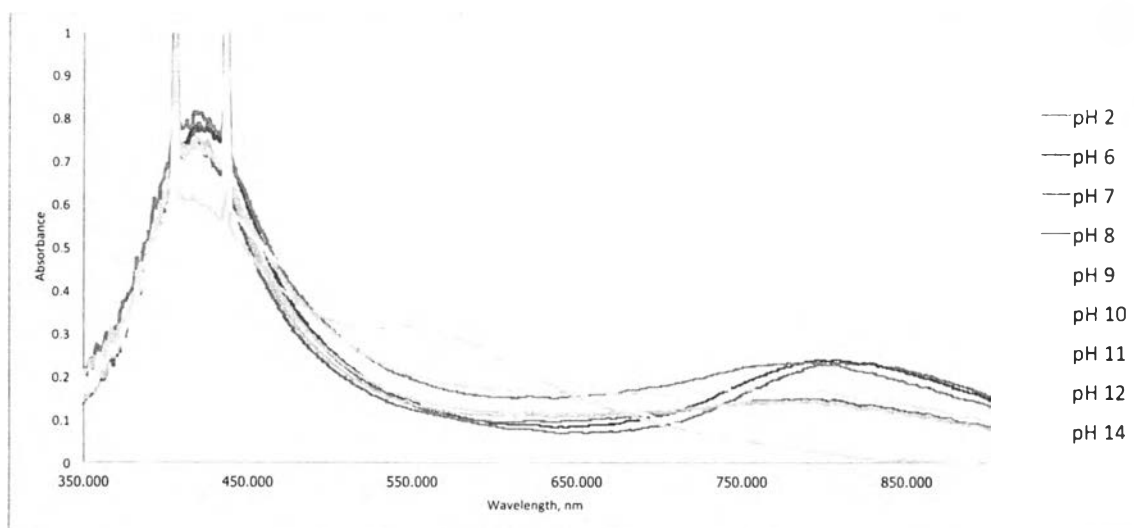


Figure B2 UV spectrum of PANI-PSS/PDADMAC with in situ silver nanoparticle multilayer film after immersed in varied pH buffer solution.

**Appendix C Supplemental Materials for Electro Properties of PANI-PSS/
PDADMAC and PANI-PSS/PDADMAC/Silver Multilayer Film**

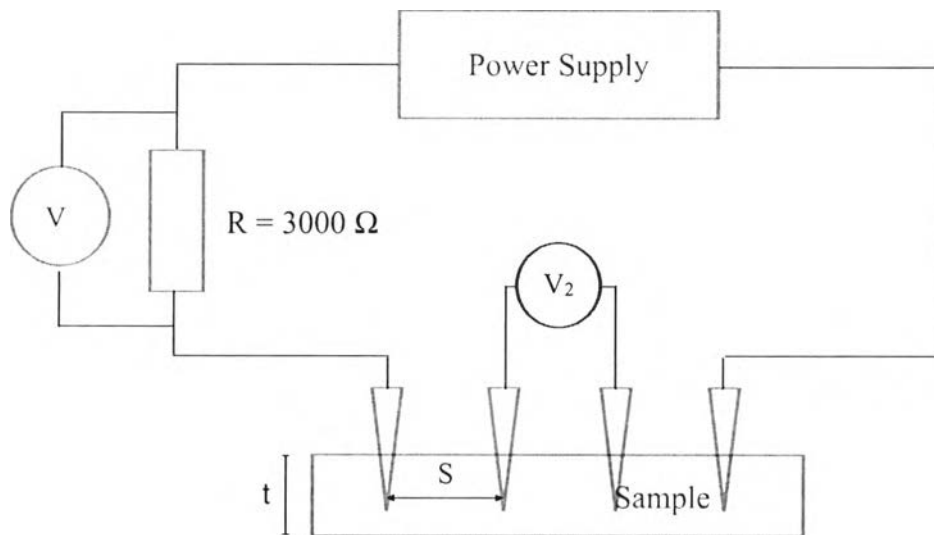


Figure C1 A schematic of a four point probe.

Bulk resistivity for a thin sheet (thickness $t < S/2$) :

$$I = V_1 / R$$

where I = Current in outer probes

V_1 = Voltage across resistor

R = Resistance

$$\rho = (\pi / \ln 2) * t * (V_2 / I)$$

where ρ = Bulk resistivity
 t = Thickness of the film
 V_2 = Voltage across inner probes

Bulk Conductivity:

$$\sigma = 1 / \rho$$

where σ = Bulk conductivity
 ρ = Bulk resistivity

Table C1 Conductivity's raw data of 31 layers PANI-PSS/PDADMAC multilayer film

	R (Ohm)	V1 (V)	I (A)	V2 (V)
sam 1	3000	0.133	4.43333E-05	9.095
	3000	0.1326	0.0000442	9.095
	3000	0.1331	4.43667E-05	8.999
Sam 2	3000	0.2222	7.40667E-05	12.23
	3000	0.2209	7.36333E-05	12.113
	3000	0.2249	7.49667E-05	12.344
Sam 3	3000	0.1085	0.0000362	7.636
	3000	0.1081	0.0000360	7.605
	3000	0.1079	0.0000360	7.564
Sam 4	3000	0.1901	0.0000634	15.267
	3000	0.1857	0.0000619	14.979
	3000	0.1774	0.0000591	14.418

Table C2 Conductivity's raw data of 31 layers PANI-PSS/PDADMAC/silver multilayer film

	R (Ohm)	V1 (V)	I (A)	V2 (V)
sam 1	3000	0.094	3.13333E-05	0.7275
	3000	0.091	3.03333E-05	0.7515
	3000	0.094	3.13333E-05	0.7324
Sam 2	3000	0.189	0.000063	8.513
	3000	0.268	8.93333E-05	9.316
	3000	0.18	0.00006	8.142
Sam 3	3000	0.063	0.0000210	3.166
	3000	0.064	0.0000213	3.23
	3000	1.145	0.0003817	11.397
Sam 4	3000	0.23	0.0000767	15.57
	3000	0.248	0.0000827	17.776
	3000	0.247	0.0000823	17.771

Table C3 Conductivity's raw data of 51 layers PANI-PSS/PDADMAC multilayer film

	R (Ohm)	V1 (V)	I (A)	V2 (V)
	3000	0.2922	0.0000974	8.571
sam 1	3000	0.2891	9.63667E-05	8.484
	3000	0.2849	9.49667E-05	8.399
	3000	0.1565	5.21667E-05	10.274
Sam 2	3000	0.1551	0.0000517	10.273
	3000	0.155	5.16667E-05	10.265
	3000	0.8544	0.0002848	14.099
Sam 3	3000	0.7828	0.0002609	13.087
	3000	0.6956	0.0002319	11.912
	3000	0.078	0.0000260	6.117
Sam 4	3000	0.078	0.0000260	6.098
	3000	0.077	0.0000257	6.103

Table C4 Conductivity's raw data of 51 layers PANI-PSS/PDADMAC/silver multilayer film

	R (Ohm)	V1 (V)	I (A)	V2 (V)
	3000	0.5	0.000166667	7.272
sam 1	3000	0.44	0.000146667	6.518
	3000	0.46	0.000153333	6.729
	3000	0.599	0.000199667	11.819
Sam 2	3000	0.522	0.000174	9.876
	3000	0.451	0.000150333	9.001
	3000	0.952	0.0003173	6.24
Sam 3	3000	0.851	0.0002837	5.59
	3000	0.872	0.0002907	5.684
	3000	2.68	0.0008933	7.769
Sam 4	3000	2.148	0.0007160	6.181
	3000	2.21	0.0007367	6.441

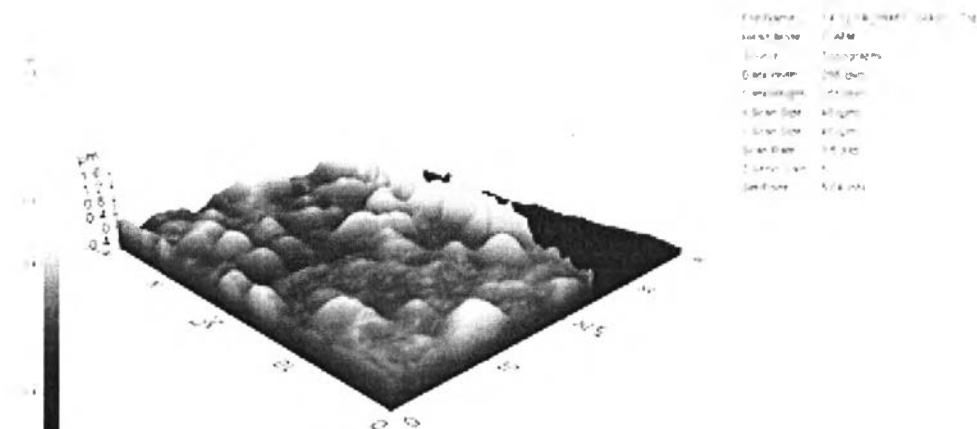


Figure C2 Atomic force microscope topographical scan of 31 layers PANI-PSS/PDADMAC multilayer film.

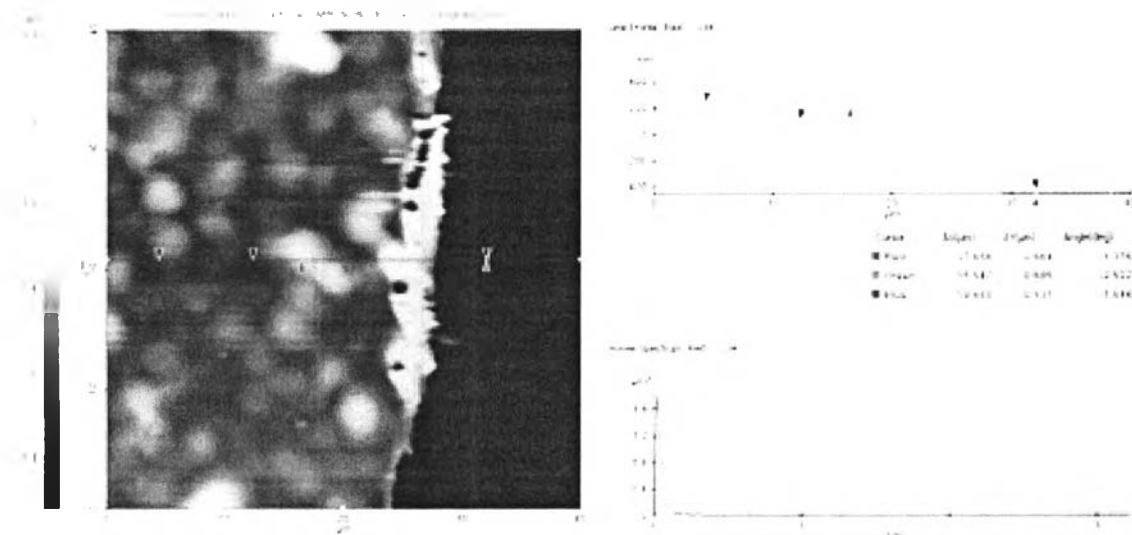


Figure C3 Thickness of PANI-PSS/PDADMAC 31 layers PANI-PSS/PDADMAC multilayer film.

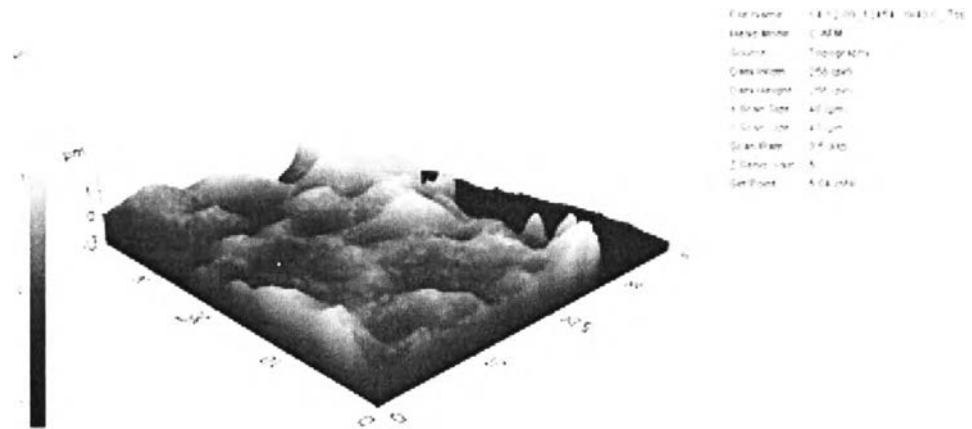


Figure C4 Atomic force microscope topographical scan of 51 layers PANI-PSS/PDADMAC multilayer film.

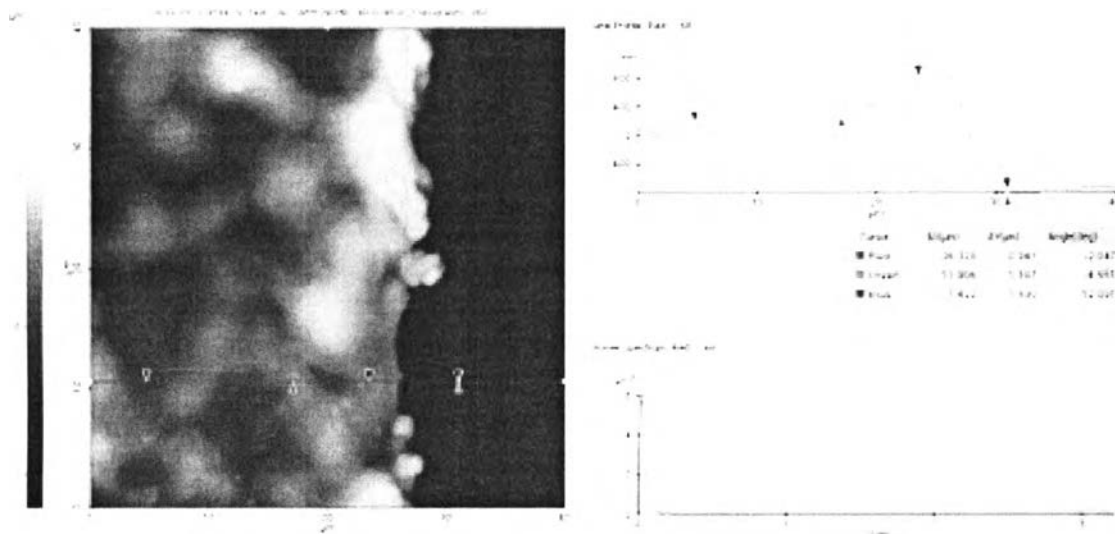


Figure C5 Thickness of PANI-PSS/PDADMAC 51 layers PANI-PSS/PDADMAC multilayer film.

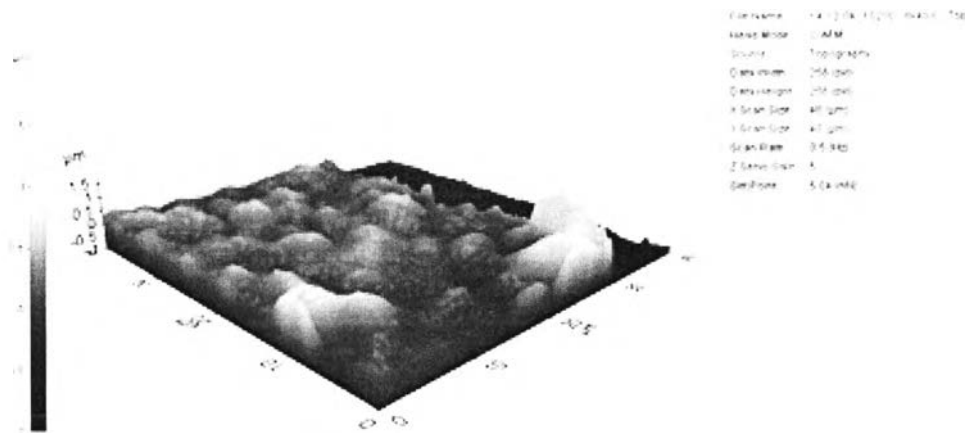


Figure C6 Atomic force microscope topographical scan of 31 layers PANI-PSS/PDADMAC/silver multilayer film.

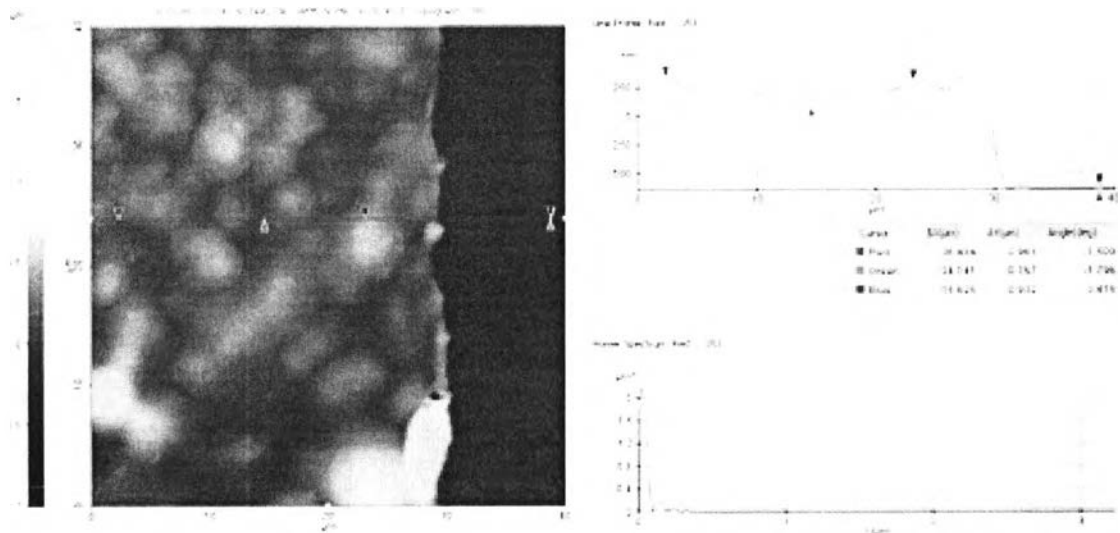


Figure C7 Thickness of PANI-PSS/PDADMAC 31 layers PANI-PSS/PDADMAC/silver multilayer film.

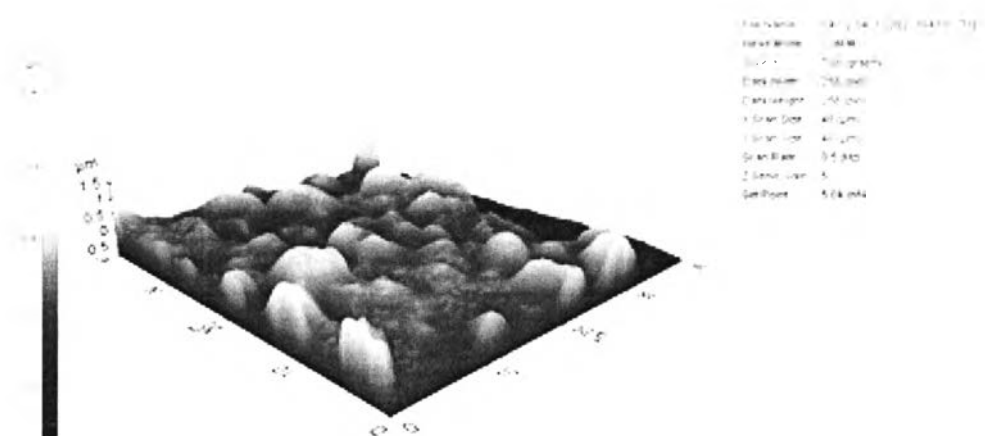


Figure C8 Atomic force microscope topographical scan of 51 layers PANI-PSS/PDADMAC/silver multilayer film.

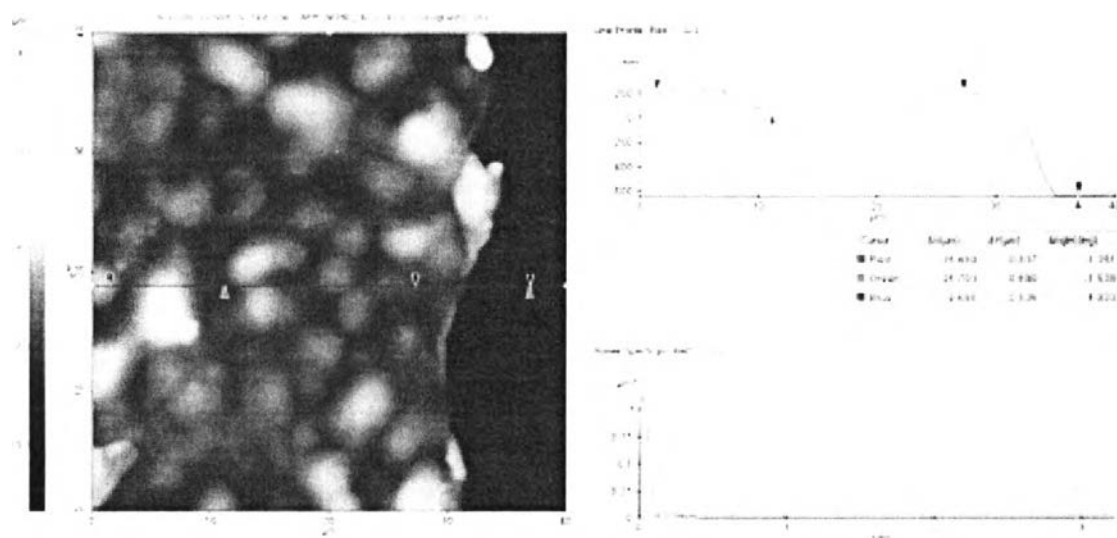


Figure C9 Thickness of PANI-PSS/PDADMAC 31 layers PANI-PSS/PDADMAC/silver multilayer film.

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1. Tongtun, P.; and Dubas, S.T. (2015, April 21) Electrical Conducting Property and Metallization of PANI/Ag Composite Multilayers Thin Film. Proceedings of The 6th Research Symposium on Petrochemical and Materials Technology and The 21th PPC Symposium on Petroleum, Petrochemicals and Polymers. Bangkok, Thailand.

Presentations:

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