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APPENDIX A

CALCULATION

PROGRAM FOR CALCULATE CONDUCTIVITY OF CONDUCTING POLYMERS BY VAN DER PAUW METHOD.

```
ok
List
10  INPUT "THICKNESS          =  " , D
20  INPUT "RESISTANCE  NO. 1 = ", R1
30  INPUT "RESISTANCE  NO. 2 = ", R2
40  M = 3.141527*D
50  R = R1
60  S = R2
70  A = M*R
80  B = M*S
90  C = (A+B)*0.5
100 X = 0.693147/C
110 I = EXP(-A*X)+EXP(-B*X)
120 IF I <= 1.00001 THEN 150
130 X = X*I
140 GOTO 110
150 PRINT "CONDUCTIVITY     = ", X
Ok
```

Calculation Conductivity of Polypyrrole

Polypyrrole (PP_6) was synthesised in 2.5 M $FeCl_3$ in methanol solution, reaction time is 20 min, reaction temperature is 0 ^oC. After washing and drying, it was pressed into disc form ($\varnothing$ = 1.20 cm.) and its thickness was measurment by vernior caliber.

Sample 1

Thickness d_1 = 0.0477 cm.

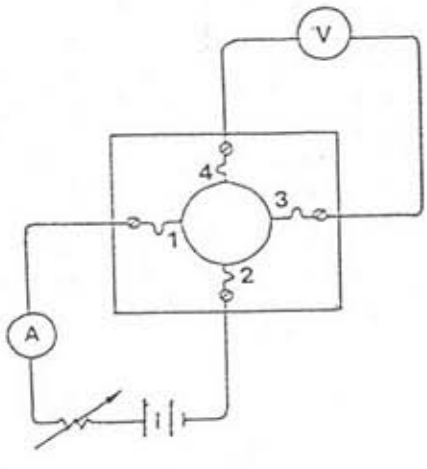
d_2 = 0.0442 cm.

d_3 = 0.0427 cm.

d_4 = 0.0420 cm.

Average thickness d = 0.0434 cm.

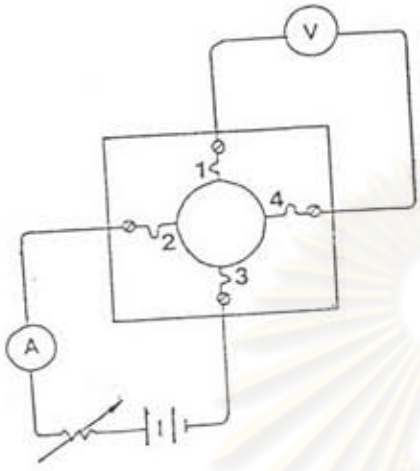
Next step four ohmic contact at the edge of the disc sample are made. measurement, first applied suitable current (I_{12}) through contacts 1 and 2 and measured potential different (V_{34}) between contact 3 and 4 and got ratio $R_1 = |V_{34}|/I_{12}$



I_{12} (mA)	$\lvert V_{34}\rvert$ (mV)	R_{1234} (Ω)
0.31	0.11	0.360
0.96	0.30	0.310
1.98	0.60	0.300

average R_{1234} (R_1) 0.320

Secondary, I_{23} was applied through the contact 2 and 3 and measured the potential difference, V_{41} which would give the ratio $R_2 = |V_{41}|/I_{23}$



I_{23} (mA)	$\lvert V_{41}\rvert$ (mV)	R_{2341} (Ω)
0.44	0.02	0.045
1.43	0.06	0.042
2.14	0.09	0.042

average R_{2341} (R_2) 0.043

The calculated for the conductivity (σ_1) of the disc ample by from eq.{2.2} above program would give the following information.

```
RUN
THICKNESS          = 0.434
RESISTANCE NO. 1 = 0.032
RESISTANCE NO. 2 = 0.43
CONDUCTIVITY       = 136.59
oK
```

In principle, σ_1, σ_2, σ_3, σ_4 , could be calculated by changing the current electrodes around.

σ_1 = 136.59

σ_2 = 135.80

σ_3 = 135.51

σ_4 = 136.14

average conductivity ———

of sample 1 = 136.01 Scm^{-1}

Sample 2

RUN

THICKNESS = 0.0570

RESISTANCE NO. 1 = 0.033

RESISTANCE NO. 2 = 0.264

CONDUCTIVITY = 130.89

oK

σ_1 = 130.89

σ_2 = 129.70

σ_3 = 129.33

σ_4 = 130.21

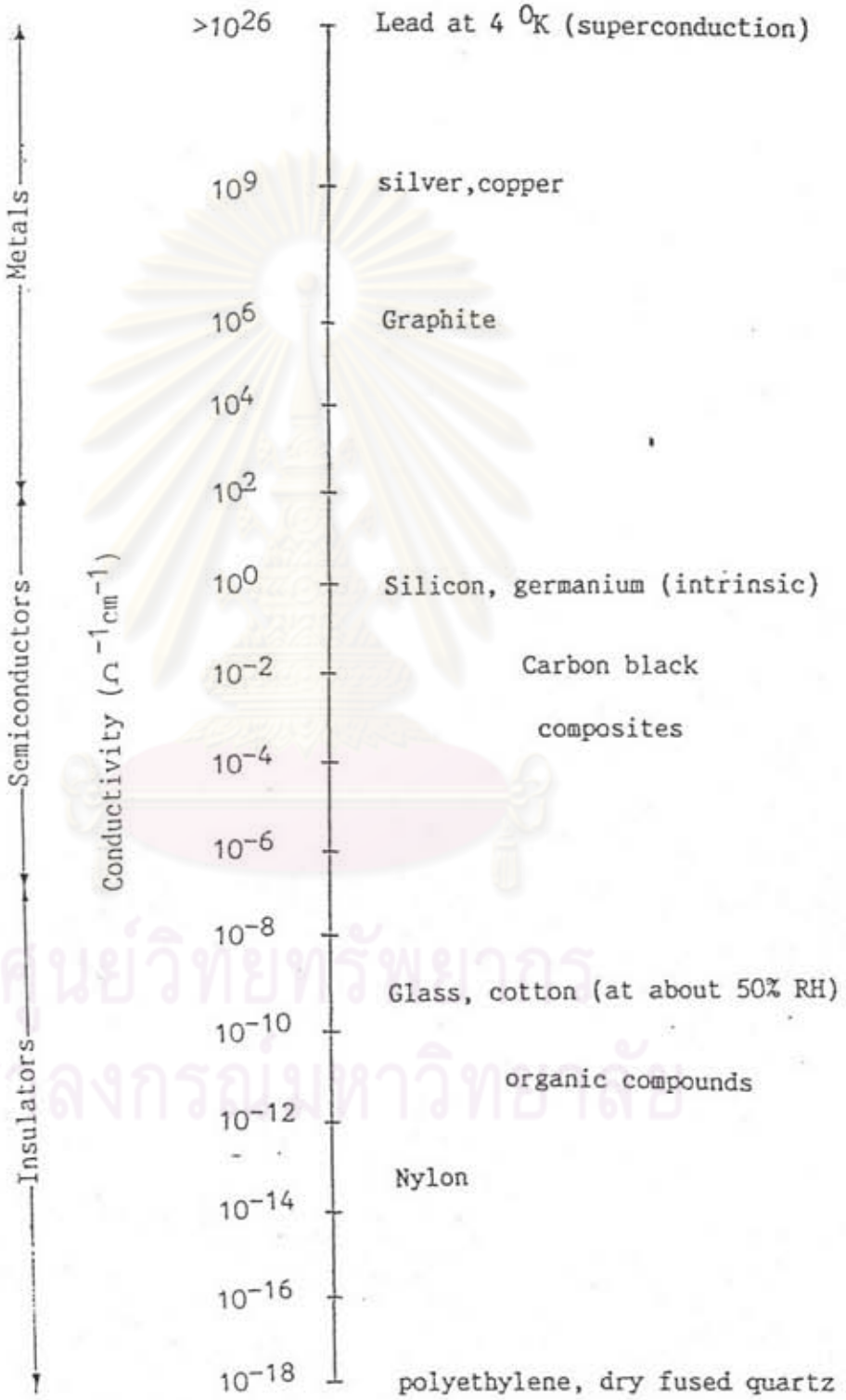
average conductivity ———

of sample 2 = 130.03 Scm^{-1} .

Finally, the average conductivity of polypyrrole (PP_6) colud be calculated by Van der Pauw method to be 133.02 Scm^{-1}

APPENDIX B

THE CONDUCTIVITY OF MATERIAL [42]



VITA

Miss Thanawadee Leejarkpai was born on Jan 12, 1969 in Bangkok. She recieved a Bachelor's Degree of Science in Chemistry from Chulalonkorn University in 1990. She has been a graduate student of the Multidisciplinary Program of Petrochemistry and Polymer, Graduate School, Chulalongkron University, since 1991.