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APPENDIX A

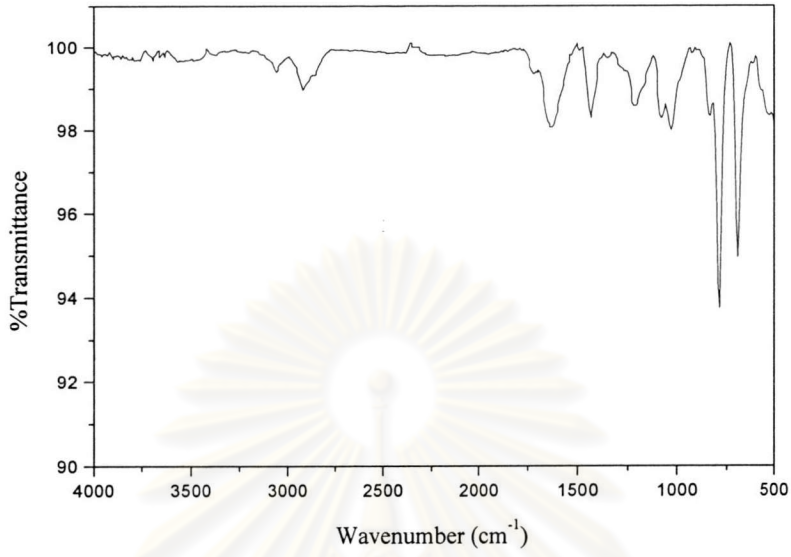

Figure A-1 FT-IR (KBr) spectrum of polythiophene

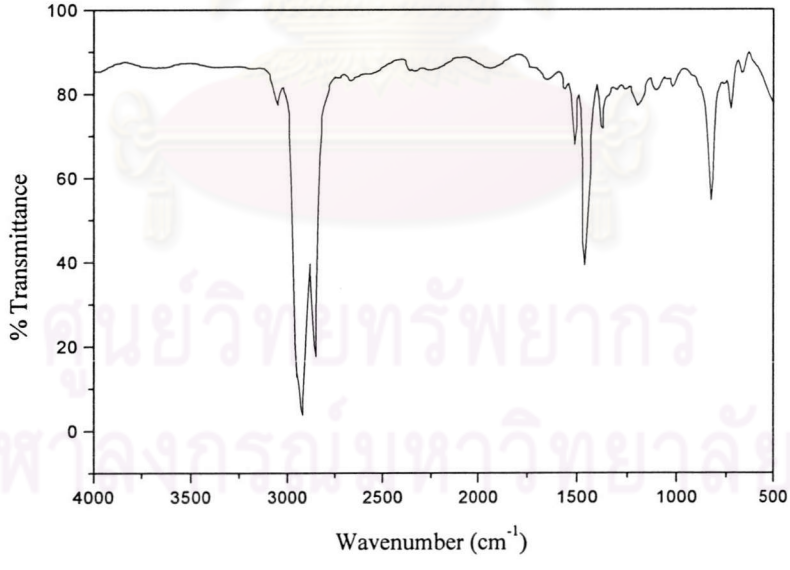

Figure A-2 FT-IR (film) spectrum of poly(3-hexylthiophene)

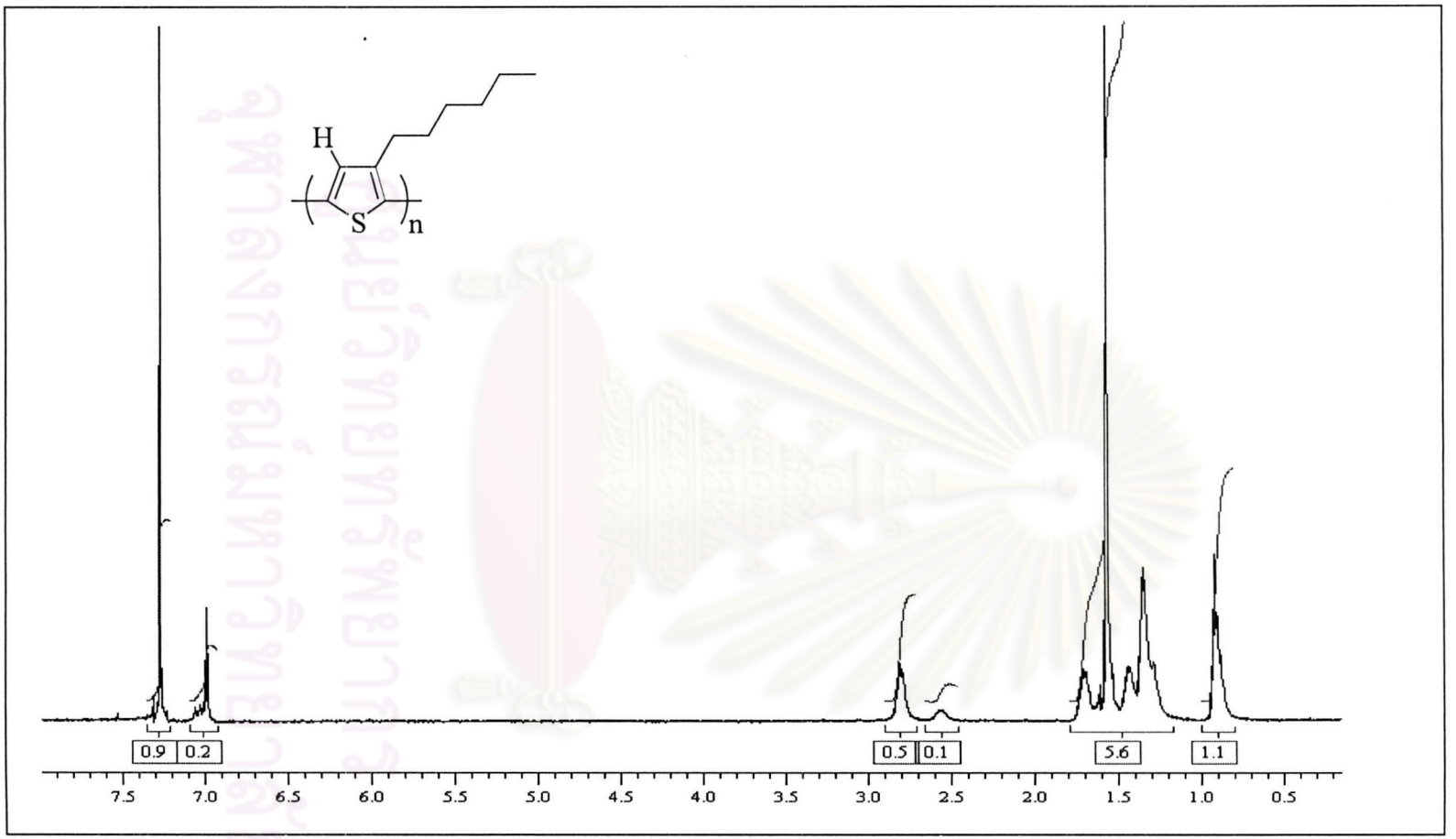

Figure A-3 The ^{1}H-NMR (400 MHz, $CDCl_3$) of poly(3-hexylthiophene)

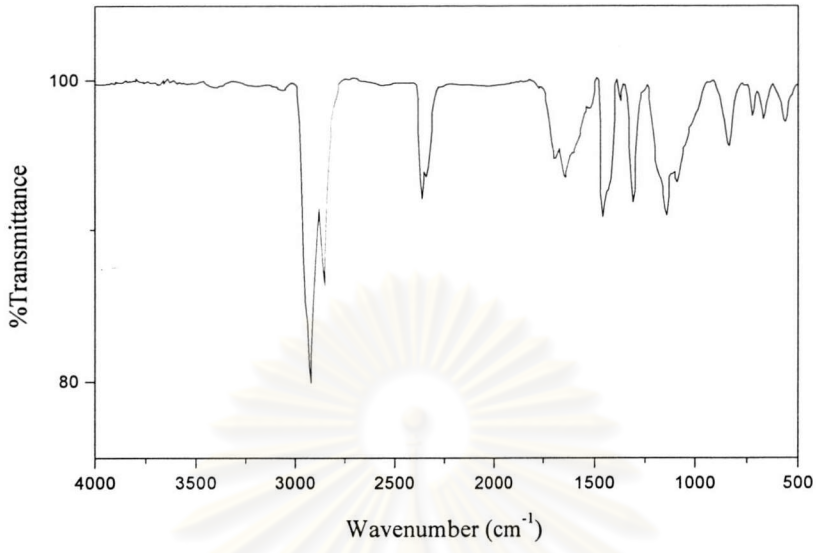

Figure A-4 FT-IR (KBr) spectrum of the oxidized poly(3-hexylthiophene)

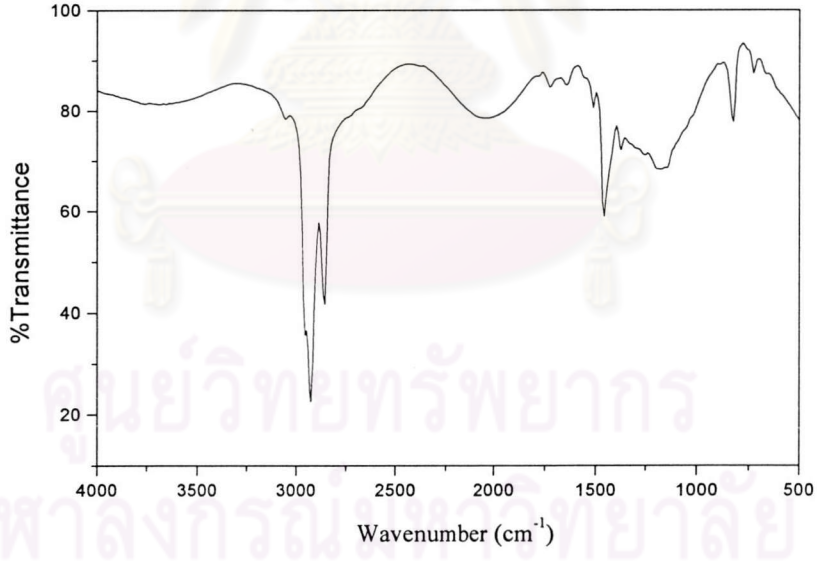

Figure A-5 FT-IR (film) spectrum of the oxidized poly(3-hexylthiophene)

APPENDIX B

The Four-point Probe Method for Electrical Conductivity Measurement [51]

Four tiny electrodes are arranged in straight line separated at exactly equal distances (d) and touched the surface of the sample to be measured. Then the electrodes are further connected with an electrical circuit equipped with an Amp meter (A) and a Voltmeter. (V) (**Figure B-1**) Contacts between the 4 electrodes and the sample surface must be equal. During the measurement, the current (I) is applied through electrode contact 1 to 4, and the potential difference (ΔV) across electrode contacts 2 and 3 is measured. The conductivity of the sample can be calculated from the equation **B-1**

Conductivity ($S.cm^{-1}$); $\sigma = I/kVt$ ..... **(B-1)**

Where I is current (A)

k is probe constant

V is voltage (volt)

t is film thickness (cm)

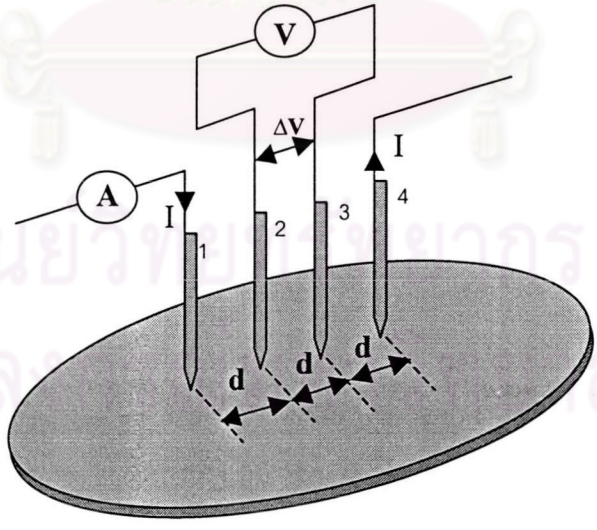

Figure B-1 Conductivity measurement by Four-point Probe method

The accuracy of the conductivity measurement by this method depends on:

i) the size of the sample, which must be very large compared to the separation distances (d) between the electrodes.

ii) thickness of the sample, which must be very small compared to the separation distances (d) between the electrodes.

APPENDIX C

Example of the calculation of AC-index

From UV-Visible spectroscopy data;

a	**b**	**x**	**f(x)**	**xf(x)**
λ (nm)	**Absorbance**	**(a1+a2)/2**	**= (b1+b2)/2**	
310	0.208152	310.5	0.208563	64.75
311	0.208974	311.5	0.209521	65.26
312	0.210067	312.5	0.210774	65.86
313	0.21148	313.5	0.212073	66.48
314	0.212667	314.5	0.213511	67.14
315	0.214356	315.5	0.215014	67.83
316	0.215672	316.5	0.216622	68.56
317	0.217572	317.5	0.218448	69.35
318	0.219324	318.5	0.22029	70.16
319	0.221256	319.5	0.222245	71.00
320	0.223233	-	-	-
Sum (310-320 nm)		**-**	**2.14700**	**676.45**

$$\text{AC-index}(310\text{-}320) = \frac{\Sigma xf(x)}{\Sigma f(x)} = \frac{676.4}{2.147} = \mathbf{315.0}$$

APPENDIX D

Table D-1 AC-index (310-700) and AC-index (310-900) of P3HT oxidized by *m*CPBA

Entry	Reaction time (minute)	AC-index	
		310-700 nm	310-900 nm
1	0	426.26	429.07
2	15	432.39	439.11
3	30	435.80	443.82
4	45	437.16	442.37
5	60	439.00	444.10

Table D-2 AC-index (310-700) and AC-index (310-900) of P3HT oxidized by H_2O_2/TFA (30 equivalence of TFA)

Entry	Reaction time (minute)	AC-index	
		310-700 nm	310-900 nm
1	0	431.46	424.72
2	30	433.69	428.30
3	60	436.76	431.85
4	90	436.70	433.25
5	120	443.11	435.13

Table D-3 AC-index (310-900) of P3HT oxidized by H_2O_2/TFA at 10 equivalence of TFA and 30 equivalence of TFA

Entry	Reaction time (minute)	AC-index	
		10 equivalence TFA	30 equivalence TFA
1	0	428.74	428.25
2	60	429.96	438.12
3	120	430.20	450.49
4	180	433.97	449.75
5	240	438.28	450.27

Table D-4 AC-index (300-1100) of P3HT solution doped by $HClO_4$; mole ratio P3HT: $HClO_4$ = 7 : 2

Entry	Reaction time (minute)	AC-index (300-1100 nm)
1	0	427.3385
2	10	484.8086
3	20	521.0944
4	30	547.0144
5	40	562.5184
6	50	595.0704
7	60	600.3691
8	70	615.6876
9	80	631.0199
10	90	635.7626
11	100	649.7941
12	110	658.587
13	120	665.3054
14	130	667.5427

Table D-5 AC-index (300-1100) of P3HT solution doped by TFA; mole ratio P3HT: TFA = 6 : 5 and 3 : 5

Entry	Reaction time (minute)	AC-index at mole ratio P3HT: TFA	
		6 : 5	3 : 5
1	0	428.0594	428.0594
2	10	463.5108	530.5357
3	20	484.3273	538.7685
4	30	485.4674	542.018
5	40	488.7551	543.4118

VITAE

Miss Krittiyapon Tepveera was born on February 28, 1976 in Pisanuloke, Thailand. She received a bachelor degree of science from Department of Chemistry, Faculty of Science, Chiangmai University, Thailand in 1998, and then worked at Winson Ink Co. Ltd. in the R&D position. In 2001, she was admitted to a Master's Degree Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University and completed the program in 2004. Her address is 146/76 Premier place condominium 2, Suanluang, Bangkok, 10250.