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APPENDICIES

Appendix A Effect of APS Concentration on PANI Polymerization

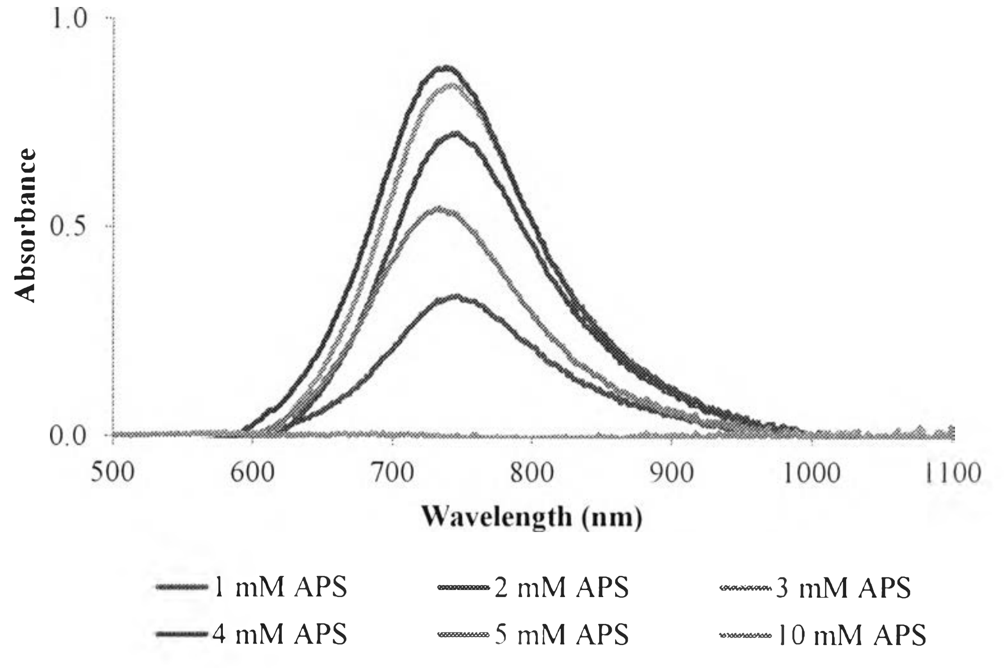


Figure A1 UV-vis spectrum of PANI-PSS at various APS concentrations.

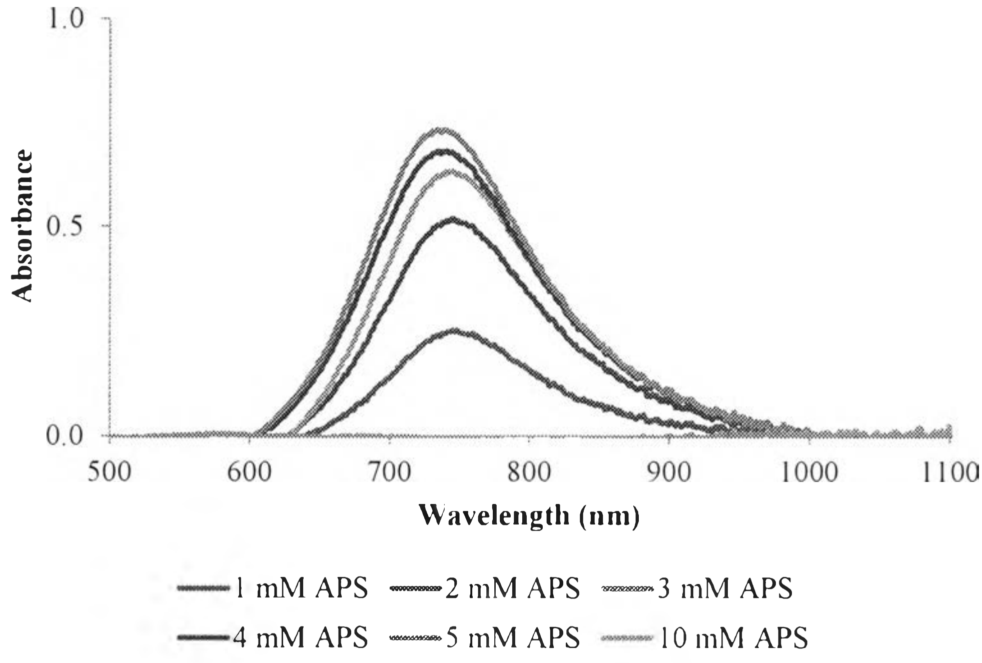


Figure A2 UV-vis spectrum of PANI-CoPSS 3:1 at various APS concentrations.

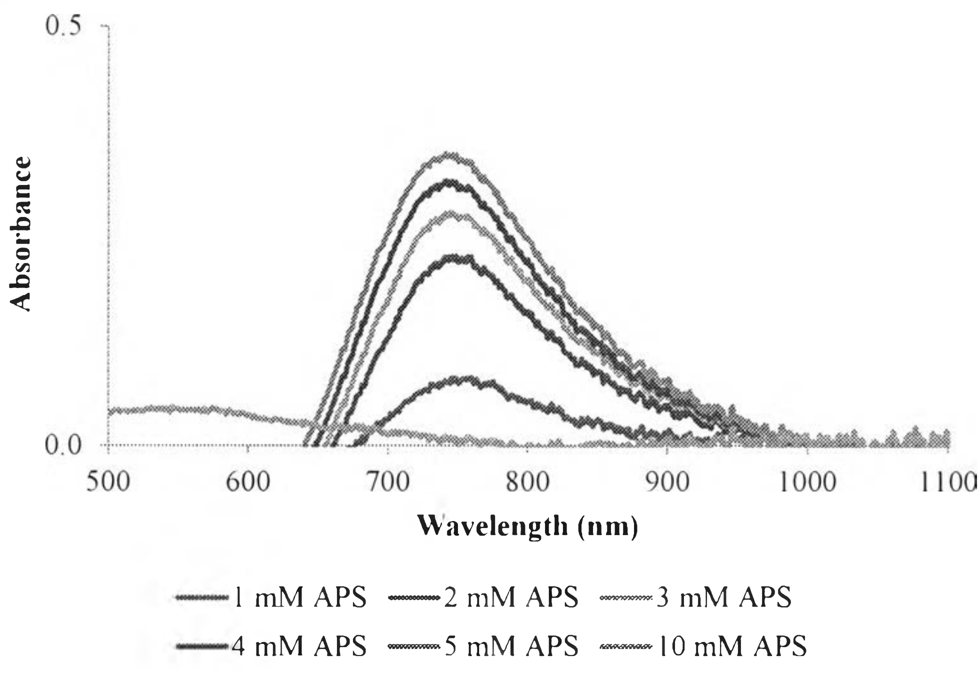


Figure A3 UV-vis spectrum of PANI-CoPSS 3:1 at various APS concentrations.

Appendix B Effect of Capping Agent Concentration on PANI Polymerization

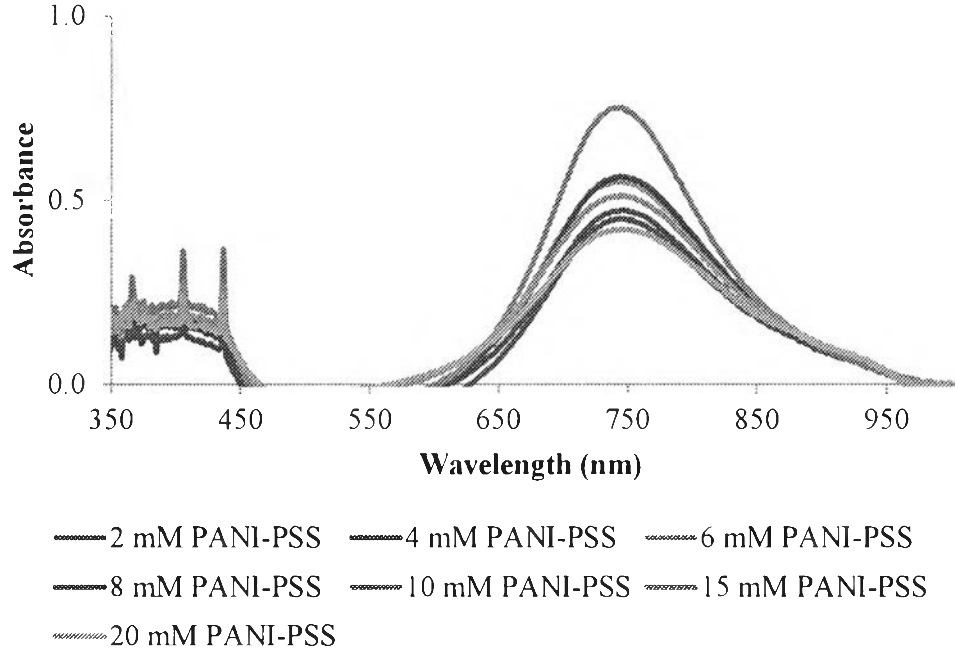


Figure B1 UV-vis spectrum of PANI with various PSS concentrations.

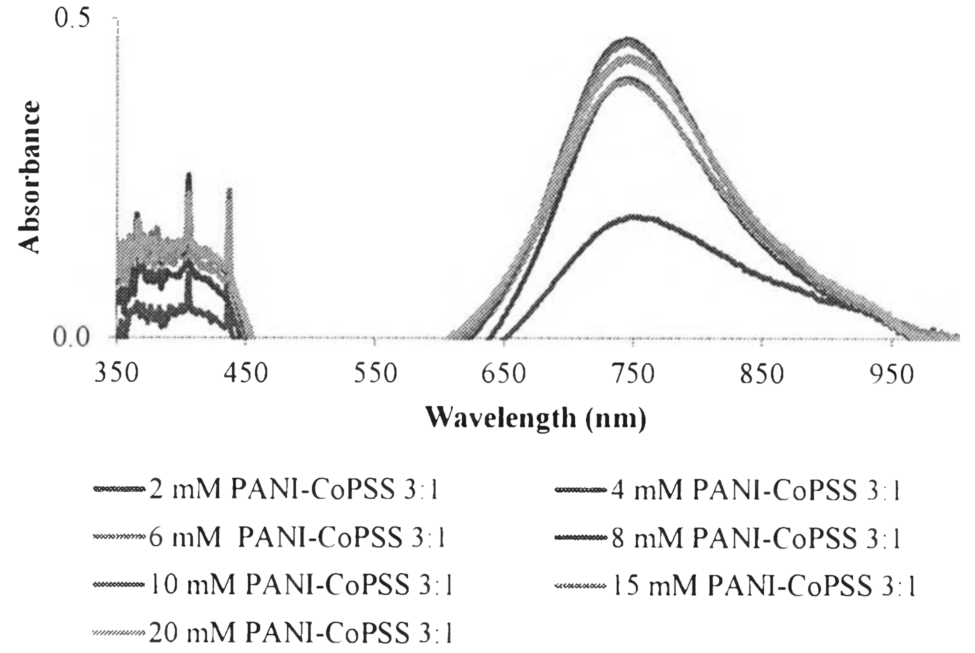


Figure B2 UV-vis spectrum of PANI with various CoPSS 3:1 concentrations.

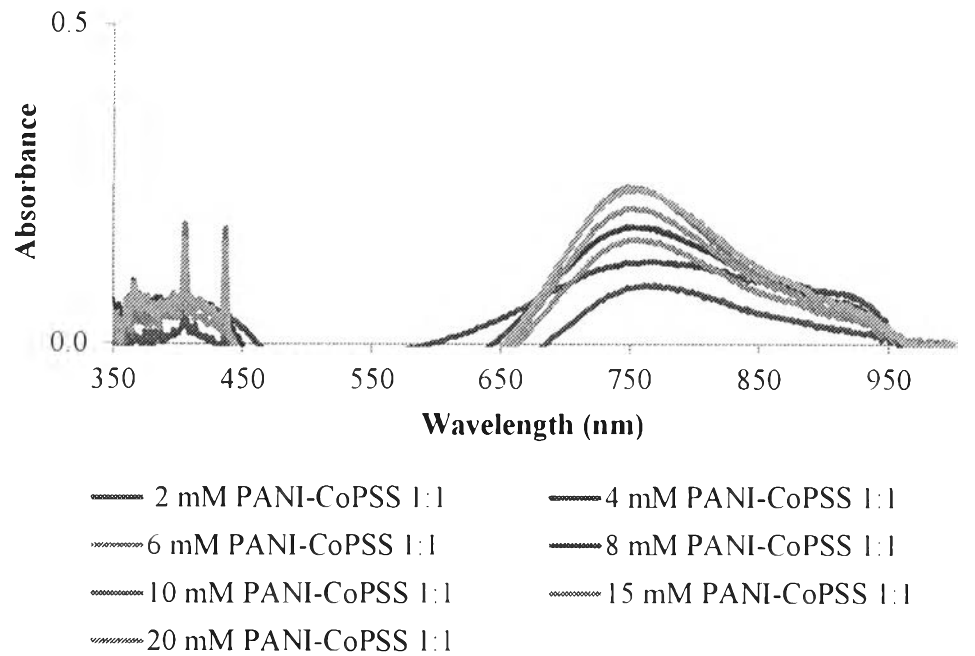


Figure B3 UV-vis spectrum of PANI with various CoPSS 1:1 concentrations.

Appendix C Effect of pH on PANI Color

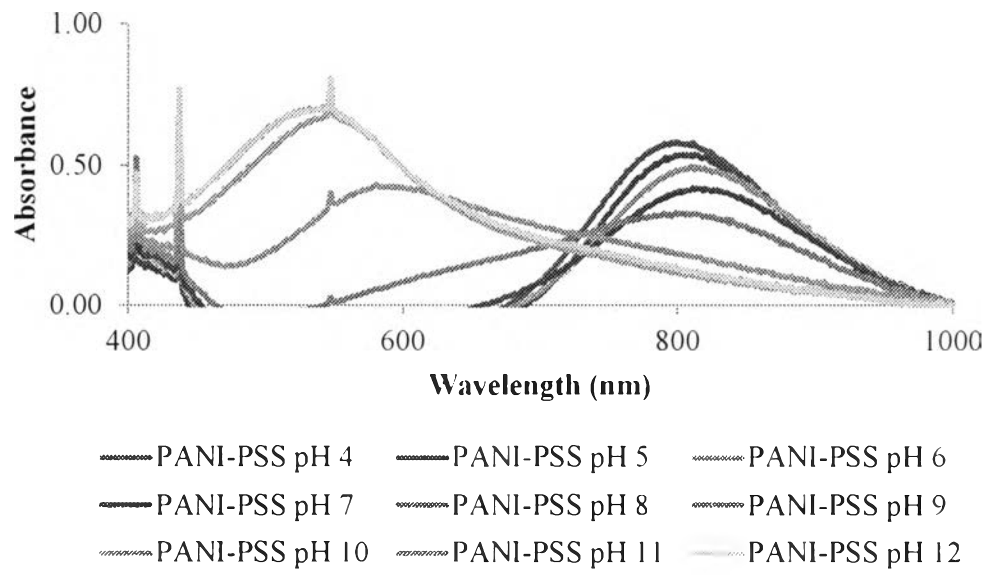


Figure C1 UV-vis spectrum of PANI-PSS with various pH.

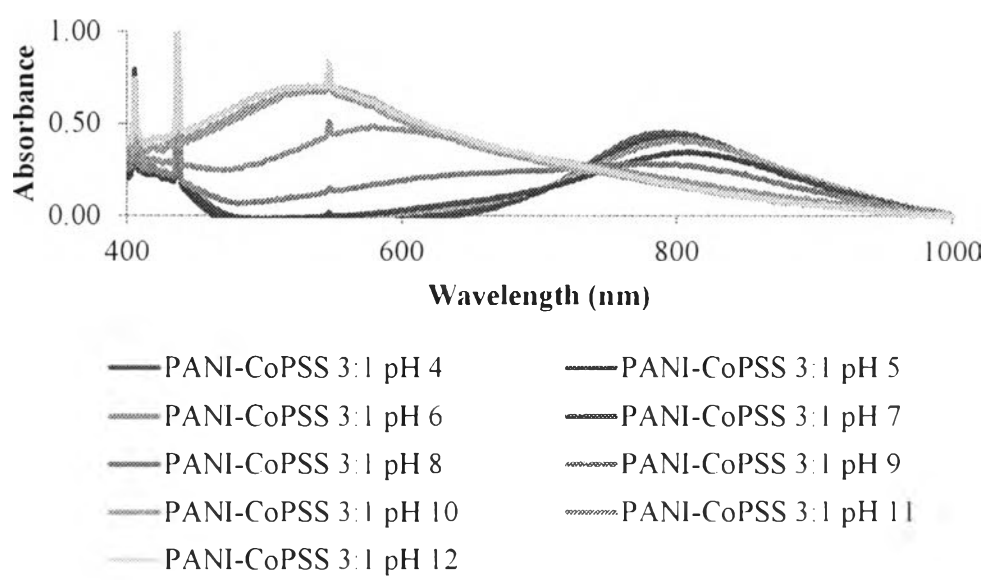


Figure C2 UV-vis spectrum of PANI-CoPSS 3:1 with various pH.

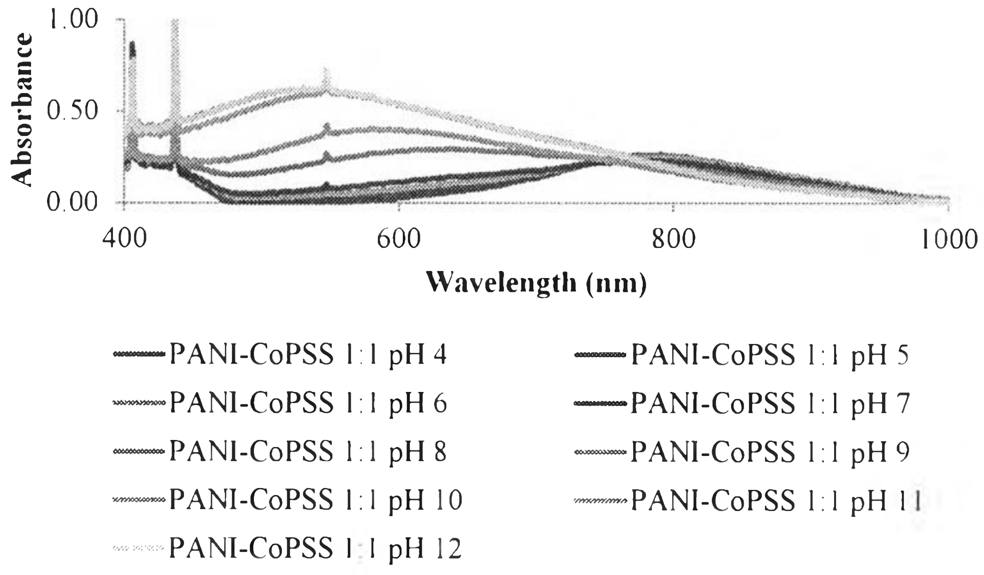


Figure C3 UV-vis spectrum of PANI-CoPSS 1:1 with various pH.

Appendix D Effect of pH, Salt and Dipping Time on PANI monolayer

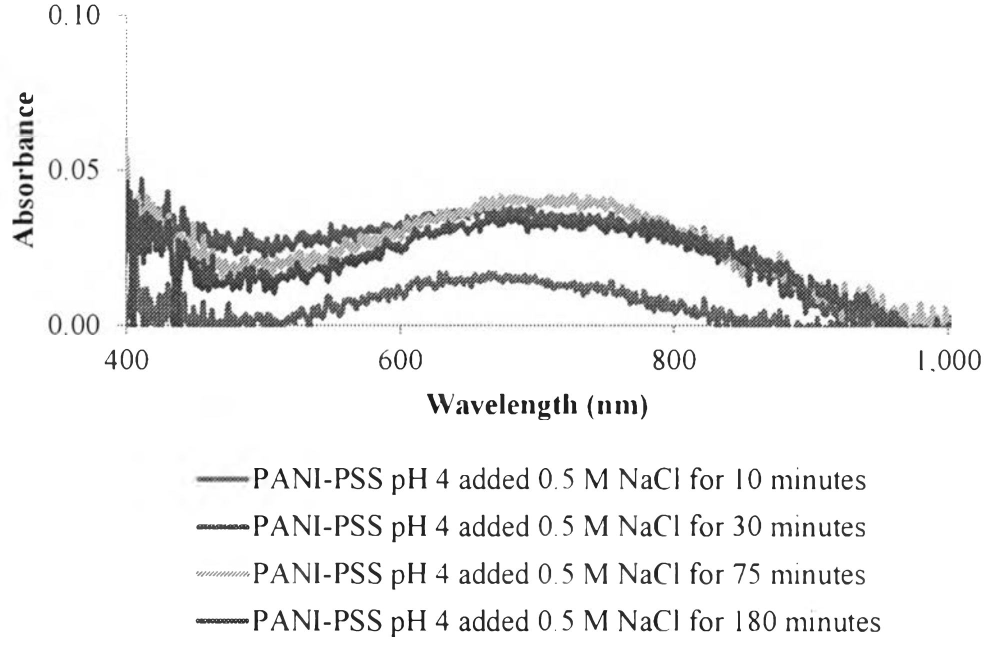


Figure D1 UV-vis spectrum of PANI-PSS monolayer at pH 4 and 0.5 M NaCl.

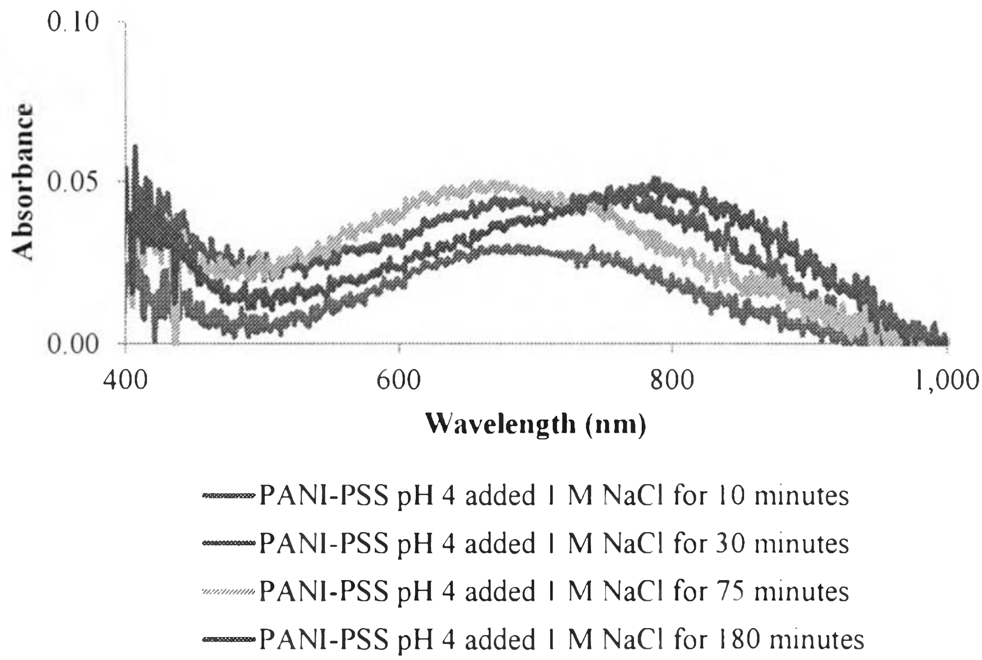


Figure D2 UV-vis spectrum of PANI-PSS monolayer at pH 4 and 1 M NaCl.

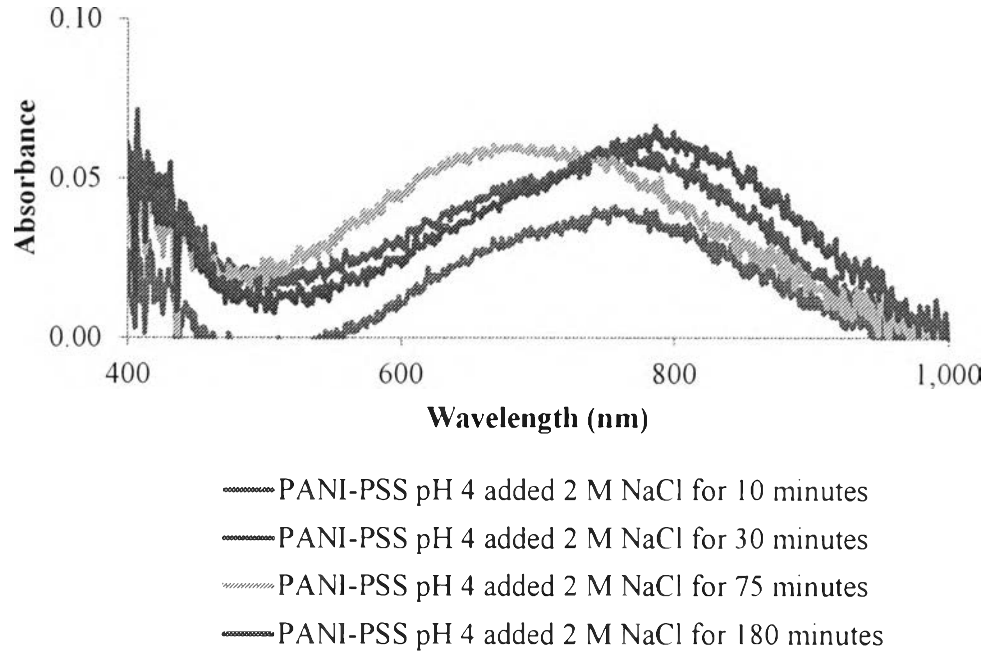


Figure D3 UV-vis spectrum of PANI-PSS monolayer at pH 4 and 2 M NaCl.

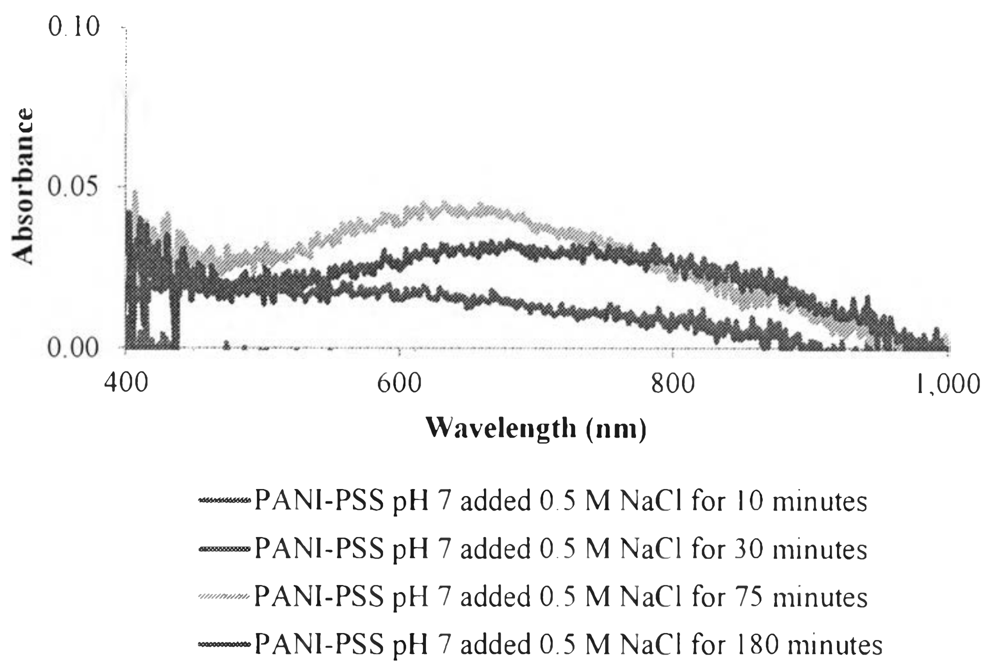
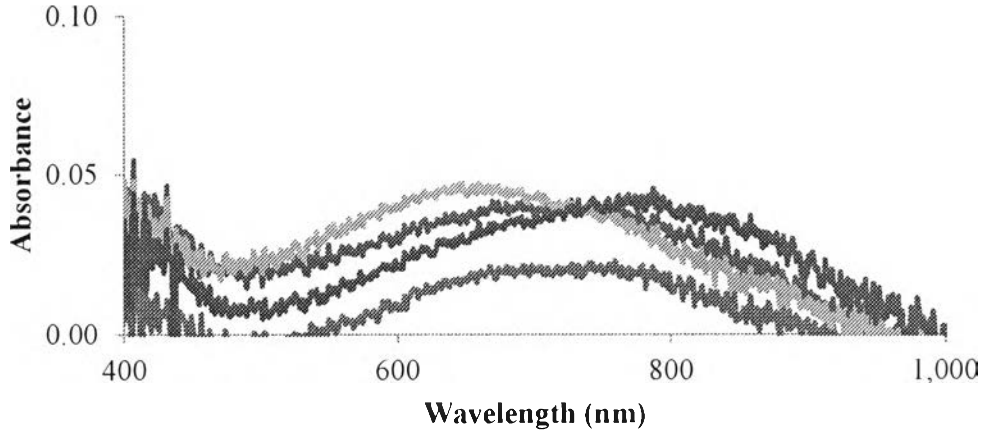
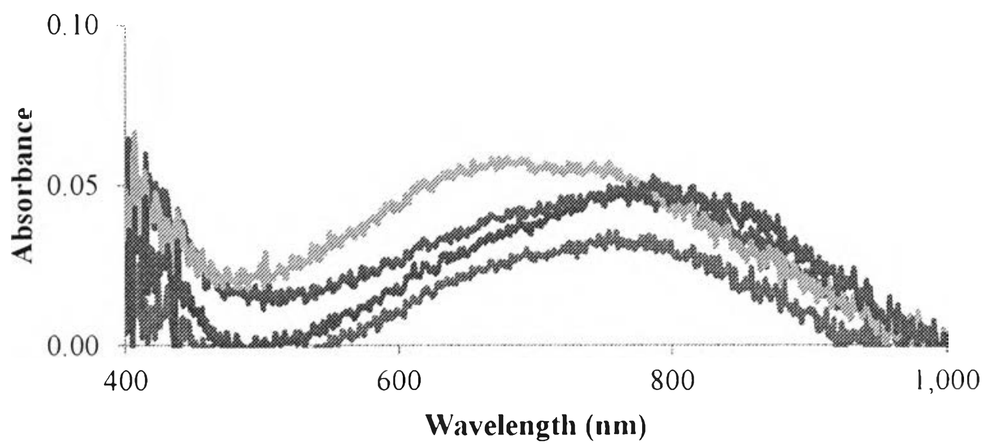


Figure D4 UV-vis spectrum of PANI-PSS monolayer at pH 7 and 0.5 M NaCl.



PANI-PSS pH 7 added 1 M NaCl for 10 minutes
PANI-PSS pH 7 added 1 M NaCl for 30 minutes
PANI-PSS pH 7 added 1 M NaCl for 75 minutes
PANI-PSS pH 7 added 1 M NaCl for 180 minutes

Figure D5 UV-vis spectrum of PANI-PSS monolayer at pH 7 and 1 M NaCl.



PANI-PSS pH 7 added 2 M NaCl for 10 minutes
PANI-PSS pH 7 added 2 M NaCl for 30 minutes
PANI-PSS pH 7 added 2 M NaCl for 75 minutes
PANI-PSS pH 7 added 2 M NaCl for 180 minutes

Figure D6 UV-vis spectrum of PANI-PSS monolayer at pH 7 and 2 M NaCl.

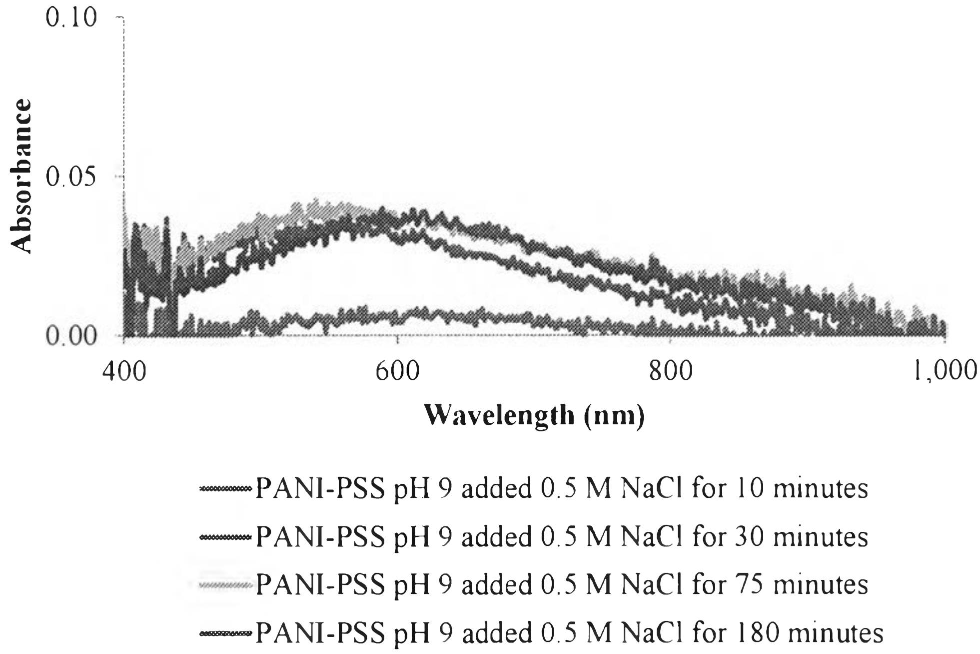


Figure D7 UV-vis spectrum of PANI-PSS monolayer at pH 9 and 0.5 M NaCl.

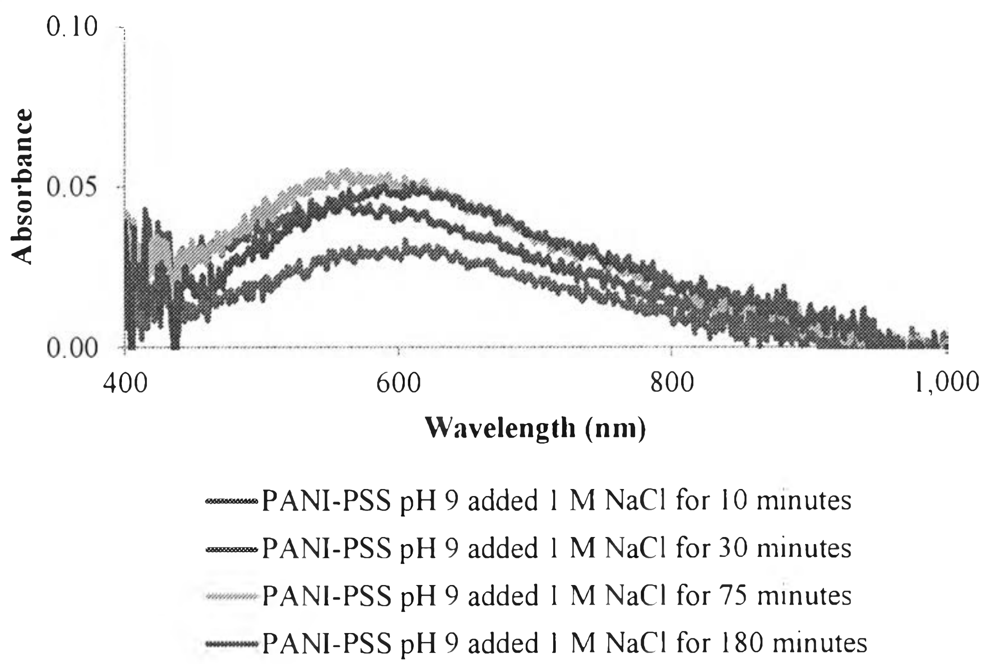


Figure D8 UV-vis spectrum of PANI-PSS monolayer at pH 9 and 1 M NaCl.

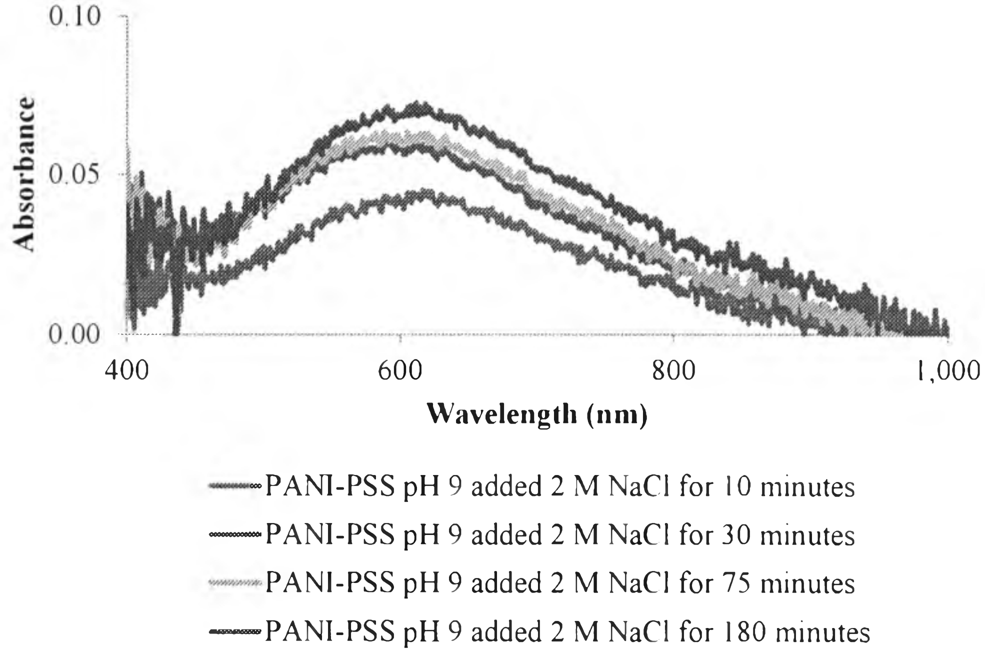


Figure D9 UV-vis spectrum of PANI-PSS monolayer at pH 9 and 2 M NaCl.

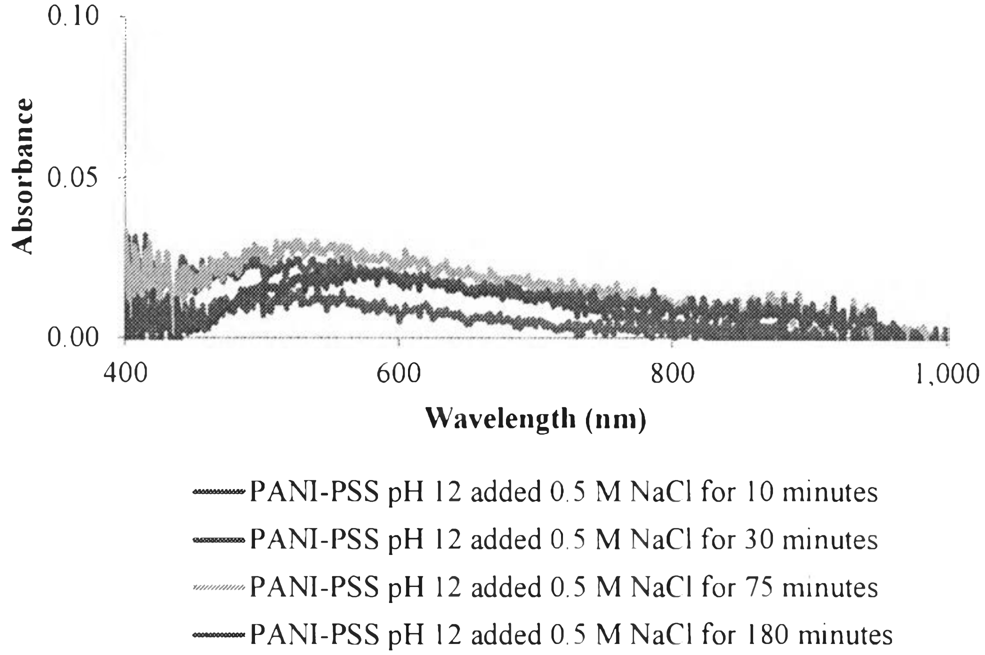


Figure D10 UV-vis spectrum of PANI-PSS monolayer at pH 12 and 0.5 M NaCl.

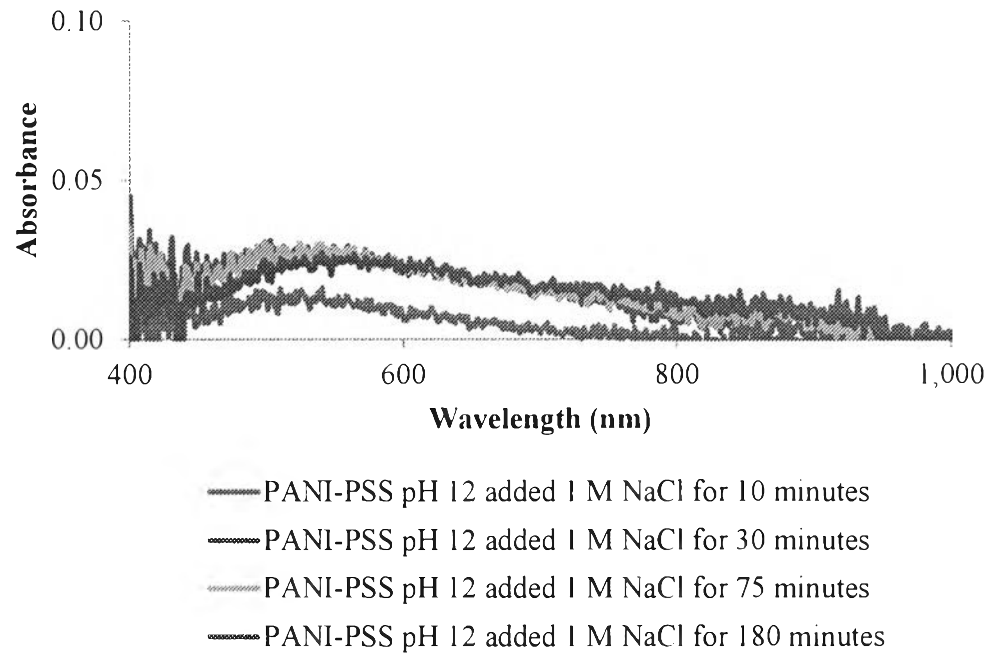


Figure D11 UV-vis spectrum of PANI-PSS monolayer at pH 12 and 1 M NaCl.

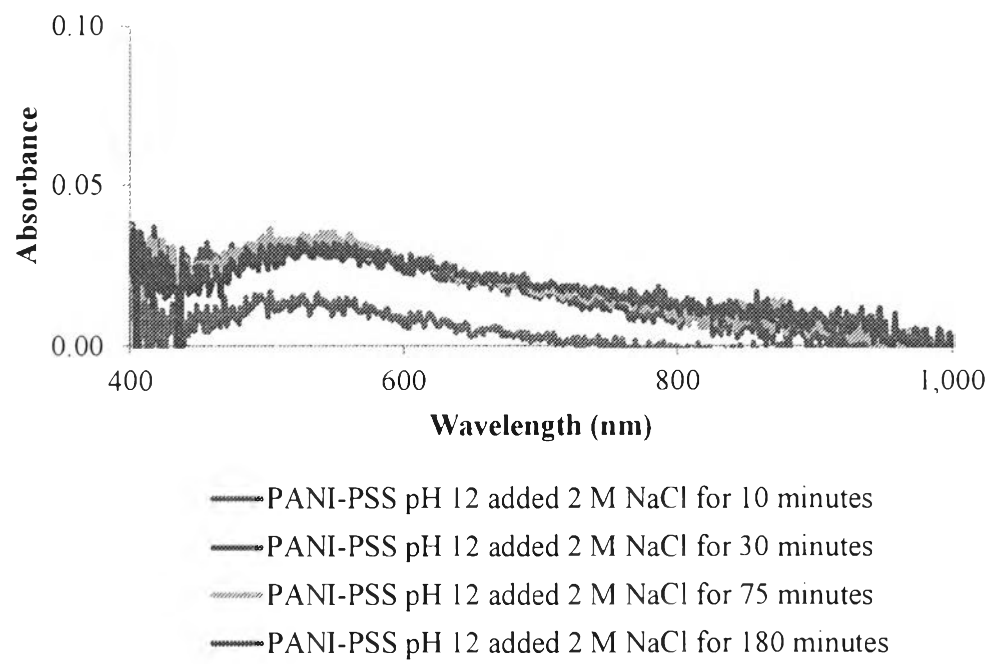


Figure D12 UV-vis spectrum of PANI-PSS monolayer at pH 12 and 2 M NaCl.

Appendix E Effect of pH and Number of Layer on PANI Multilayer

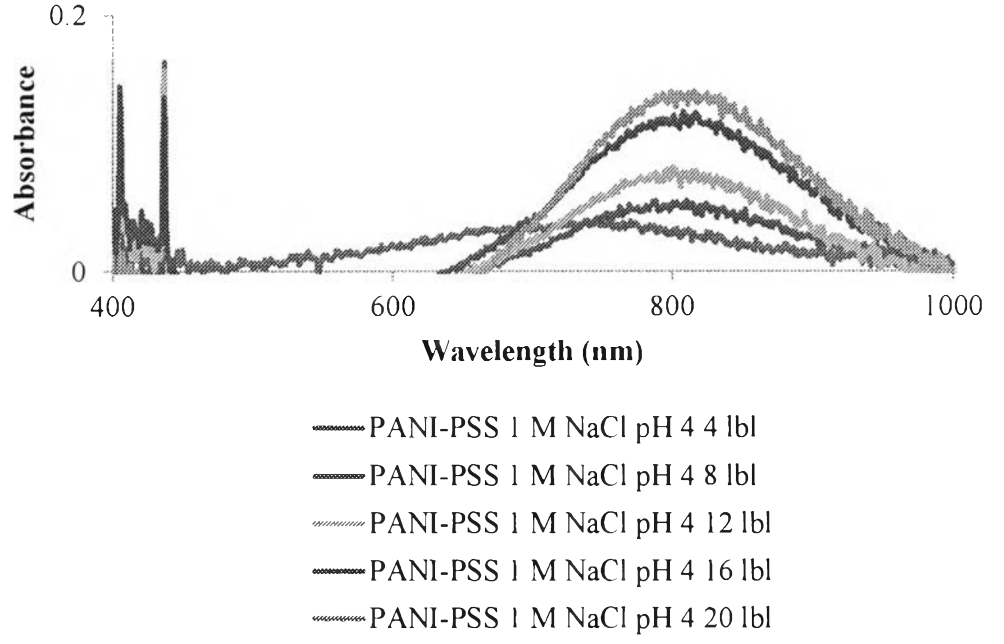


Figure E1 UV-vis spectrum of PANI-PSS multilayer at pH 4 and 1 M NaCl.

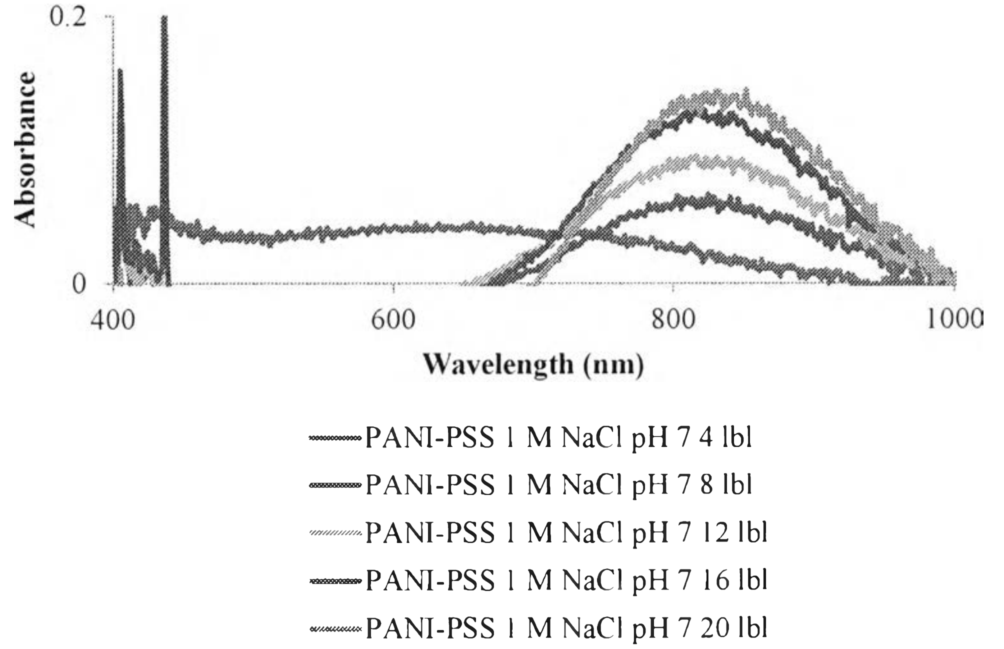


Figure E2 UV-vis spectrum of PANI-PSS multilayer at pH 7 and 1 M NaCl.

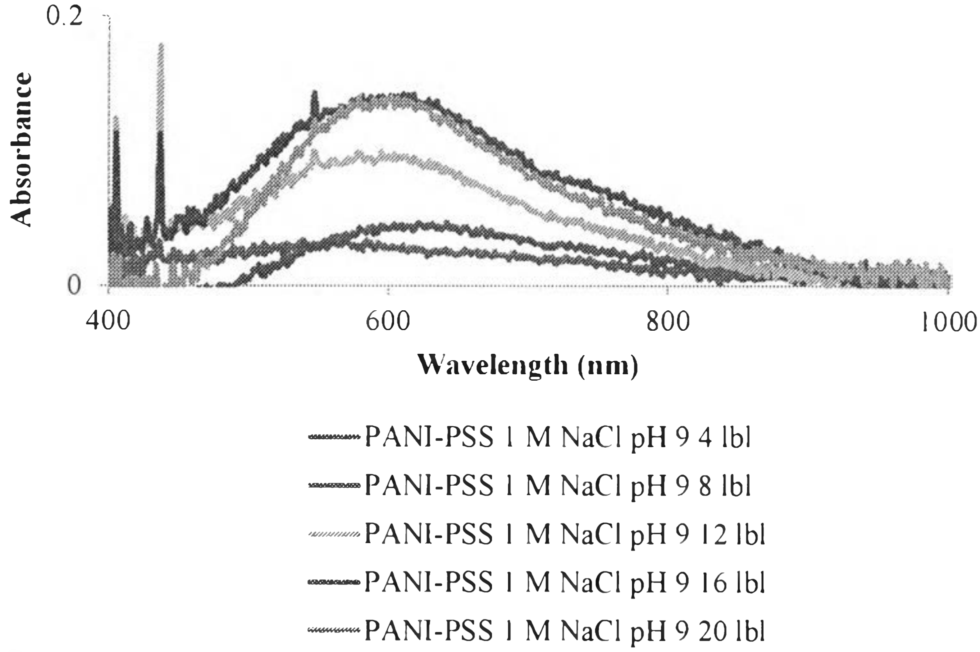


Figure E3 UV-vis spectrum of PANI-PSS multilayer at pH 9 and 1 M NaCl.

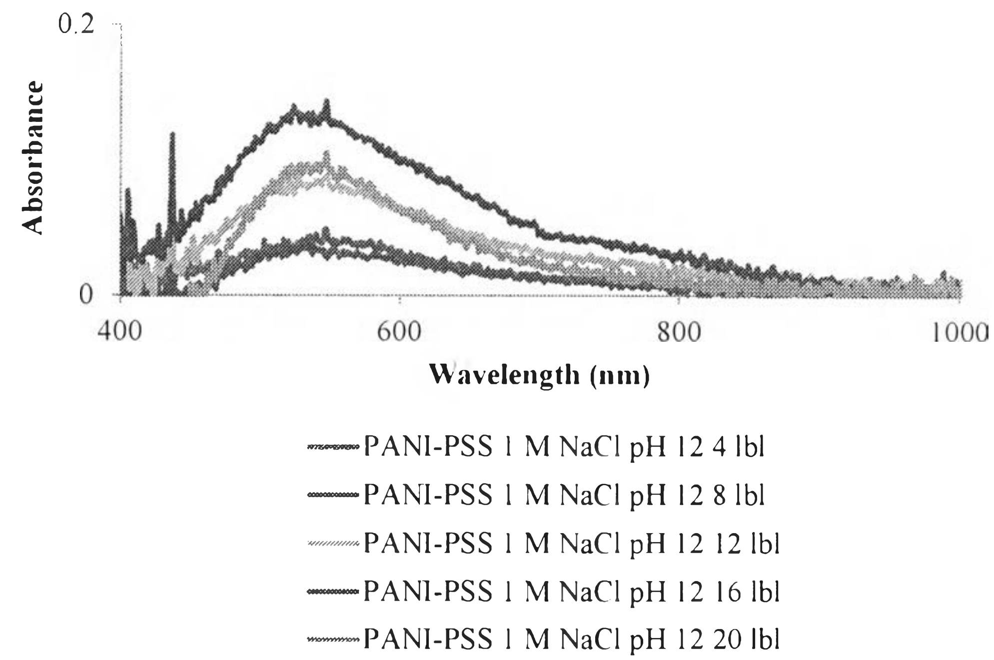


Figure E4 UV-vis spectrum of PANI-PSS multilayer at pH 12 and 1 M NaCl.

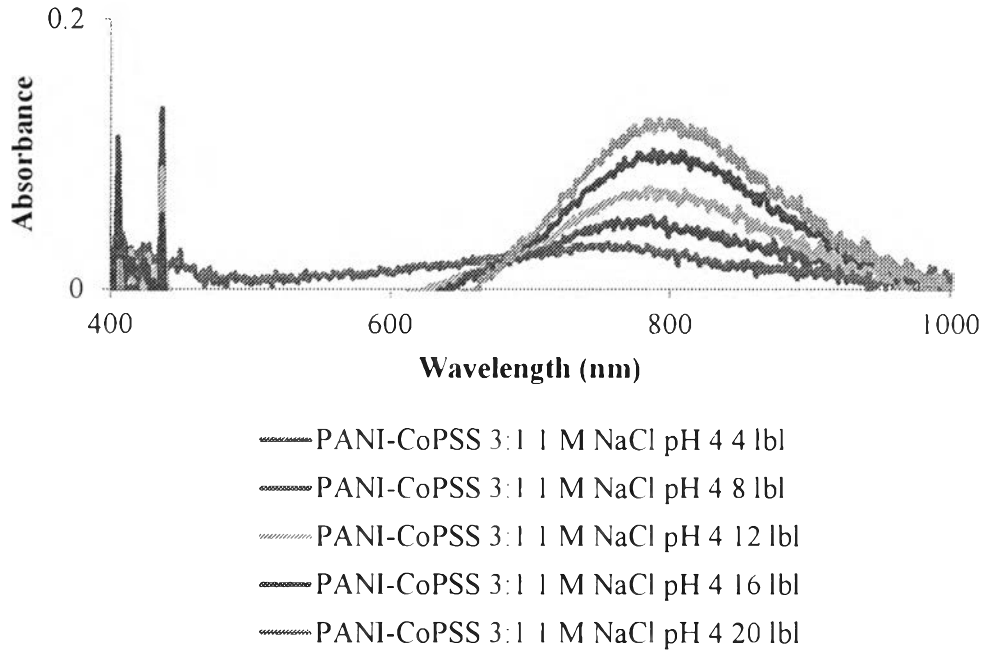


Figure E5 UV-vis spectrum of PANI-CoPSS 3:1 multilayer at pH 4 and 1 M NaCl.

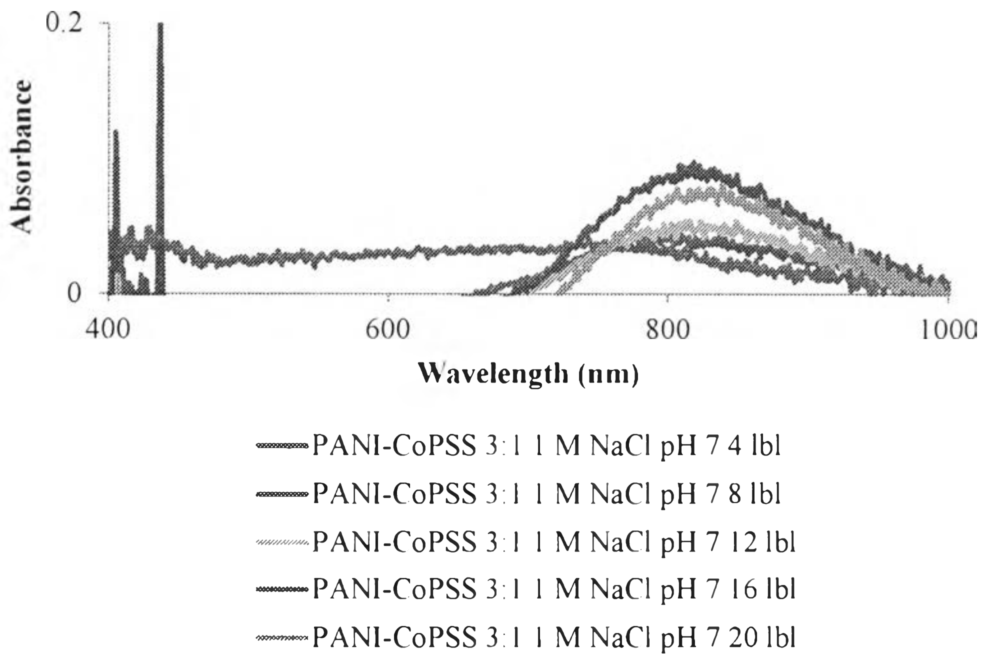


Figure E6 UV-vis spectrum of PANI-CoPSS 3:1 multilayer at pH 7 and 1 M NaCl.

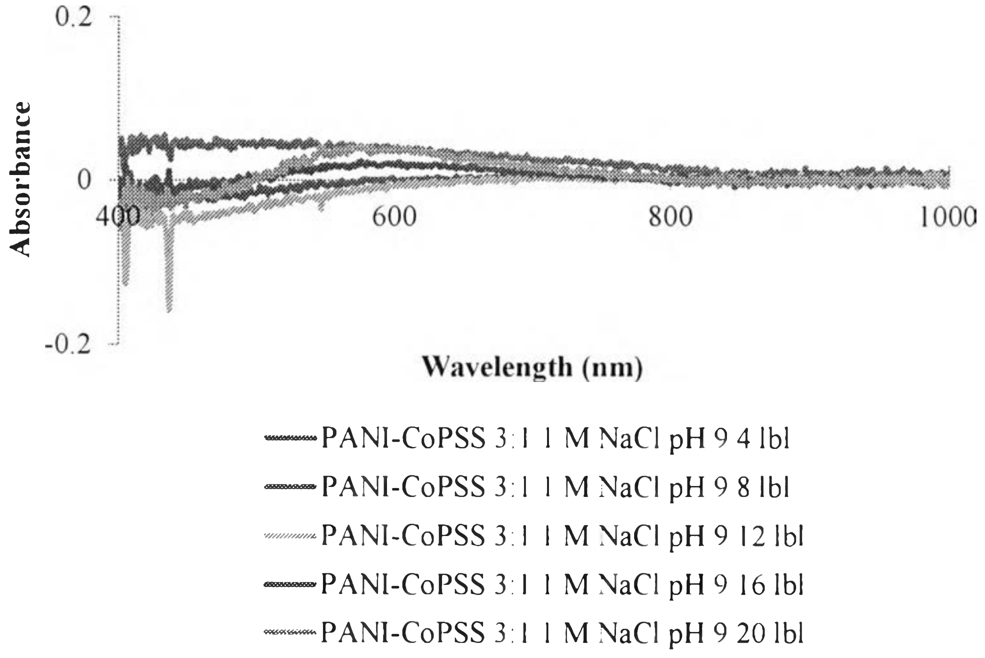


Figure E7 UV-vis spectrum of PANI-CoPSS 3:1 multilayer at pH 9 and 1 M NaCl.

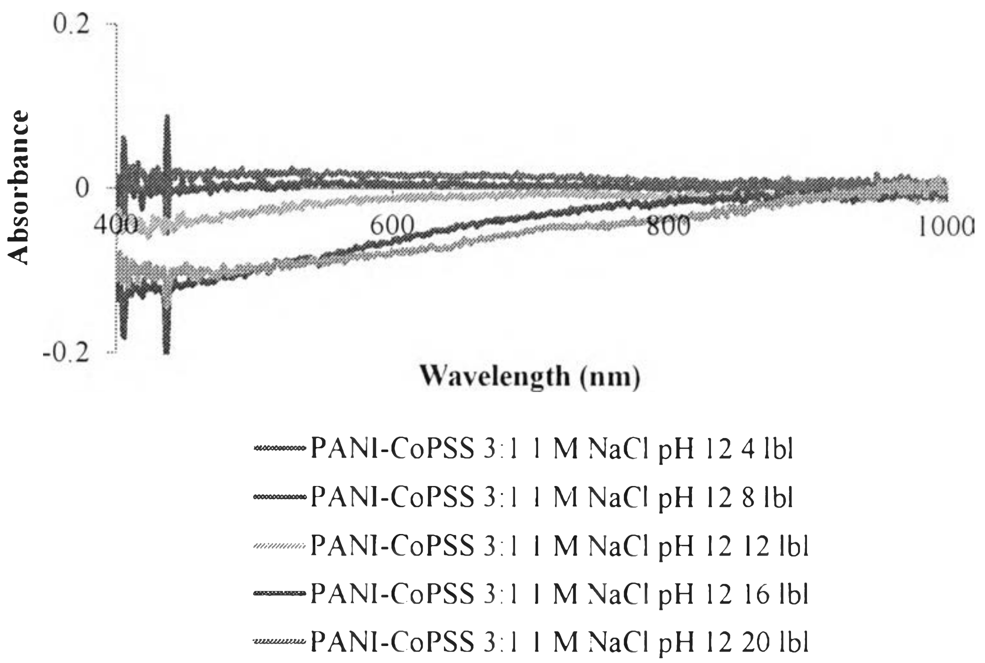


Figure E8 UV-vis spectrum of PANI-CoPSS 3:1 multilayer at pH 12 and 1 M NaCl.

Appendix F Effect of Capping Agent on Silver Nanoparticles Synthesis

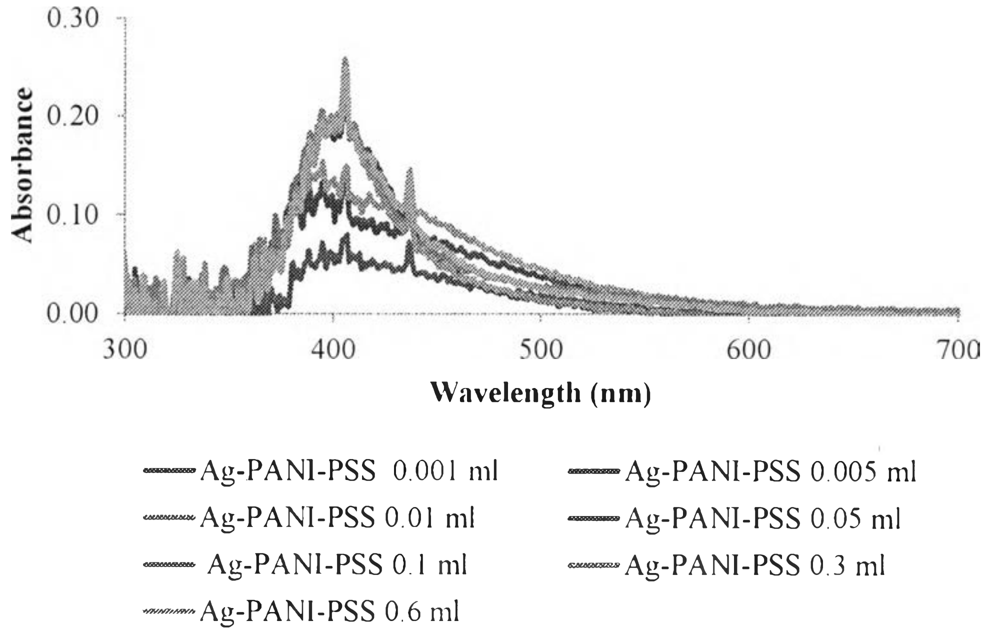


Figure F1 UV-vis spectrum of Ag with various PANI-PSS dilutions.

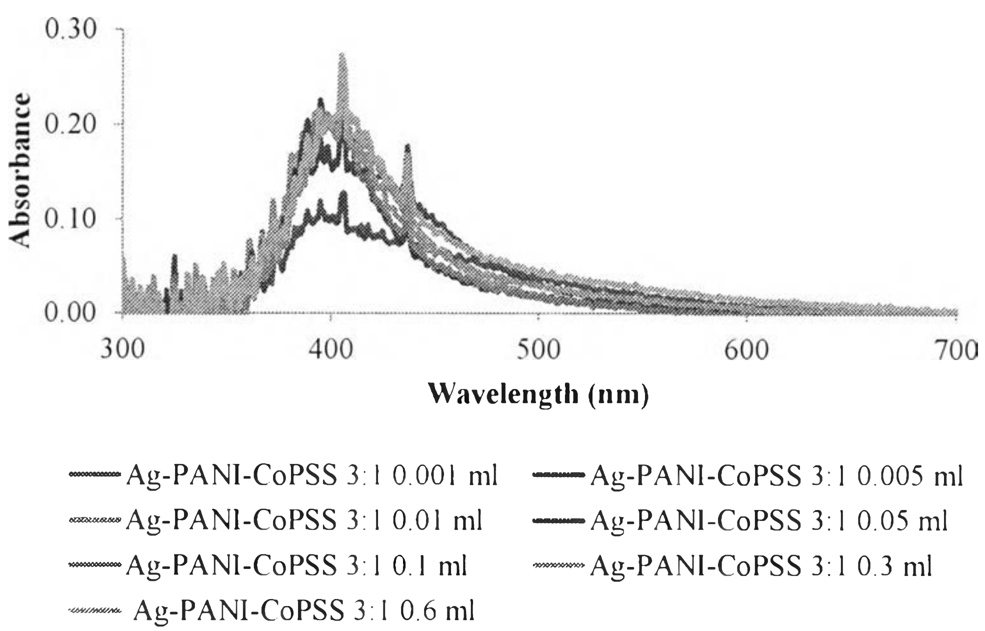


Figure F2 UV-vis spectrum of Ag with various PANI-CoPSS 3:1 dilutions.

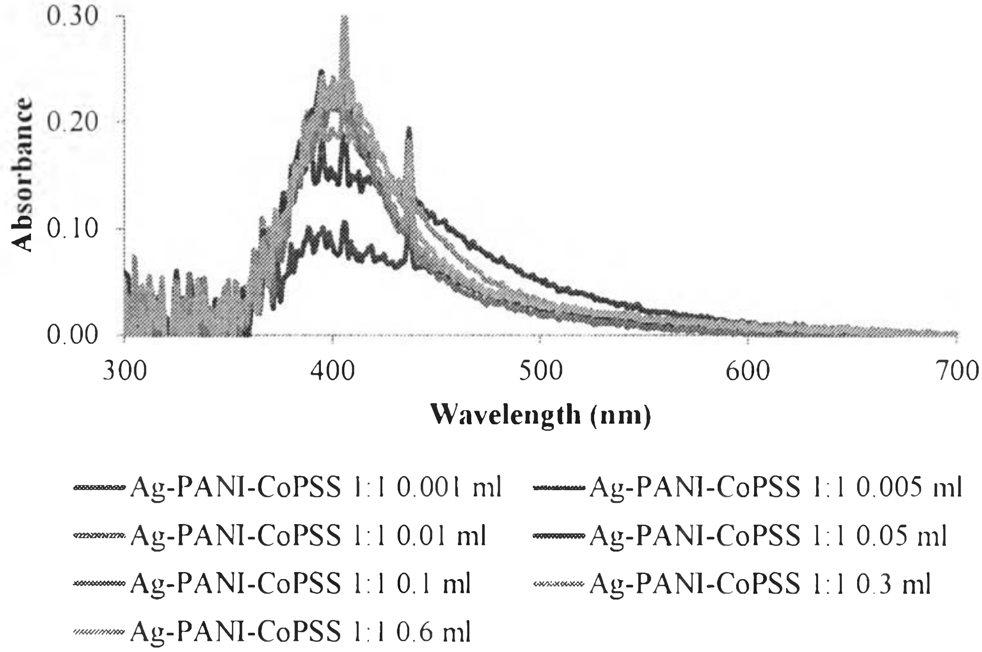


Figure F3 UV-vis spectrum of Ag with various PANI-CoPSS 1:1 dilutions.

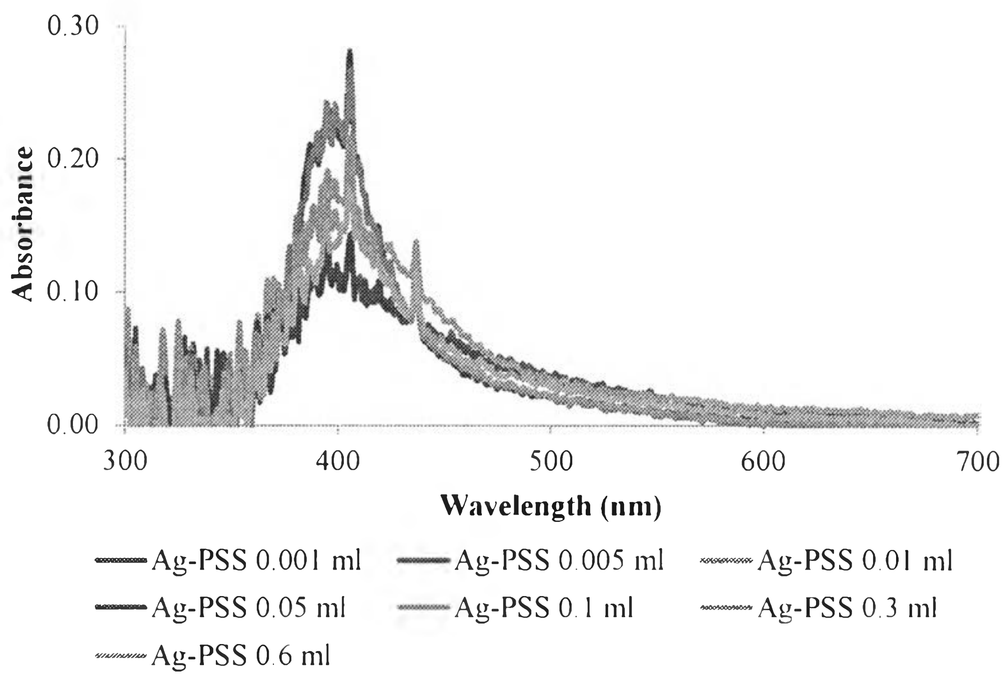


Figure F4 UV-vis spectrum of Ag with various PSS dilutions.

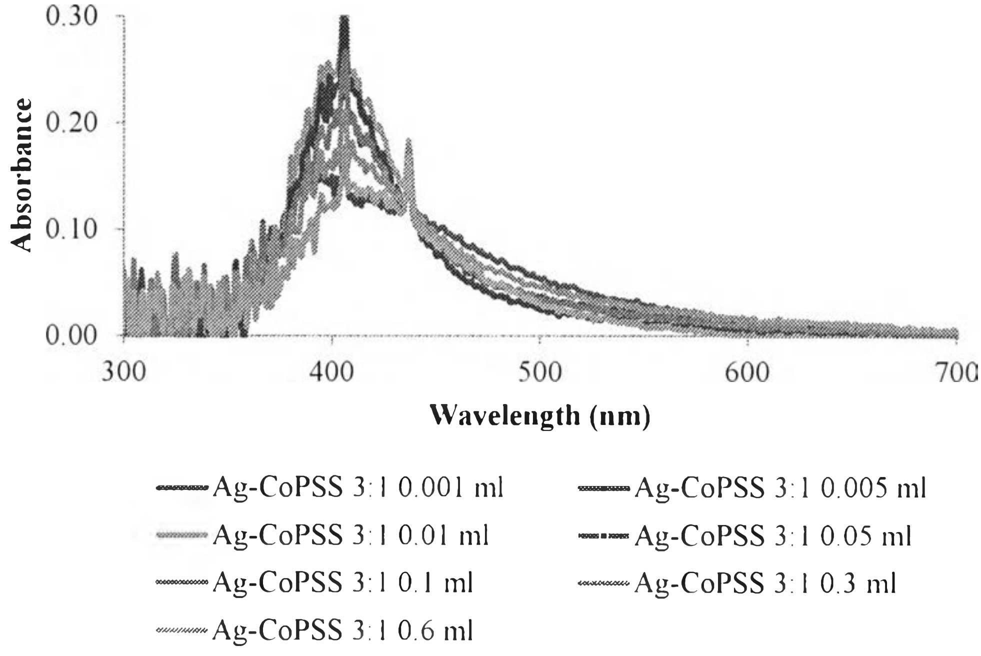


Figure F5 UV-vis spectrum of Ag with various CoPSS 3:1 dilutions.

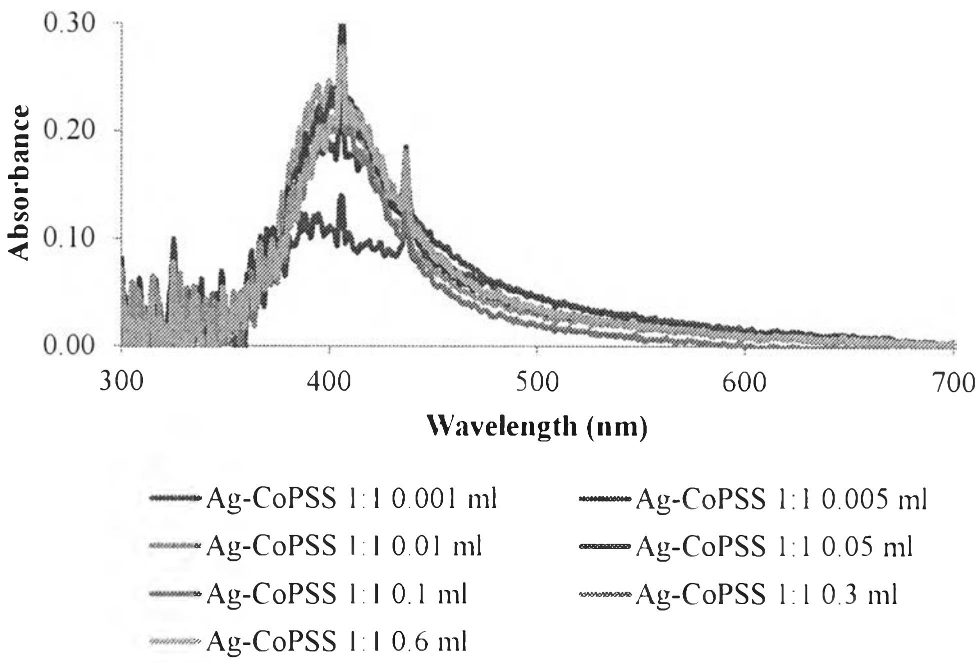


Figure F6 UV-vis spectrum of Ag with various CoPSS 1:1 dilutions.

Appendix G Effect of Capping Agent Volume and Dipping Time on Silver Nanoparticles Monolayer

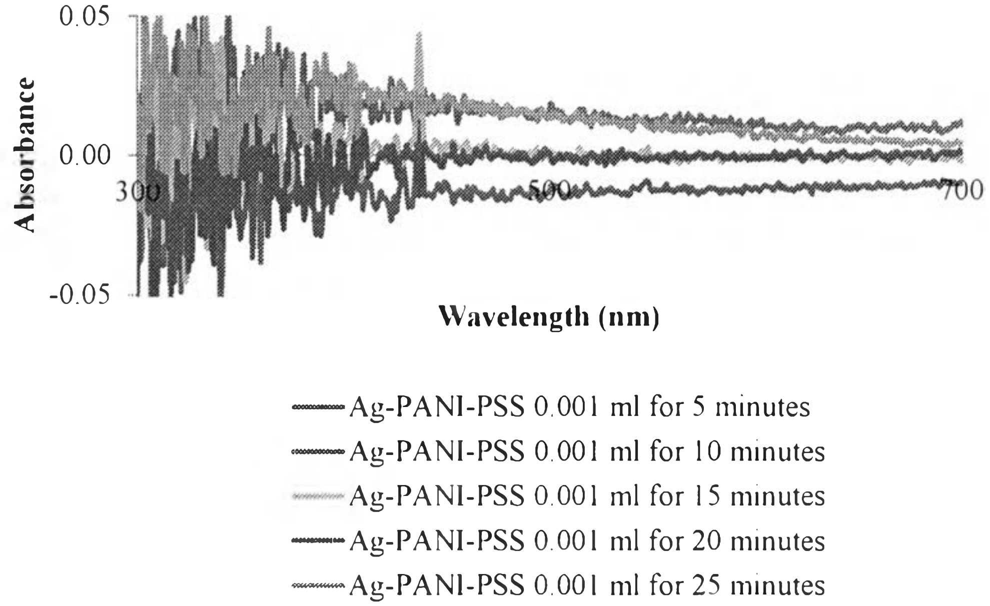


Figure G1 UV-vis spectrum of Ag-PANI-PSS 0.001 ml with dipping time.

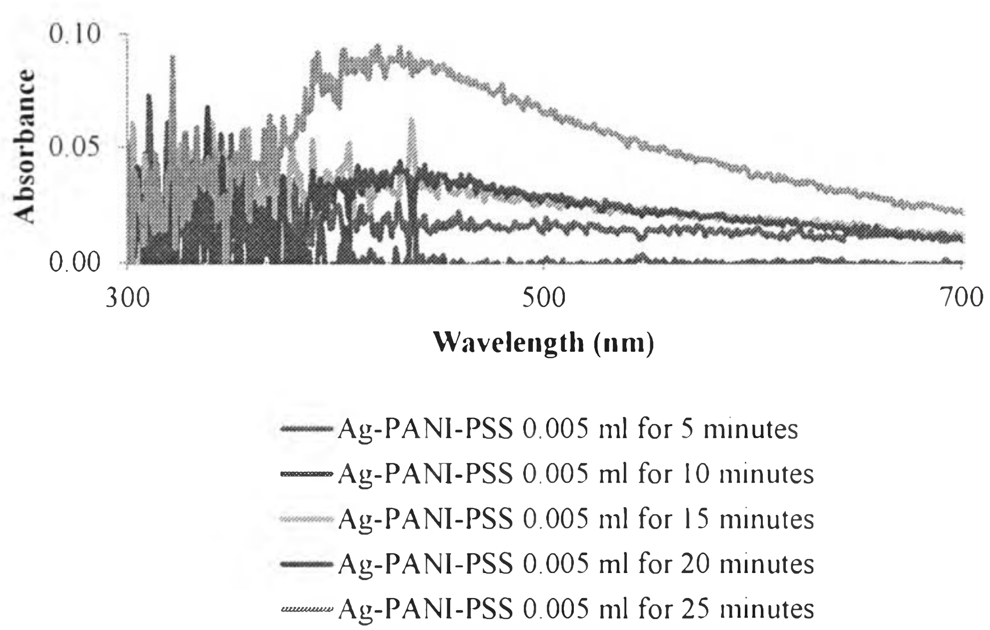


Figure G2 UV-vis spectrum of Ag-PANI-PSS 0.005 ml with dipping time.

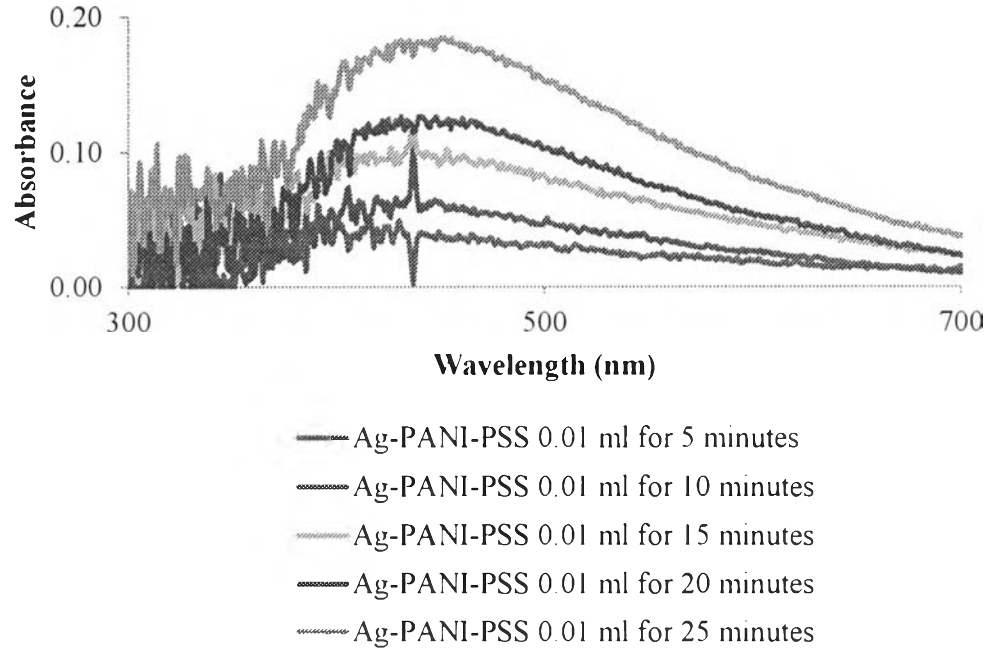


Figure G3 UV-vis spectrum of Ag-PANI-PSS 0.01 ml with dipping time.

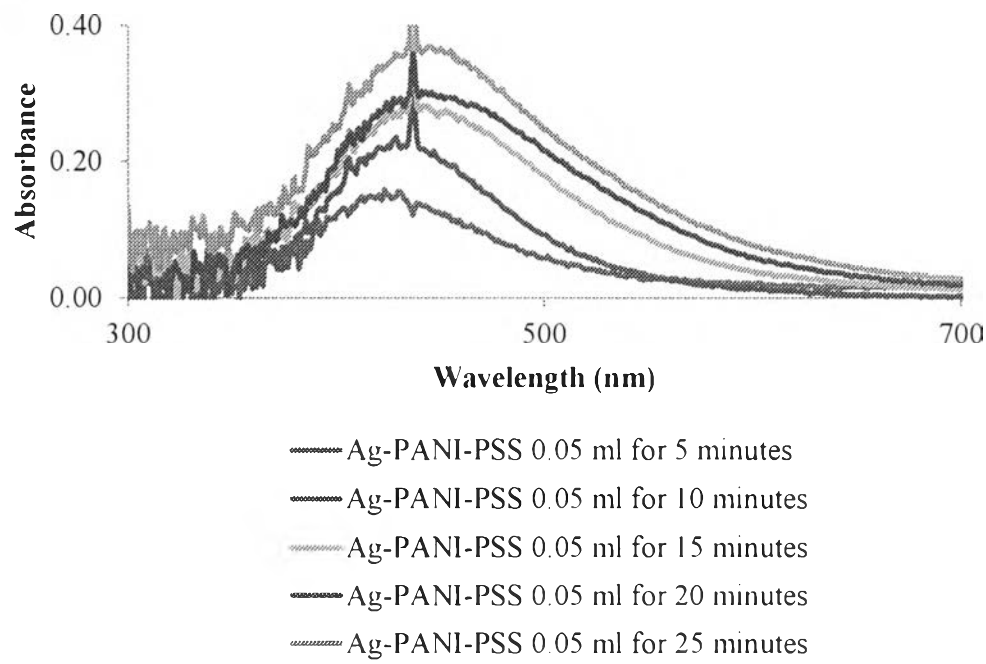


Figure G4 UV-vis spectrum of Ag-PANI-PSS 0.05 ml with dipping time.

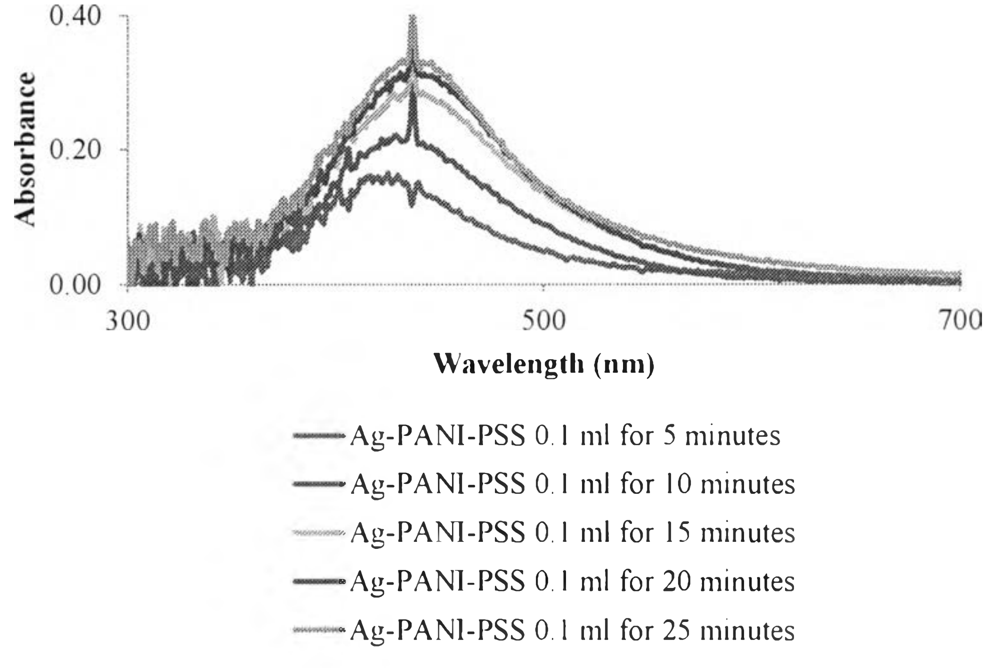


Figure G5 UV-vis spectrum of Ag-PANI-PSS 0.1 ml with dipping time.

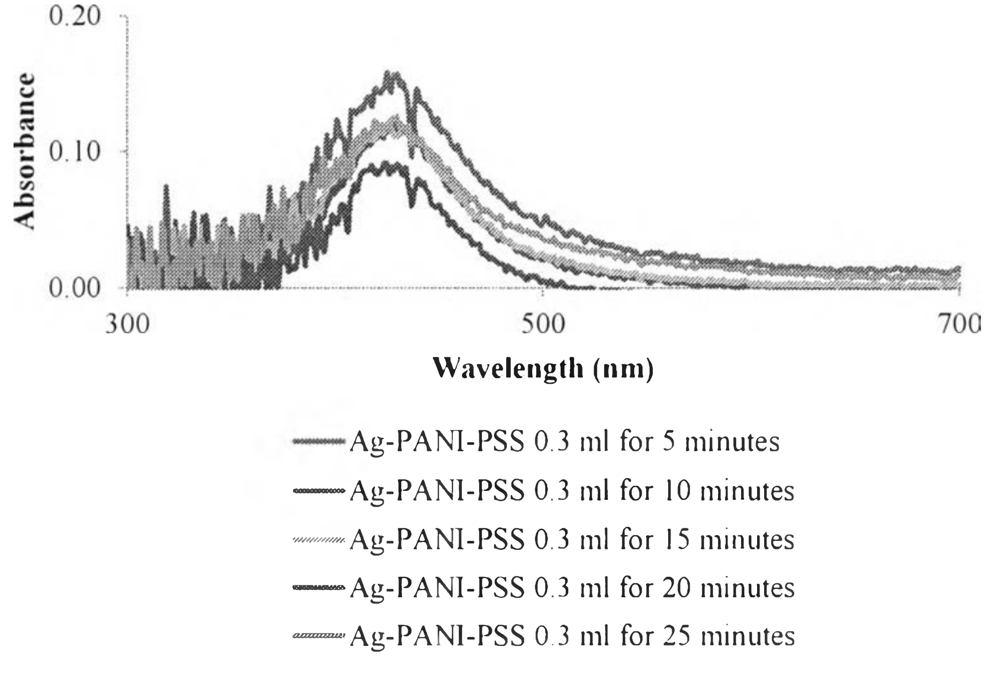


Figure G6 UV-vis spectrum of Ag-PANI-PSS 0.3 ml with dipping time.

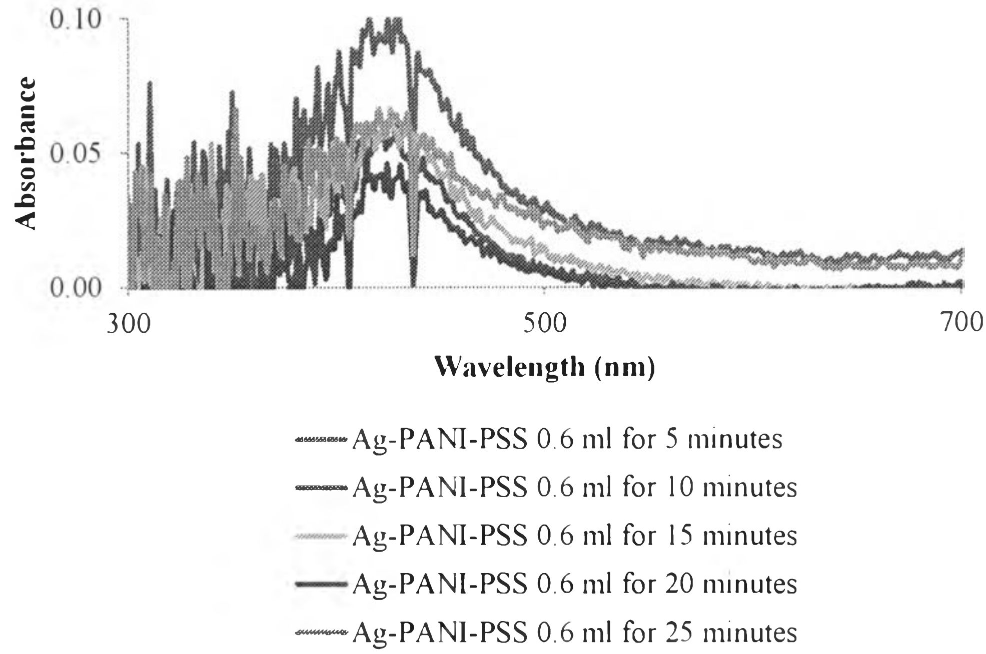


Figure G7 UV-vis spectrum of Ag-PANI-PSS 0.6 ml with dipping time.

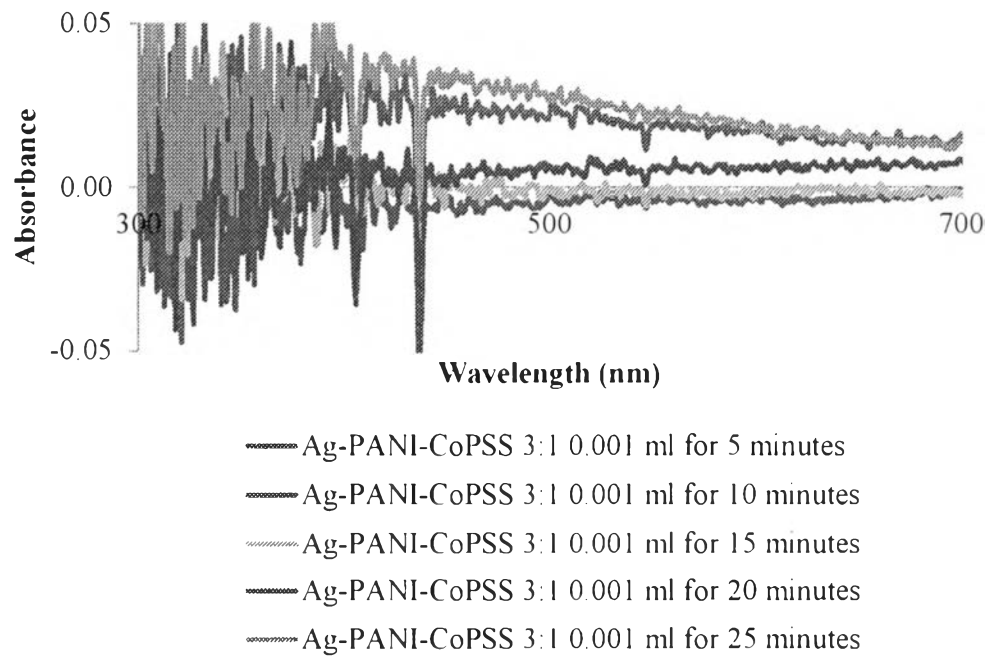


Figure G8 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.001 ml with dipping time.

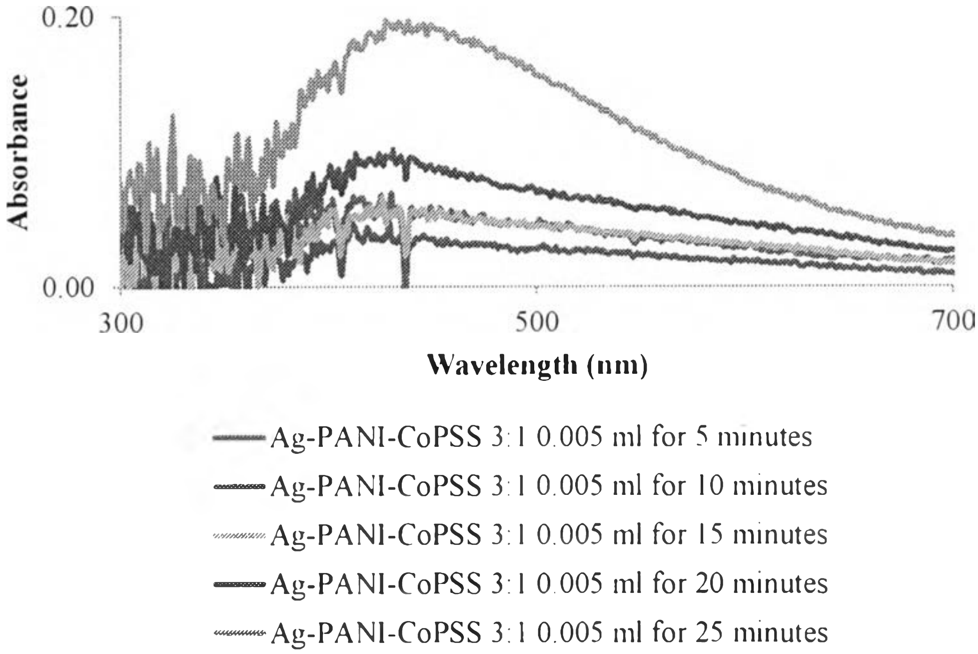


Figure G9 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.005 ml with dipping time.

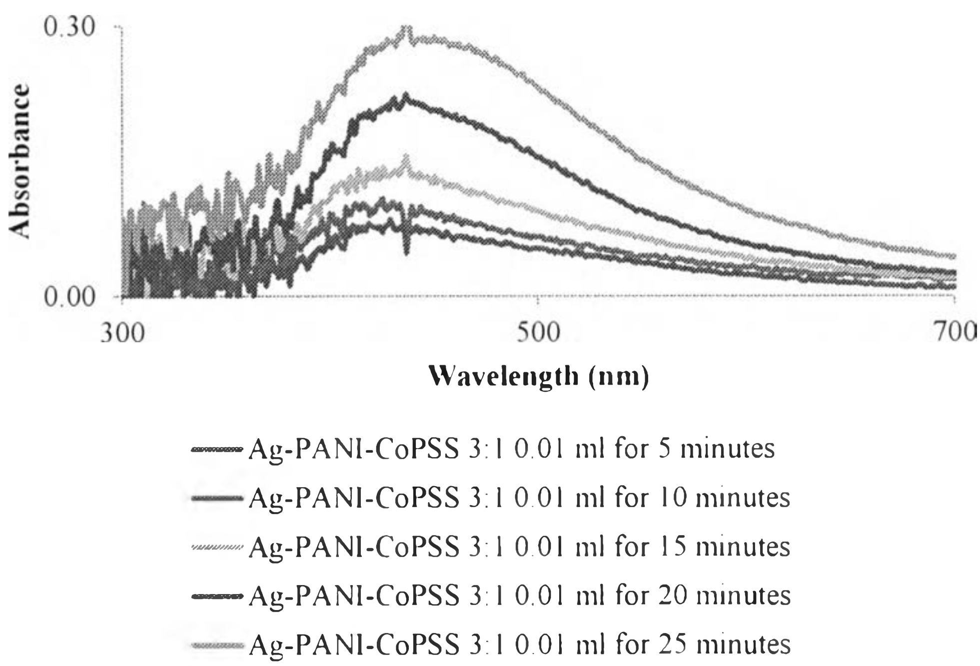


Figure G10 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.01 ml with dipping time.

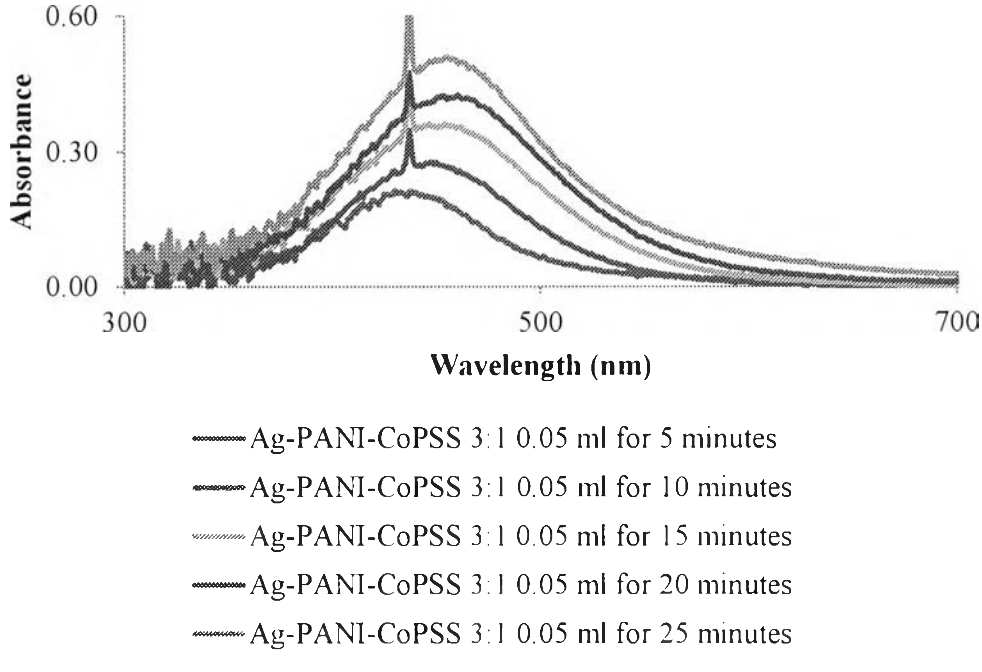


Figure G11 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.05 ml with dipping time.

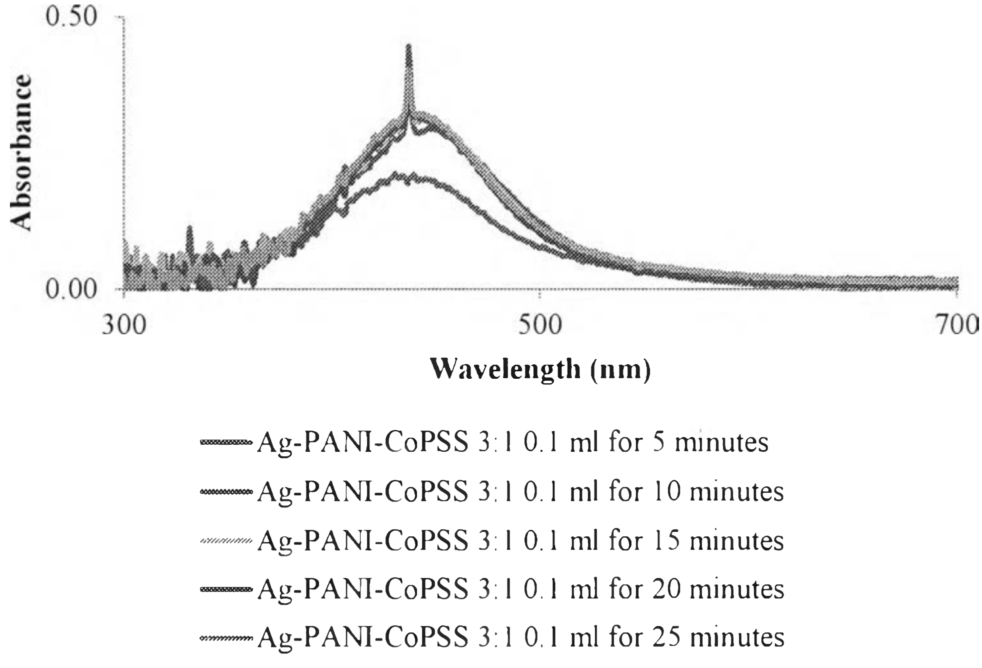


Figure G12 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.1 ml with dipping time.

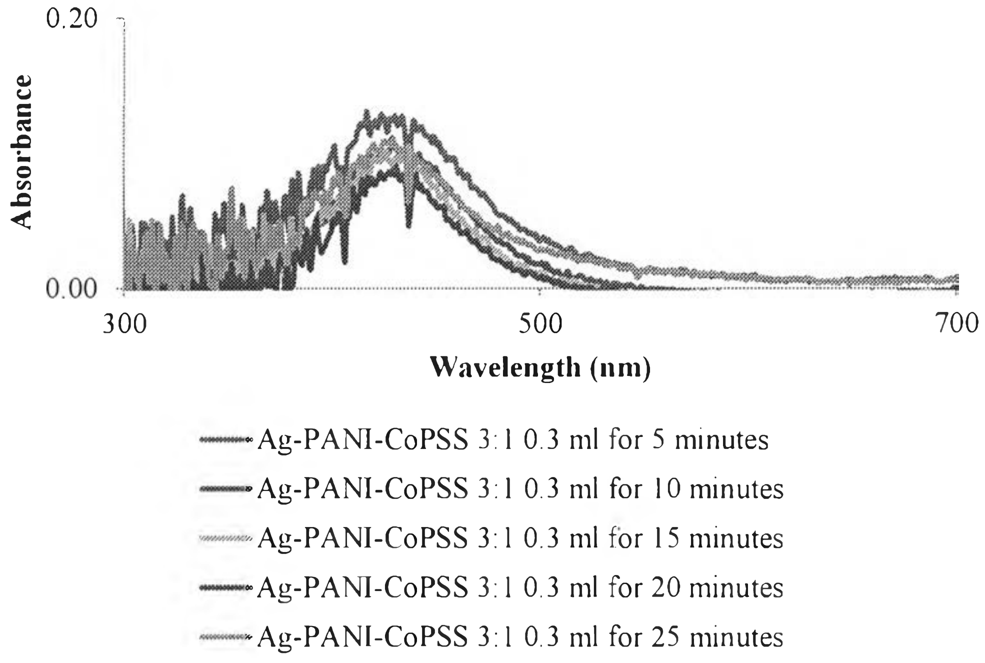


Figure G13 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.3 ml with dipping time.

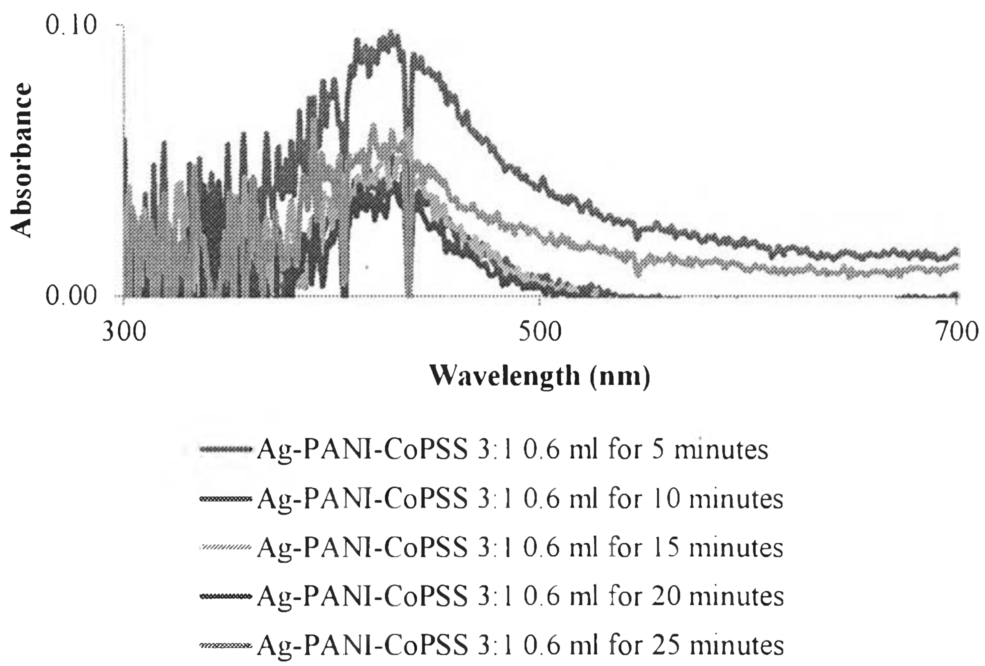


Figure G14 UV-vis spectrum of Ag-PANI-CoPSS 3:1 0.6 ml with dipping time.

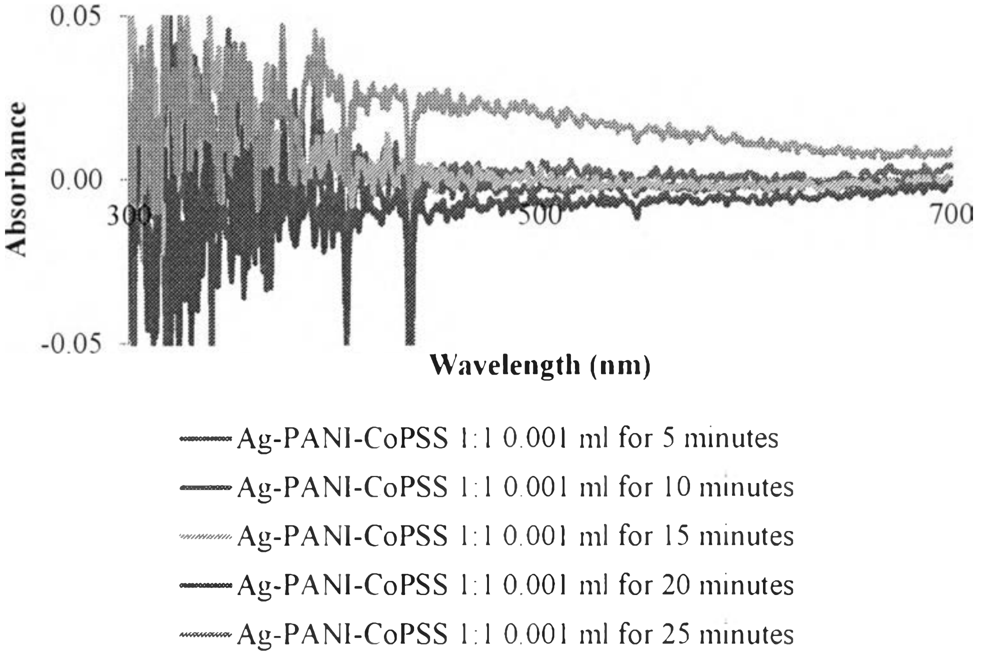


Figure G15 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.001 ml with dipping time.

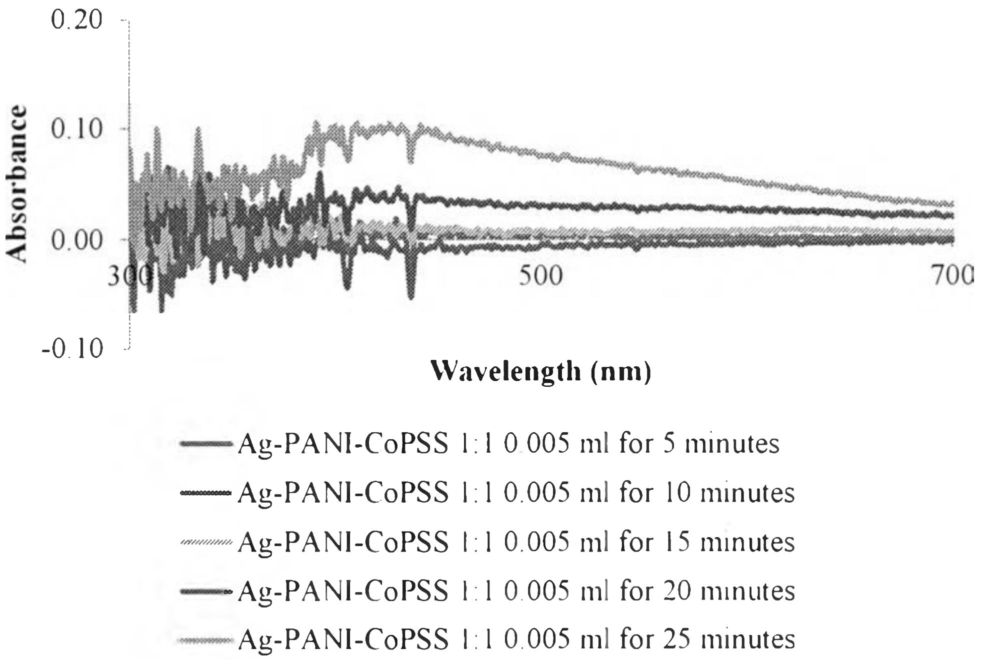


Figure G16 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.005 ml with dipping time.

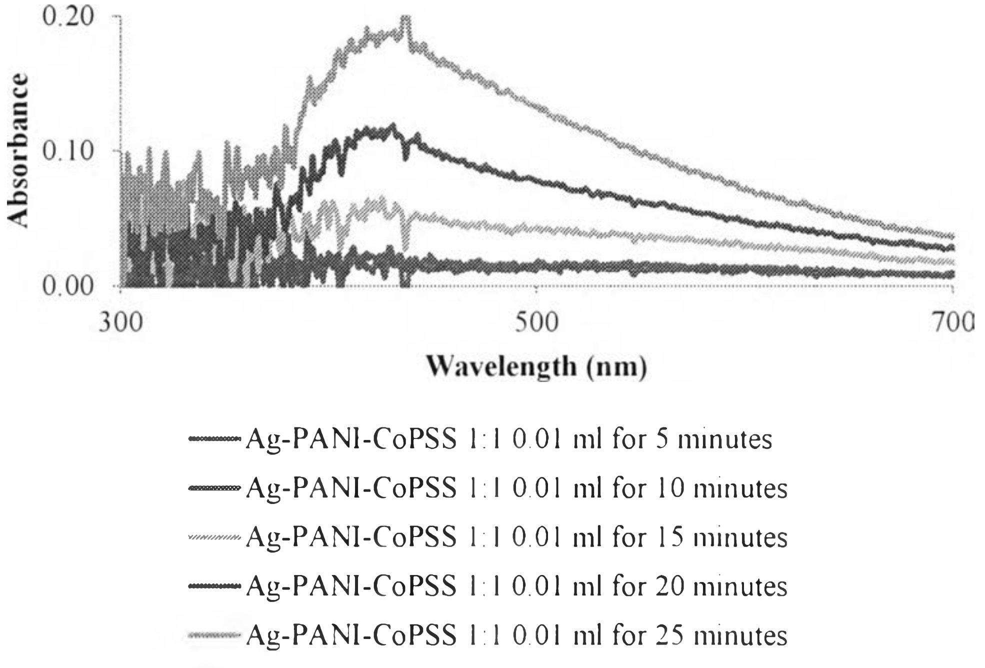


Figure G17 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.01 ml with dipping time.

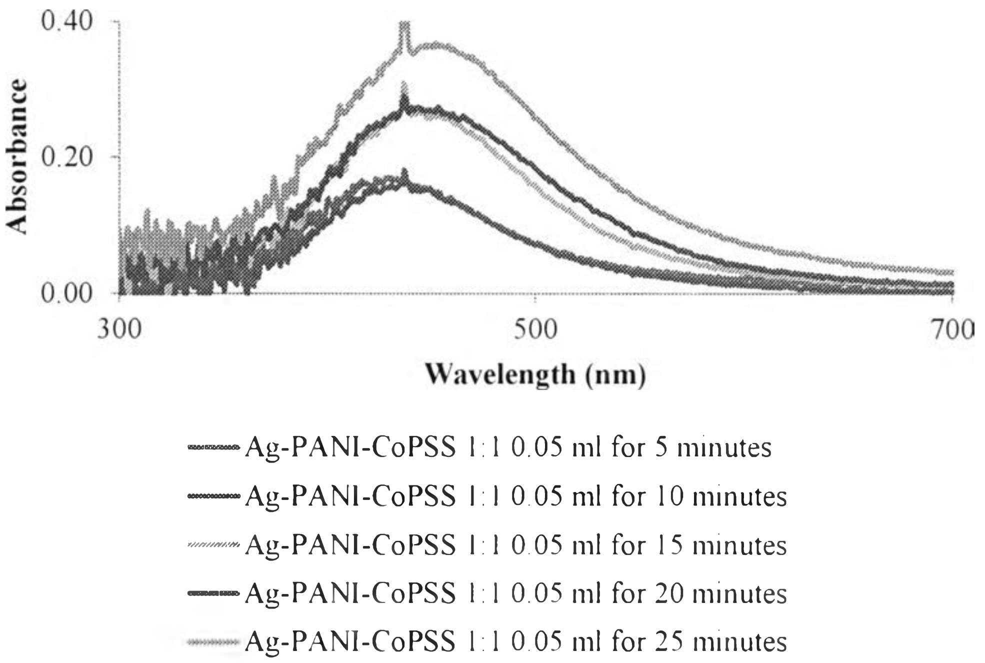


Figure G18 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.05 ml with dipping time.

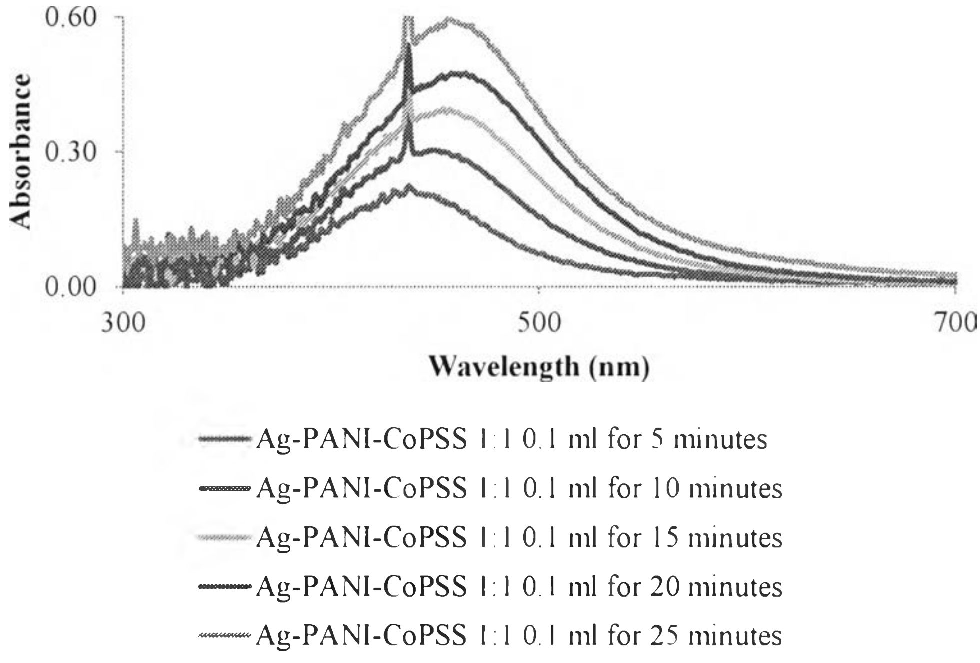


Figure G19 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.1 ml with dipping time.

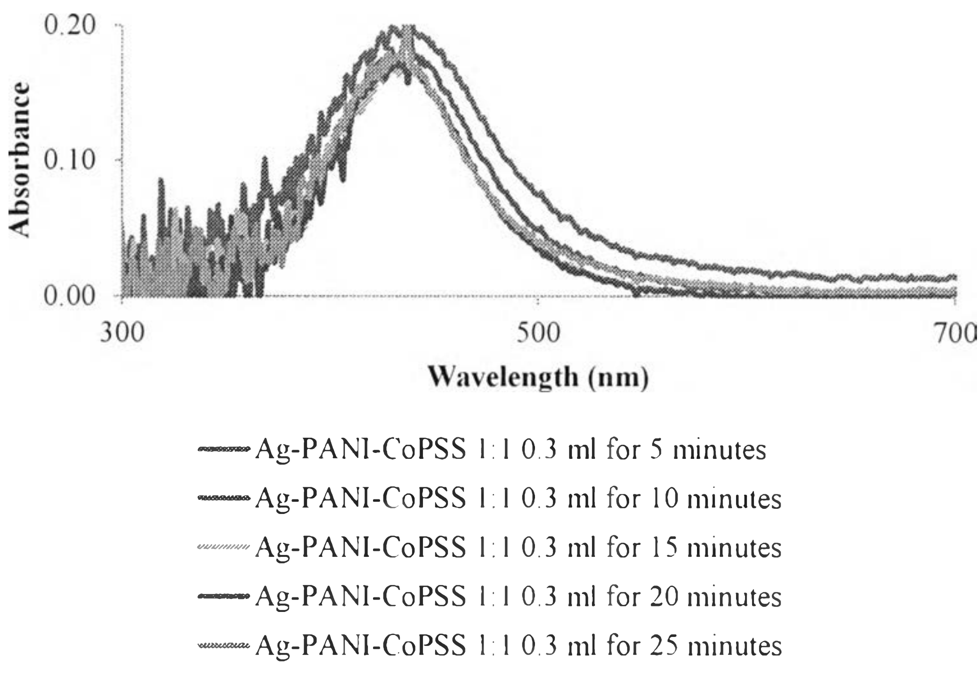


Figure G20 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.3 ml with dipping time.

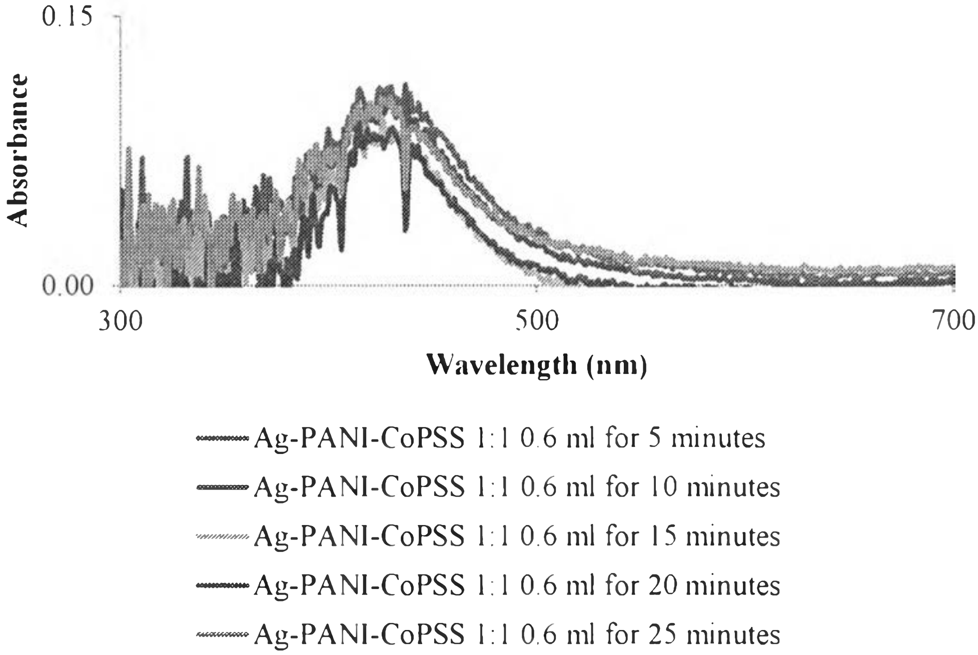


Figure G21 UV-vis spectrum of Ag-PANI-CoPSS 1:1 0.6 ml with dipping time.

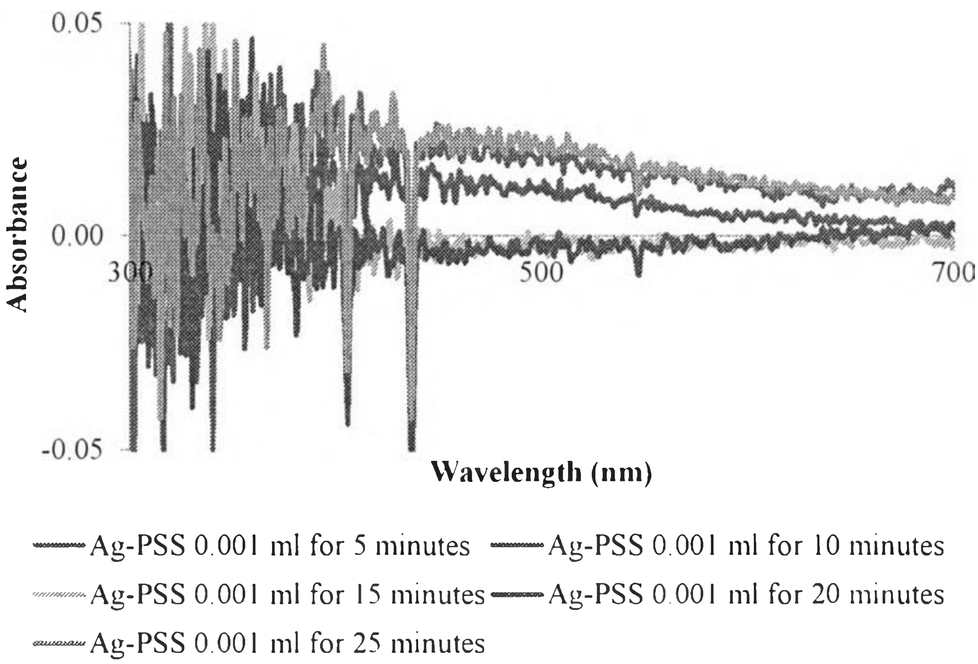


Figure G22 UV-vis spectrum of Ag-PSS 0.001 ml with dipping time.

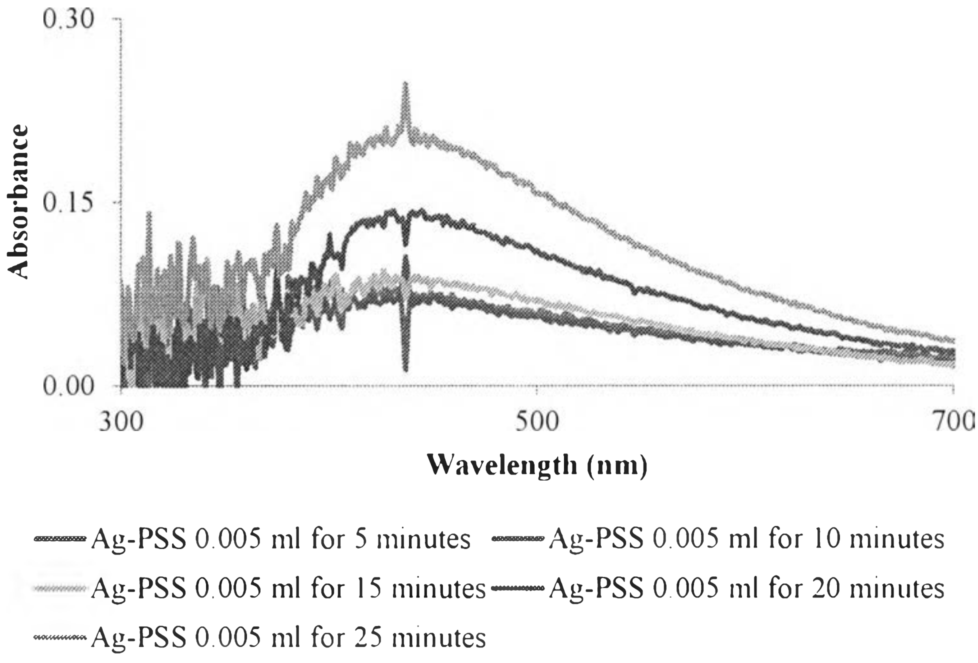


Figure G23 UV-vis spectrum of Ag-PSS 0.005 ml with dipping time.

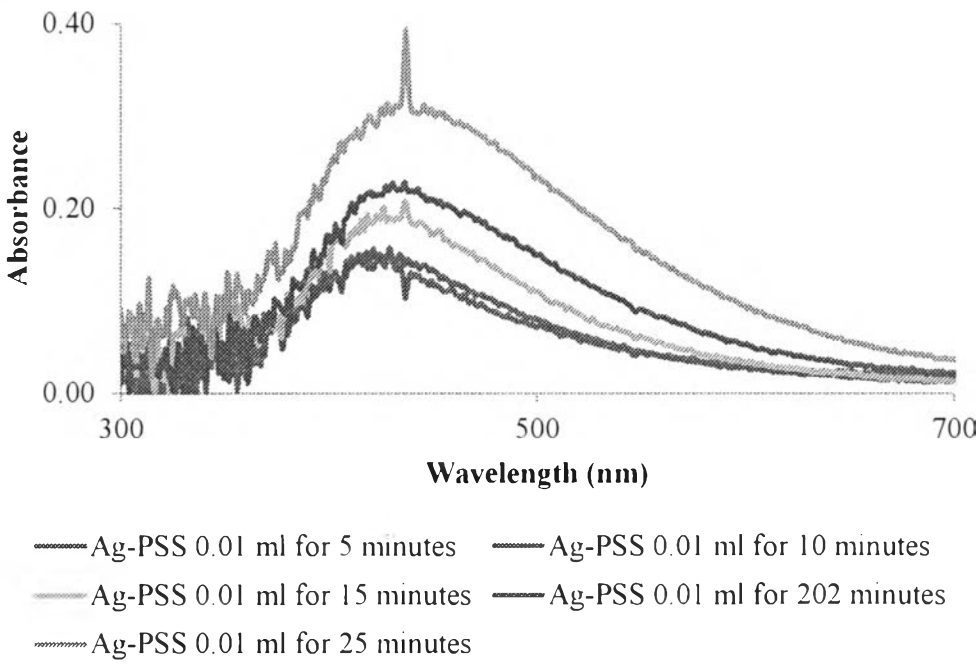


Figure G24 UV-vis spectrum of Ag-PSS 0.01 ml with dipping time.

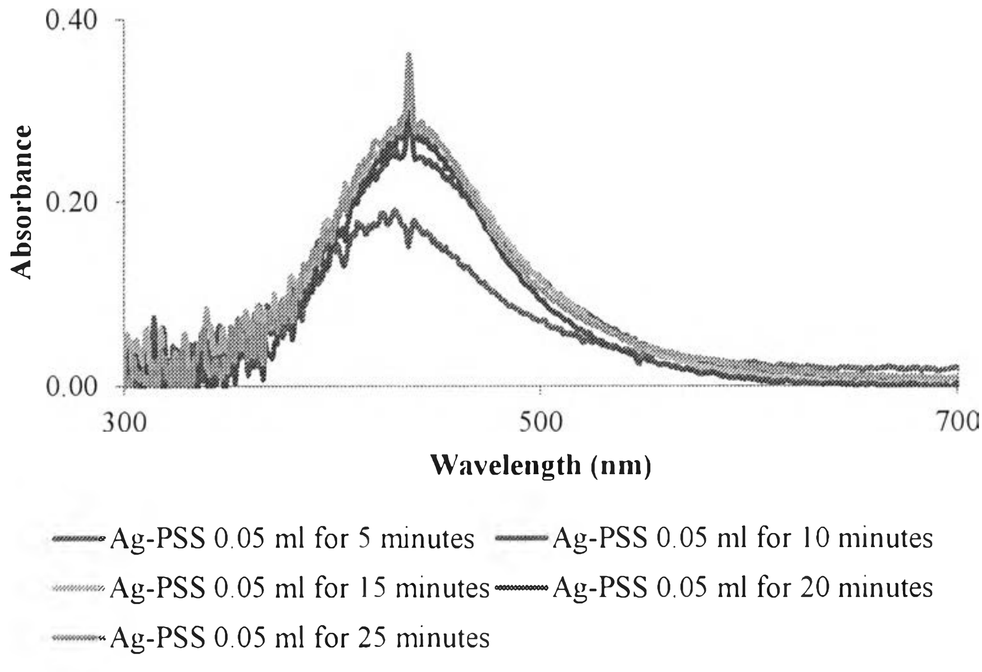


Figure G25 UV-vis spectrum of Ag-PSS 0.05 ml with dipping time.

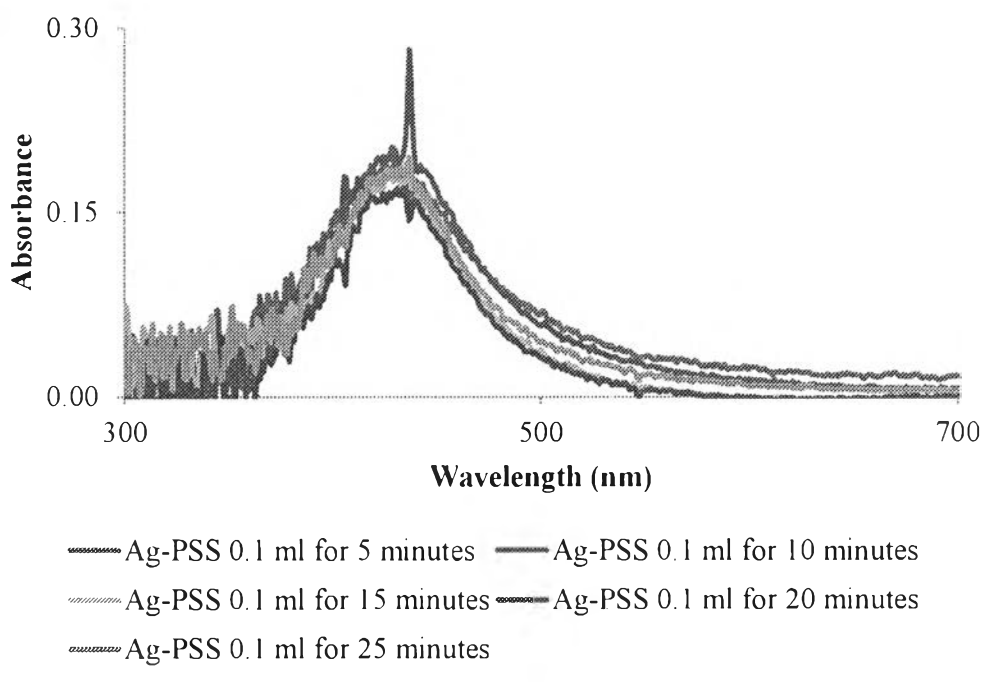


Figure G26 UV-vis spectrum of Ag-PSS 0.1 ml with dipping time.

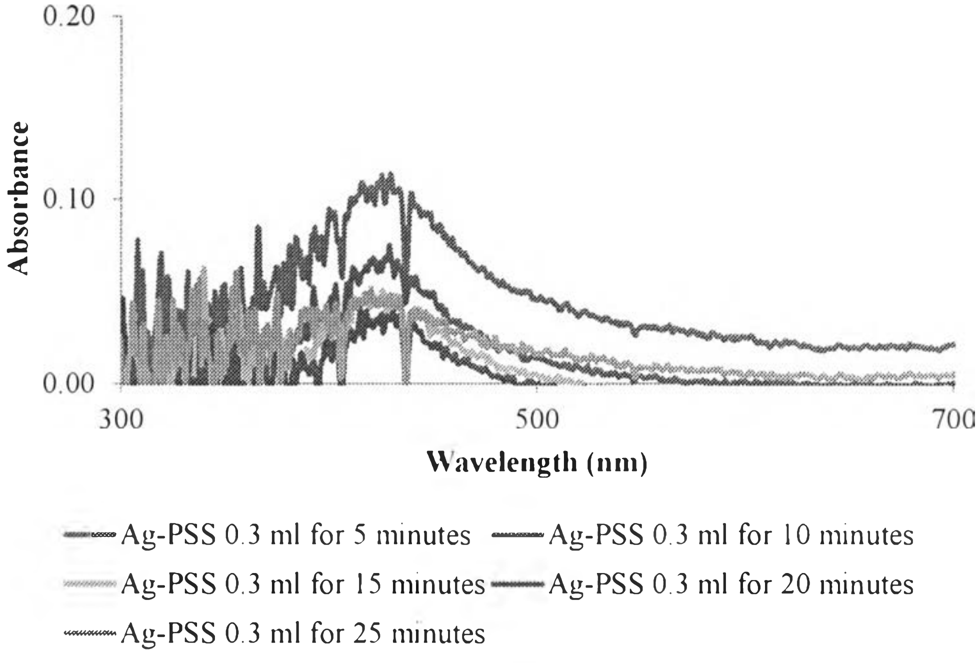


Figure G27 UV-vis spectrum of Ag-PSS 0.3 ml with dipping time.

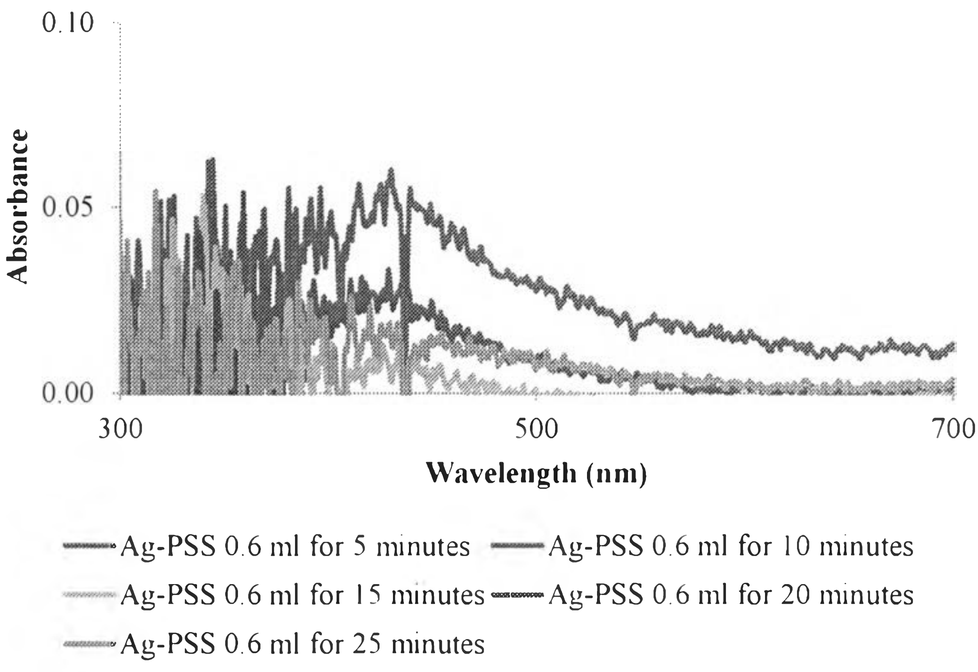


Figure G28 UV-vis spectrum of Ag-PSS 0.6 ml with dipping time.

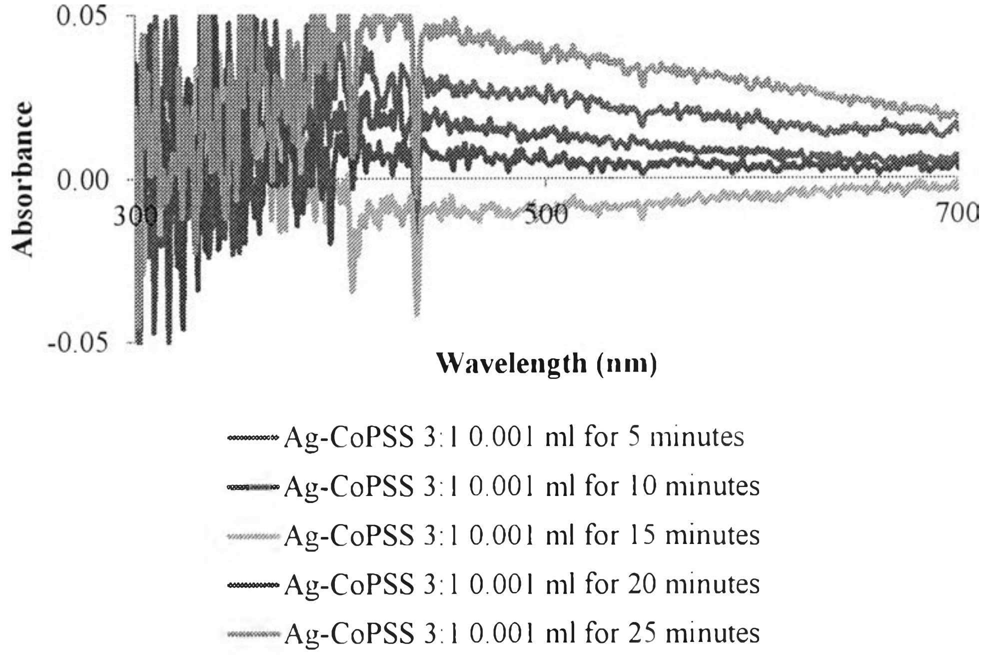


Figure G29 UV-vis spectrum of Ag-CoPSS 3:1 0.001 ml with dipping time.

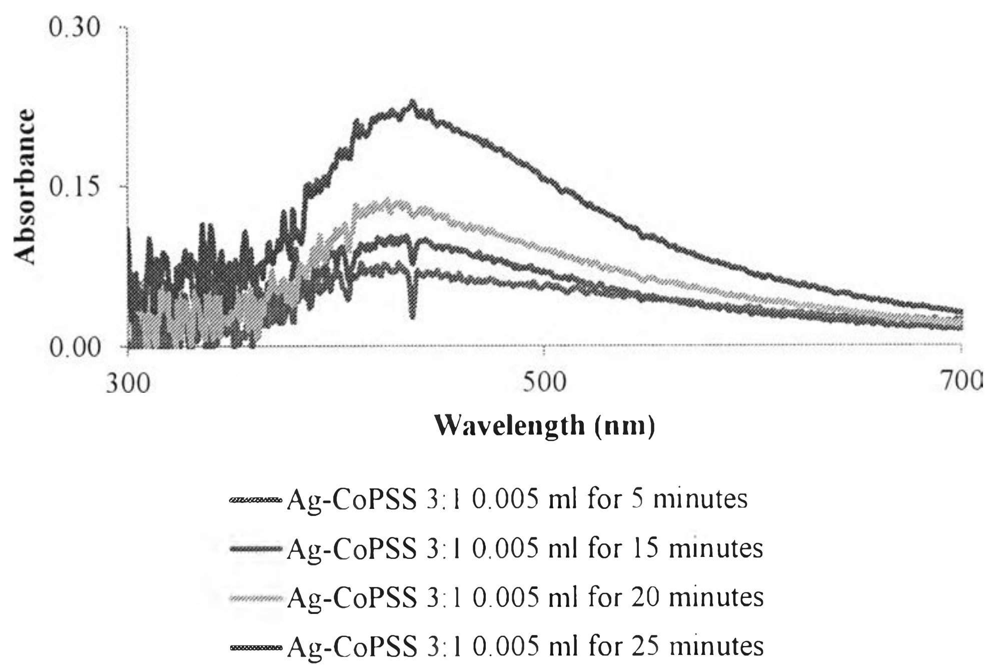


Figure G30 UV-vis spectrum of Ag-CoPSS 3:1 0.005 ml with dipping time.

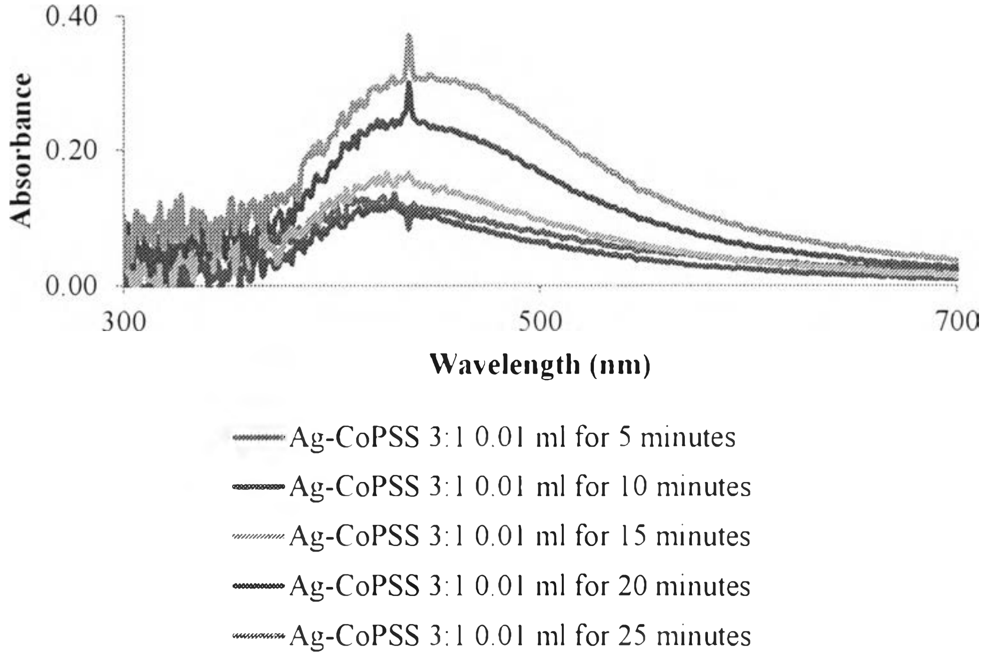


Figure G31 UV-vis spectrum of Ag-CoPSS 3:1 0.01 ml with dipping time.

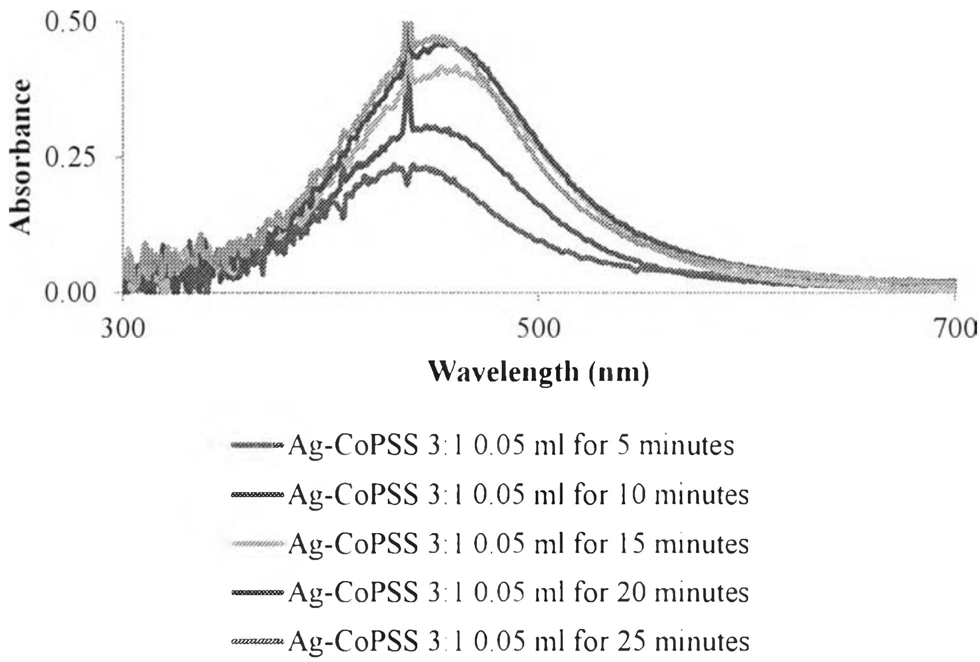


Figure G32 UV-vis spectrum of Ag-CoPSS 3:1 0.05 ml with dipping time.

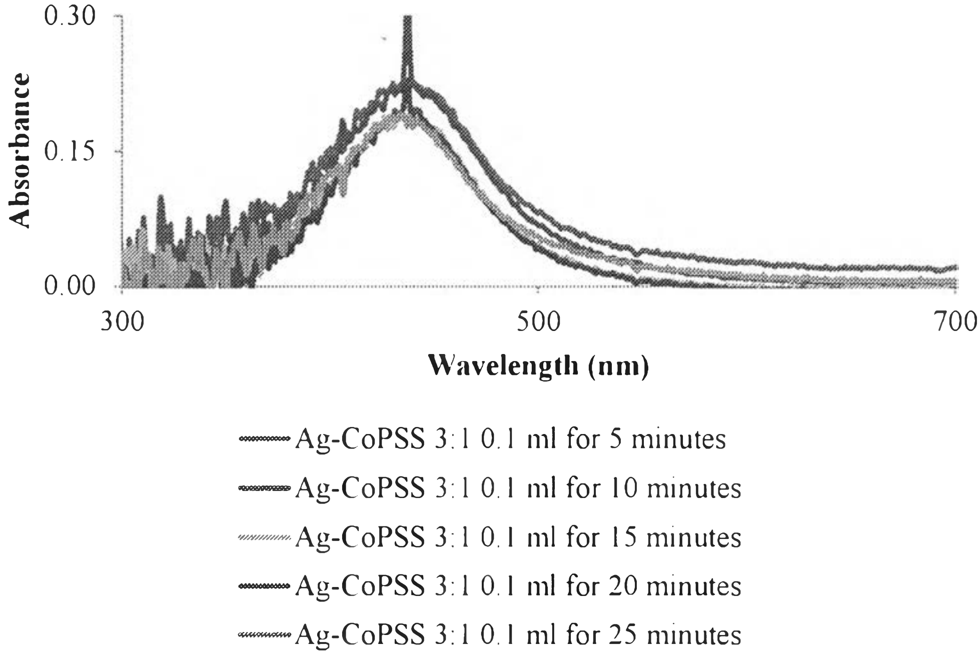


Figure G33 UV-vis spectrum of Ag-CoPSS 3:1 0.1 ml with dipping time.

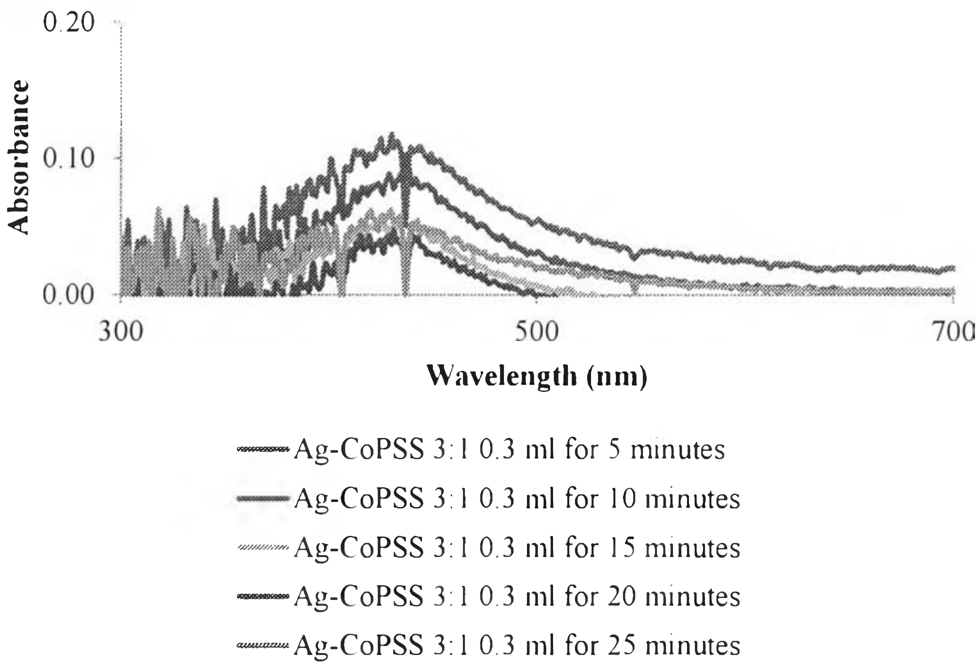


Figure G34 UV-vis spectrum of Ag-CoPSS 3:1 0.3 ml with dipping time.

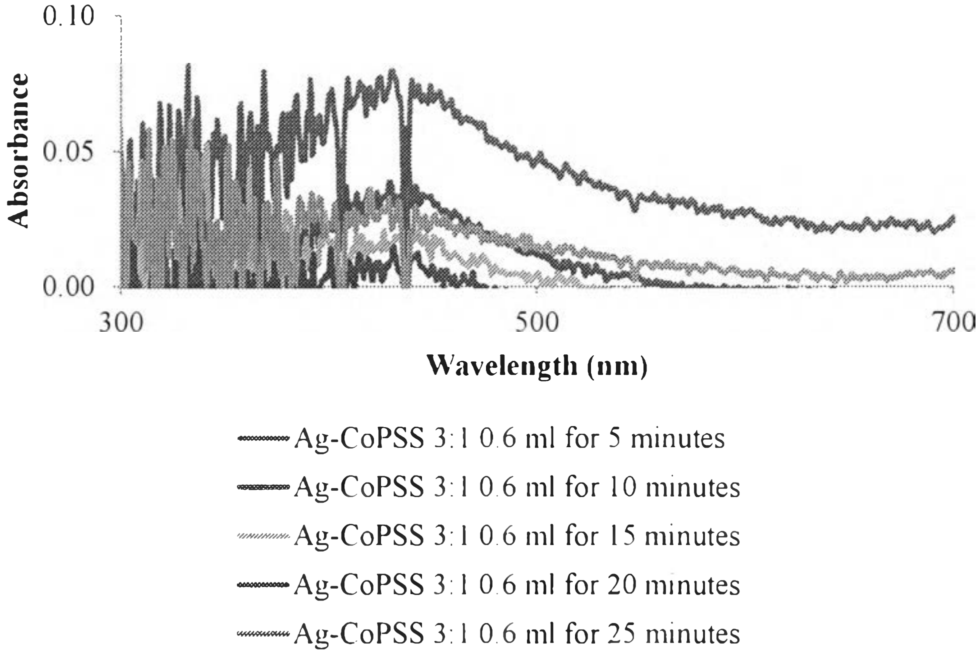


Figure G35 UV-vis spectrum of Ag-CoPSS 3:1 0.6 ml with dipping time.

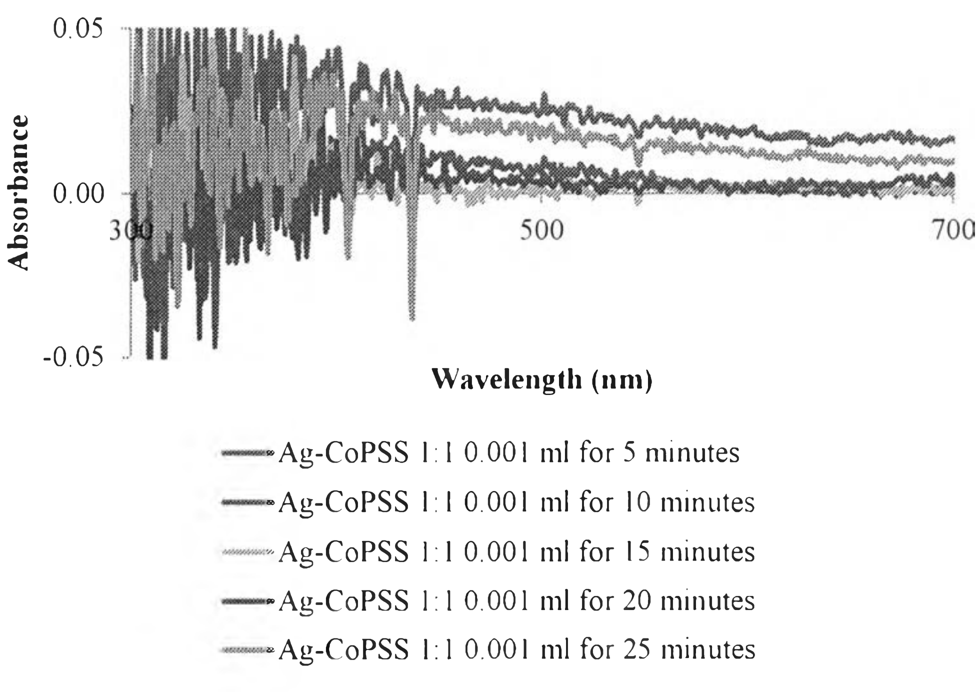


Figure G36 UV-vis spectrum of Ag-CoPSS 1:1 0.001 ml with dipping time.

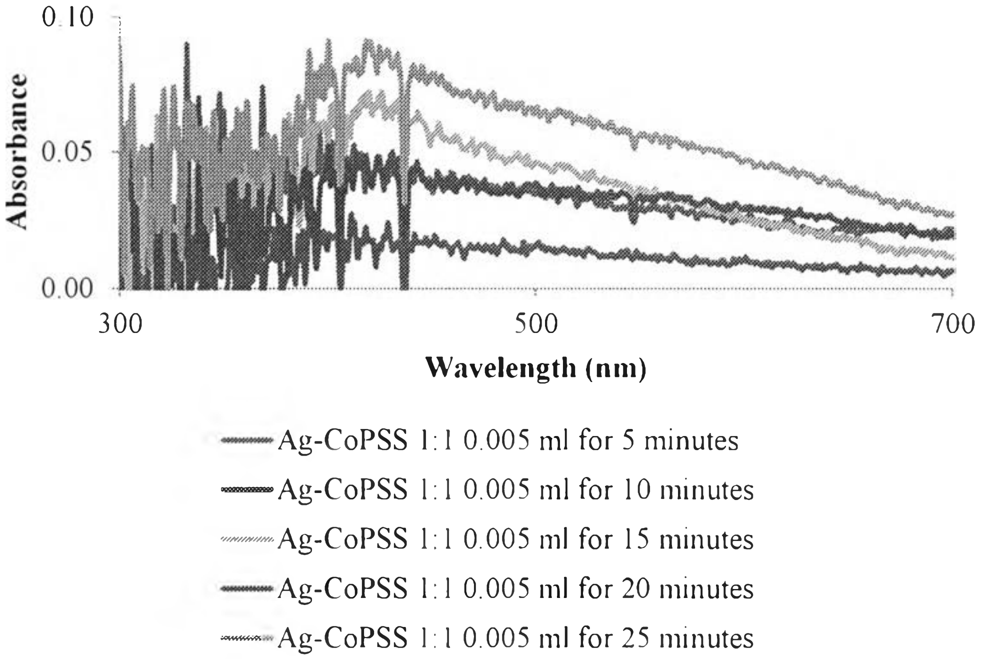


Figure G37 UV-vis spectrum of Ag-CoPSS 1:1 0.005 ml with dipping time.

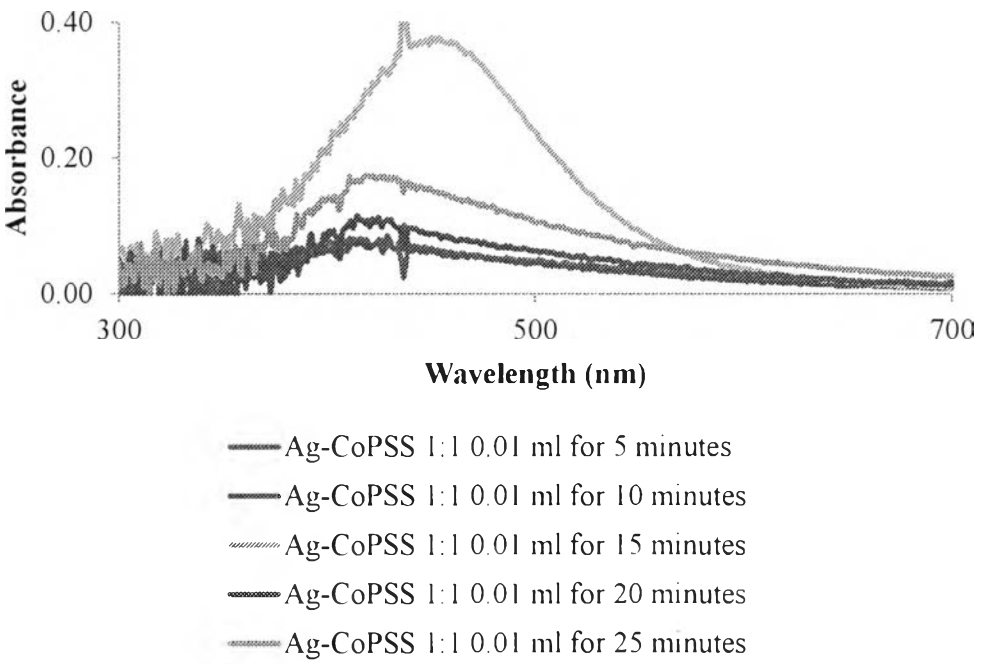


Figure G38 UV-vis spectrum of Ag-CoPSS 1:1 0.01 ml with dipping time.

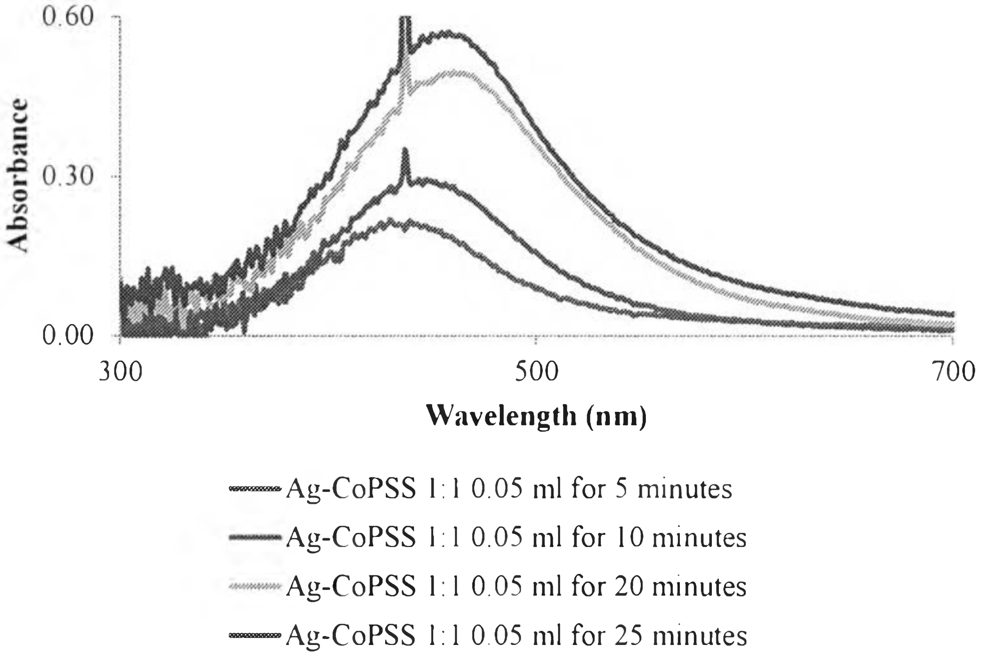


Figure G39 UV-vis spectrum of Ag-CoPSS 1:1 0.05 ml with dipping time.

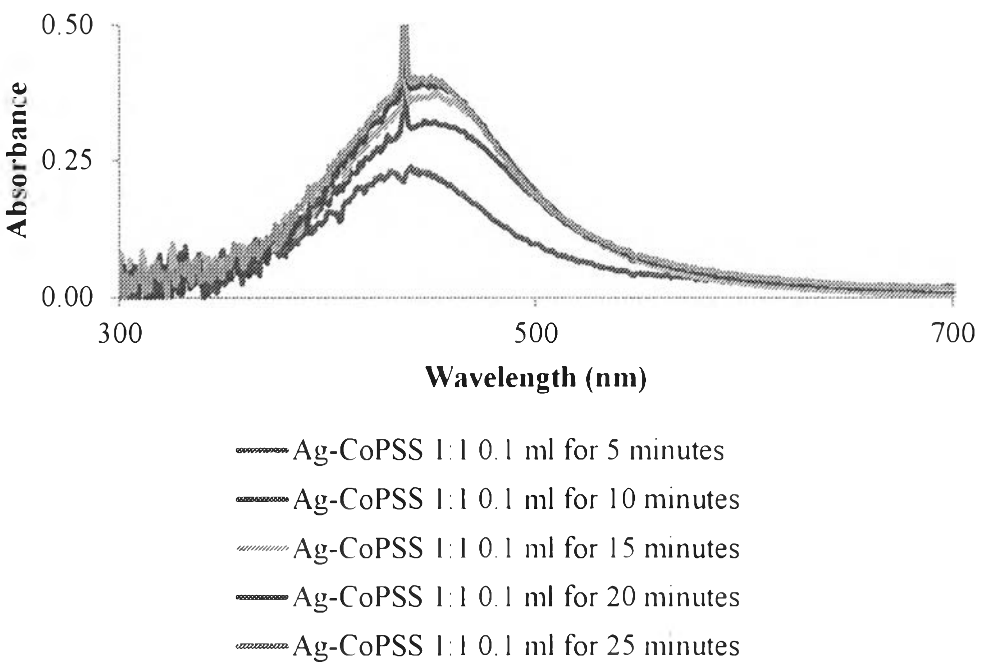


Figure G40 UV-vis spectrum of Ag-CoPSS 1:1 0.1 ml with dipping time.

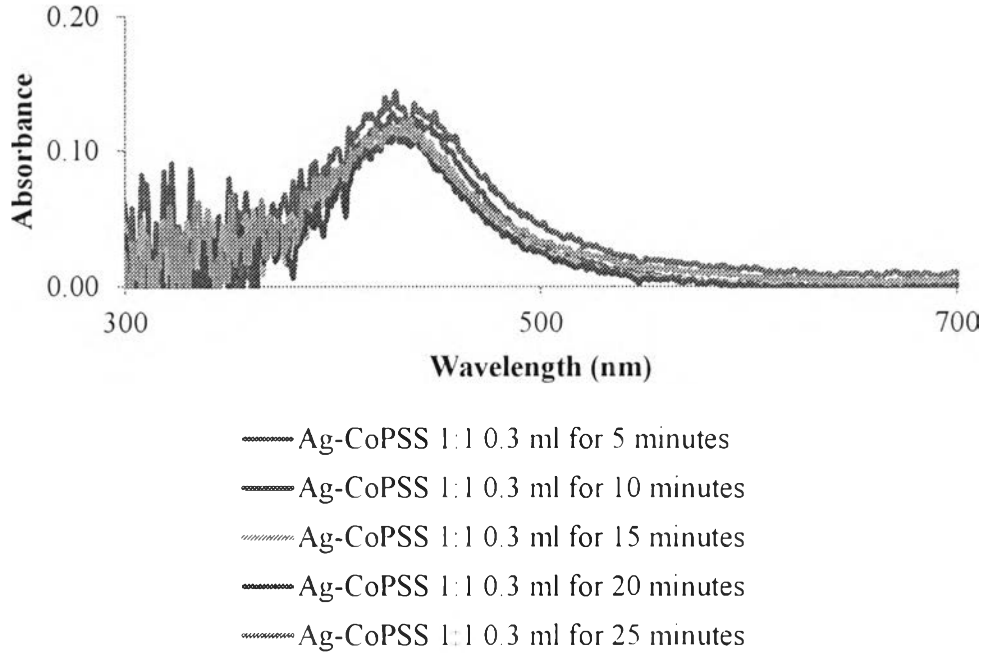


Figure G41 UV-vis spectrum of Ag-CoPSS 1:1 0.3 ml with dipping time.

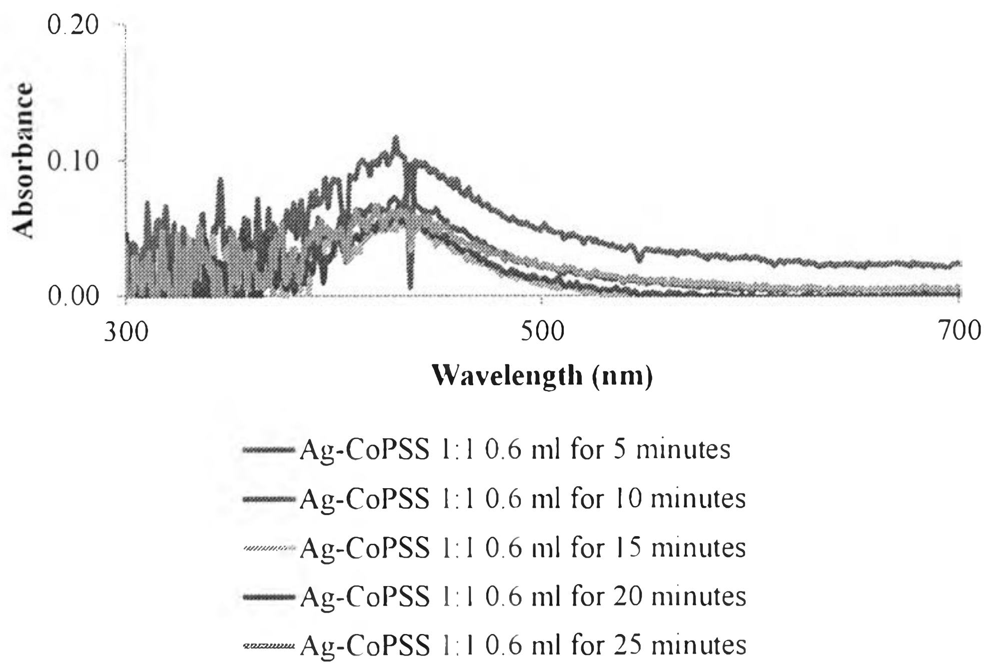


Figure G42 UV-vis spectrum of Ag-CoPSS 1:1 0.6 ml with dipping time.

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Proceeding:

1. Jeerawitkhajorn, N.; and Dubas, S.(2014, April 22) Development of Polyaniline/Metallic Nanoparticles Hybrid Films for Food Packaging Sensors. Proceedings of the 5th Research Symposium on Petrochemical and Materials Technology and The 20th PPC Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand.

Presentation:

1. Jeerawitkhajorn, N.; and Dubas, S. (2013, December 2) Development of Polyaniline/metallic nanoparticles hybrid films for food packaging sensors, Paper presented at the 2nd Seminar on Future Vision of Green Mobility and Advance Technologies for Realizing the vision, Bangkok, Thailand.