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APPENDICES

Appendix A Determination of Functional Groups in PPV Precursor, PPV, and Doped PPV by Fourier Transform Infrared Spectroscopy

The PPV Precursor, PPV, and doped PPV were characterized by FT-IR spectroscopy in order to identify functional groups. Optical grade KBr (Carlo Erba Reagent) was used as the background material. Ten-mg sample was mixed with 50-mg KBr. An FT-IR spectrum was observed by using an FT-IR spectrometer (Bruker, model EQUOX55/S) in the absorption mode with 32 scans at a reso6lution of 4 cm^{-1}

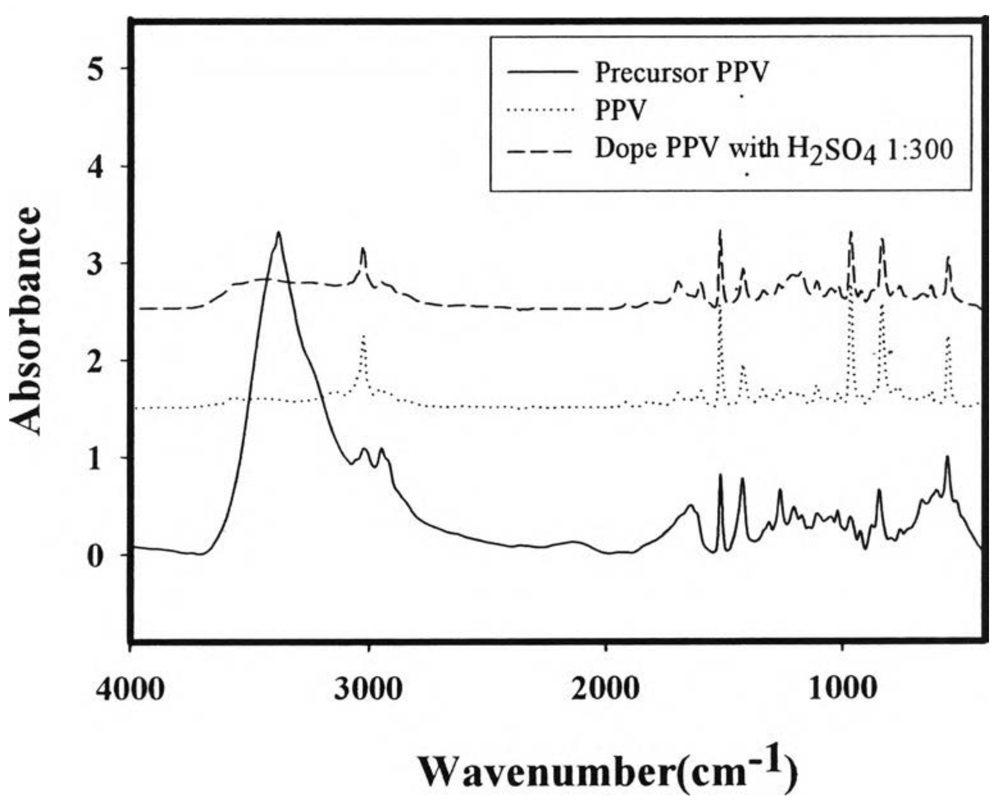


Figure A4 The FT-IR spectra of PPV Precursor, PPV, and doped PPV with a mole ratio of sulfuric acid to monomer unit equal to 300:1.

Table A1 Peak positions from FT-IR spectra of PPV Precursor, PPV, and doped PPV with a mole ratio of sulfuric acid to monomer unit equal to 1:300

Functional groups	**Wavenumber (cm^{-1})**			**References**
	PPV Precursor	**PPV**	**doped PPV**	
Phenylene out of plane ring bending	550±10 (558)	550±10 (557)	550±10 (556)	Çirpan *et al.*,(2002)
C-S stretching	638±10 (637)	–	–	Fernandes *et al.*,(2004)
S-O stretching	–	–	650±10 (664)	Fernandes *et al.*,(2004)
Para-phenylene ring C-H out of plane bending	830±10 (847)	830±10 (836)	830±10 (835)	Peres *et al.*,(2006)
C-H out of plane bending	960±10 (950)	960±10 (964)	960±10 (964)	Peres *et al.*,(2006)
S=O symmetric stretching	–	–	1050±10 (1047)	Fernandes *et al.*,(2004)
Quinoid ring C=C stretching	–	–	1170±10 (1172)	Fernandes *et al.*,(2004)
S=O asymmetric stretching	–	–	1200±10 (1204)	Fernandes *et al.*,(2004)
C-C ring stretching	1517±10 (1515)	1517±10 (1516)	1517±10 (1517)	Peres *et al.*,(2006)
CH_3 symmetric stretching	2872±10 (2880)	2872±10 (2882)	2872±10 (2882)	Çirpan *et al.*,(2002)
CH_3 asymmetric stretching	2960±10 (2946)	2960±10 (2950)	2960±10 (2950)	Çirpan *et al.*,(2002)
Trans vinylene C-H strectching	–	3022±10 (3024)	3022±10 (3023)	Peres *et al.*,(2006)

Identification of peaks in the spectrum are shown in Table A1. PPV Precursor, PPV and sulfuric acid doped PPV were examined by FTIR spectroscopy. The presence of the absorption band near 960 cm^{-1}, resulting from C-H out-of-plane bending, is a characteristic of the trans configuration of the vinylene group (Peres, 2006). The absorption band around 3022 cm^{-1} is due to thetrans vinylene C-H stretching mode. The absorption band around 550 cm^{-1} is attributed to the phenylene out-of-plane ring-bending. The bands at 830 cm^{-1} and 1516 cm^{-1} are assigned to para-phenylene ring C-H out-of-plane bending and C-C ring stretching, respectively. The bands at 2872 and 2960 cm^{-1} represent the CH_3 symmetric and CH_3 asymmetric deformation (Çirpan, 2002). After the heat treatment under vacuum, the intensity of these two bands decrease. The intensity of the absorption band near 3022 cm^{-1} increase due to the elimination of the tetrahydrothiopenyl group and HCl. The absence of the C-S linkage peak at 632 cm^{-1} from tetrahydrothiophene indicate full conversion of the precursor after pyrolysis (Fernandes, (2004). Upon oxidation of PPV, the infrared spectrum shows band at 1170 cm^{-1}. The emergence of this band in the spectra is related with the formation of quinoid structure. The quinoid structure is a result of a break of symmetry of the polymeric chain. The presence of vibrational bands from hydrogensulfate anion the counter ion of the oxidized polymer backbone , at 1200, 1050, and 650 cm^{-1} are due to S=O asymmetric stretching, S=O symmetric stretching, and S-O stretching, respectively (Fernandes, 2004).

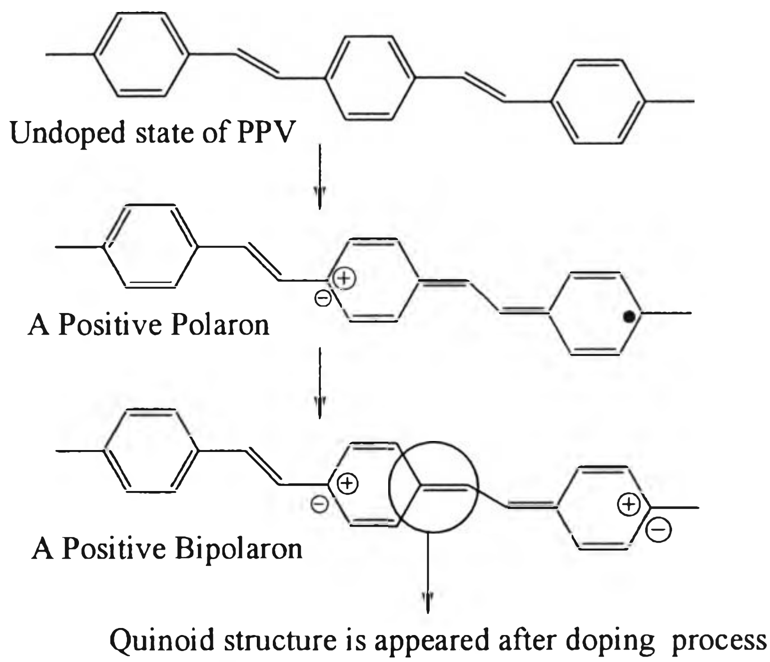


Figure A2 Doping Process.

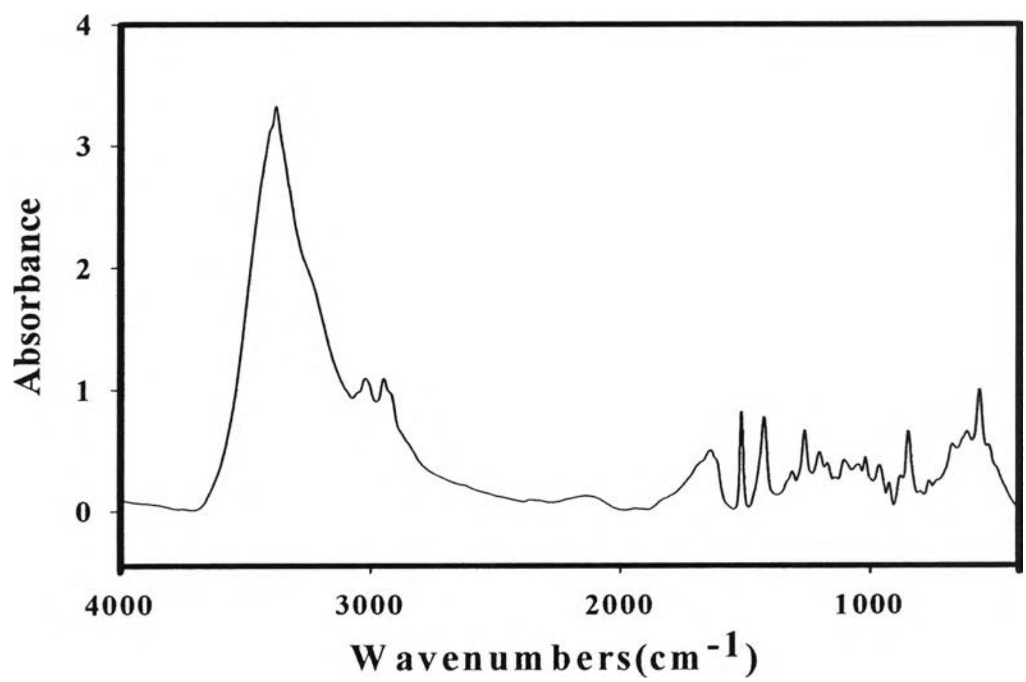


Figure A3 The FT-IR spectra of PPV Precursor.

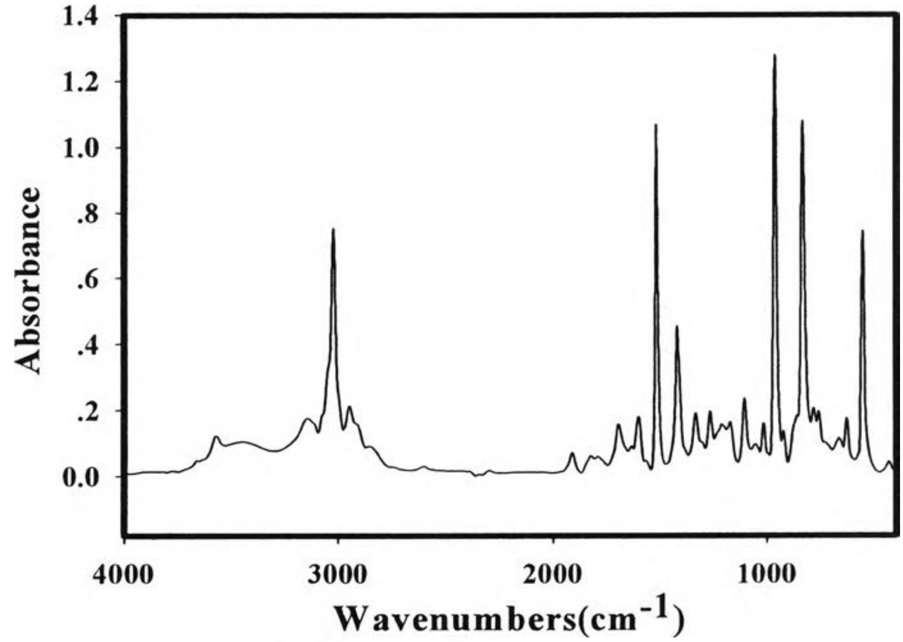


Figure A4 The FT-IR spectra of PPV.

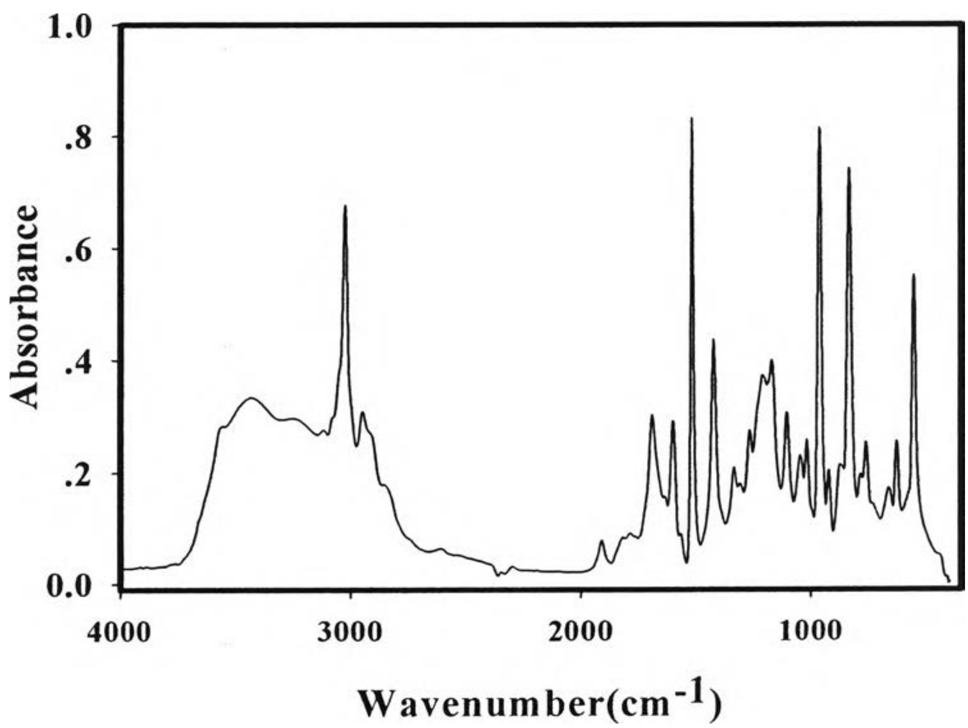


Figure A5 The FT-IR spectra of doped PPV with a mole ratio of sulfuric acid to polymer unit equal to 300:1.

Appendix B The Thermogravimetric Thermogram of PPV Precursor, PPV, and Doped PPV

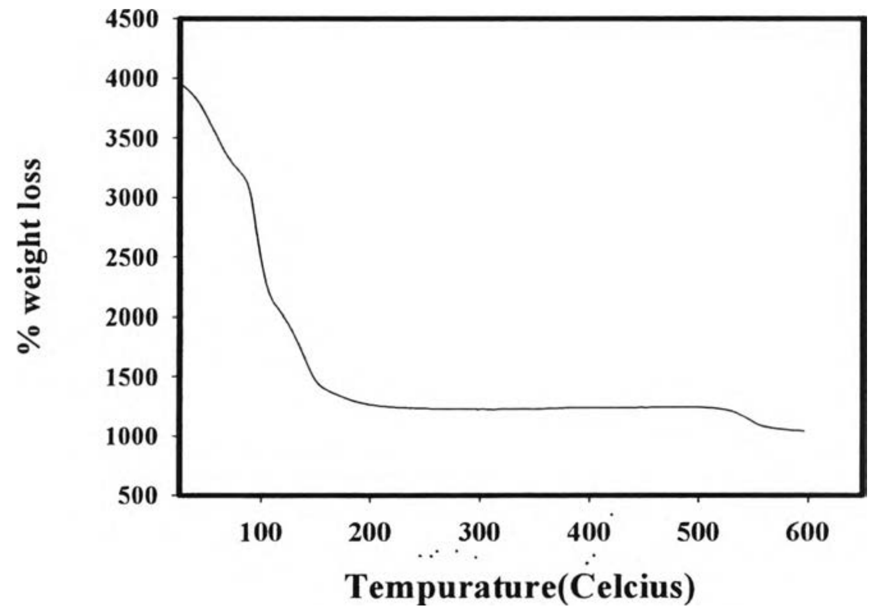


Figure B1 TGA thermogram of Precursor PPV.

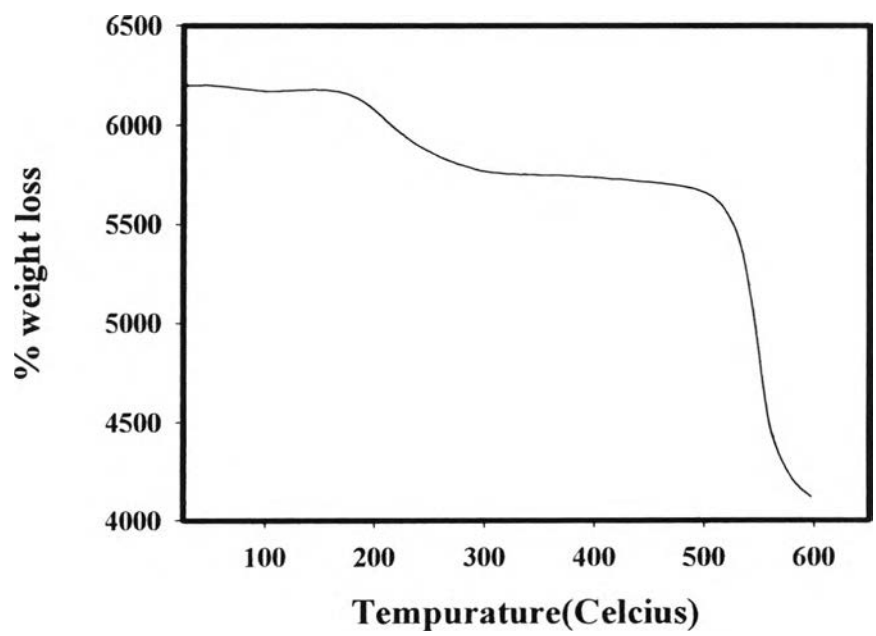


Figure B2 TGA thermogram of PPV

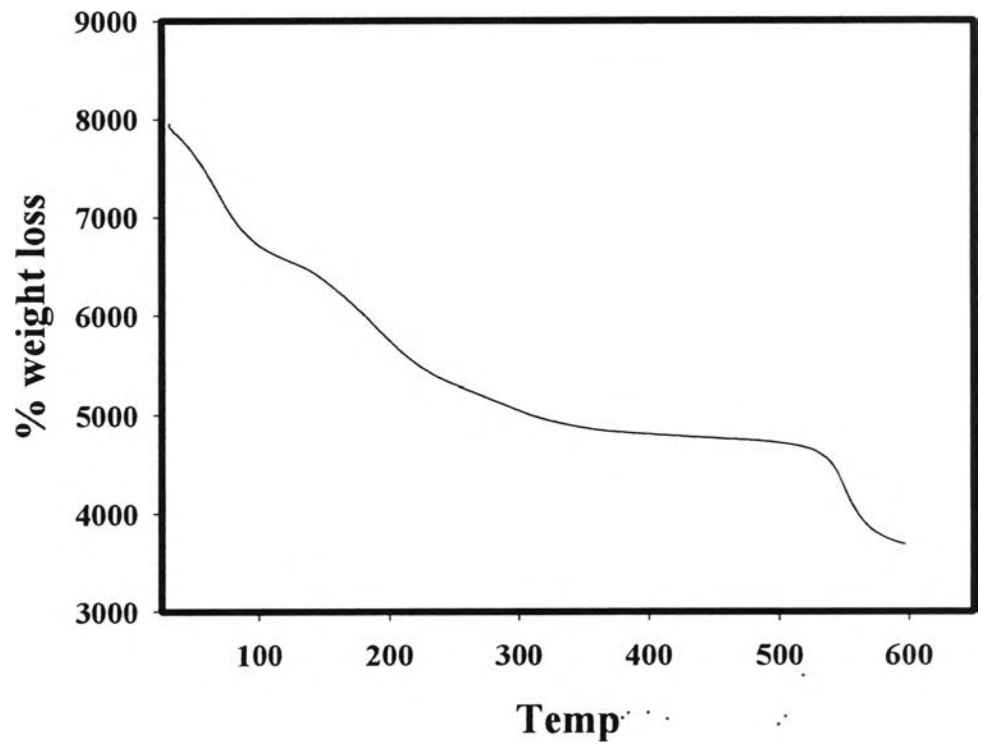


Figure B3 TGA thermogram of dPPV

Table B1 The summary of percent weight loss in the TGA thermogram of PPV Precursor, PPV, and doped PPV

Sample	Transition Temperature (°C)			% Weight Loss			% Residue
	1st	2nd	3rd	1st	2nd	3rd	
PPV Precursor	88-127	150-249	520-550	21.70	10.47	4.90	62.93
PPV	50-110	478-596		6.62	25.2		68.19
300 H_2SO_4 : PPV	30-139	139-269	530-590	20.61	16.55	9.15	53.19

Appendix C Determination of the Correction Factor (K)

The electrical conductivity of sample was measured by two point probe meter.

The meter consists of two probes, that making contact on the surface of thin layer sample. These probes were connected to a source meter (Keithley, Model 6517A) for a constant voltage source and reading the resultant current.

The geometrical correction factor was taken into account of geometric effects, depending on the configuration and probe tip spacing

$$K = \frac{w}{l} \tag{C.1}$$

where K is geometrical correction factor

w is width of probe tip spacing (cm)

l is the length between probe (cm)

This measurement, the constant K value was measured by using a standard sheet with a known resistivity value; we used silicon wafer chips (SiO_2). K was calculated by using Equation C.2.

$$K = \frac{\rho}{R \times t} = \frac{I \times \rho}{V \times t} \tag{C.2}$$

where K = geometric correction factor

ρ = resistivity of standard silicon wafer which were calibrated by using a four point probe at King Mongkut's Institute Technology Lad Krabang (Ω.cm)

t = film thickness (cm)

R = film resistance (Ω)

I = measure current (A)

V = voltage drop (V)

Standard Si wafer were cleaned to remove organic impurities prior to be used according to the standard RCA method (Kern, 1993).

Materials

Acetones (Scharlau, 99.5%), Methanol (CARLO ERBA, 99.9%), Ammonium hydroxide (Merk, 99.9%), Hydrogen peroxide (CARLO ERBA, 30% in water), and dilute (2%) Hydrofuric acid

Experiment

The cleaning procedures contain 3 steps: the solvent clean, the RCA01 and the HF dip. The first step is the solvent clean step, employed to remove oils and organic residues that appeared on Si wafer surface. The Si wafer was placed into the acetone at 55°C for 10 min, removed and placed in methanol for 2-5 min, subsequently rinsed with deionized water and blown dried with nitrogen gas. Second step is the RCA clean, to remove organic residues from silicon wafers. This process oxidized the silicon wafer and left a thin oxide on the surface of the wafer. RCA solution was prepared with 5 parts of water (H_2O), 1 part of 27% ammonium hydroxide (NH_4OH), and 1 part of 30% hydrogen peroxide (H_2O_2). 65 ml of NH_4OH (27%) was added into 325 ml of deionized water in a beaker and then heated to 70 ± 5°C. The mixture would bubble vigorously after 1-2 min, indicated that it was ready to use. Silicon wafer was soaked in the solution for 15 min, consequently overflowed with deionized water in order to rinse and remove the solution. The third step is the HF dip, which was carried out to remove native silicon dioxide from wafer. 480 ml of deionised water was added to the polypropylene bottle and then added to 20 ml HF. Wafer was soaked in this solution for 2 min, removed and checked for hydrophobicity by performing the wetting test. Deionized water was poured onto the surface wafer; the clean silicon surface would shows that the beads of water would roll off. Clean Si wafer was further blown dried with nitrogen and stored in a clean and dry environment.

Table C1 Determination the correction factor of probe 4, 6, A1, A2, A3

Probe	K (correction factor)				
	1	2	3	Average	SD
4	$1.30x10^{-3}$	$1.30x10^{-3}$	$1.30x10^{-3}$	$1.30x10^{-3}$	$2.15x10^{-6}$
6	$7.39x10^{-4}$	$7.49x10^{-4}$	$7.59x10^{-4}$	$1.02x10^{-5}$	$7.49x10^{-4}$
A1	$1.74x10^{-5}$	$1.75x10^{-5}$	$1.75x10^{-5}$	$1.75x10^{-5}$	$3.72x10^{-8}$
A2	$1.94x10^{-5}$	$1.94x10^{-5}$	$1.94x10^{-5}$	$1.94x10^{-5}$	$1.5x10^{-8}$
A3	$2.80x10^{-5}$	$2.81x10^{-5}$	$2.81x10^{-5}$	$2.81x10^{-5}$	$3.02x10^{-8}$

Table C2 Determination the correction factor of probe 4 with standard Si wafer (Temperature 26 ± 1 °C, Humidity 55 ± 1 %) ρ/t = 107.373

Applied Voltage (V)	Measured Current (A)		
	Probe 4		
	1	2	3
0.25	$4.86x10^{-4}$	$4.85x10^{-4}$	$4.87x10^{-4}$
0.30	$5.64x10^{-4}$	$6.00x10^{-4}$	$5.98x10^{-4}$
0.35	$7.13x10^{-4}$	$7.28x10^{-4}$	$7.17x10^{-4}$
0.40	$8.49x10^{-4}$	$8.50x10^{-4}$	$8.53x10^{-4}$
0.45	$9.71x10^{-4}$	$9.49x10^{-4}$	$9.58x10^{-4}$
0.50	$1.07x10^{-3}$	$1.08x10^{-3}$	$1.09x10^{-3}$
0.55	$1.20x10^{-3}$	$1.23x10^{-3}$	$1.22x10^{-3}$
0.60	$1.29x10^{-3}$	$1.29x10^{-3}$	$1.31x10^{-3}$
0.65	$1.41x10^{-3}$	$1.43x10^{-3}$	$1.42x10^{-3}$
0.70	$1.48x10^{-3}$	$1.50x10^{-3}$	$1.50x10^{-3}$
0.75	$1.55x10^{-3}$	$1.55x10^{-3}$	$1.56x10^{-3}$
0.80	$1.61x10^{-3}$	$1.57x10^{-3}$	$1.60x10^{-3}$
0.85	$1.59x10^{-3}$	$1.55x10^{-3}$	$1.57x10^{-3}$
0.90	$1.60x10^{-3}$	$1.61x10^{-3}$	$1.60x10^{-3}$
0.95	$1.59x10^{-3}$	$1.59x10^{-3}$	$1.58x10^{-3}$
1.00	$1.65x10^{-3}$	$1.67x10^{-3}$	$1.61x10^{-3}$
1.05	$1.59x10^{-3}$	$1.56x10^{-3}$	$1.59x10^{-3}$
1.10	$1.54x10^{-3}$	$1.55x10^{-3}$	$1.59x10^{-3}$
1.15	$1.59x10^{-3}$	$1.56x10^{-3}$	$1.59x10^{-3}$
1.20	$1.56x10^{-3}$	$1.56x10^{-3}$	$1.56x10^{-3}$

(Temperature 26 ± 1 °C, Humidity 55 ± 1 %)

Table C3 Determination the correction factor of probe 6 with standard Si wafer (Temperature 26 ± 1 °C, Humidity 55 ± 1 %) ρ/t = 107.373

Applied Voltage (V)	Measured Current (A)		
	Probe 4		
	1	2	3
1.0	$4.23x10^{-4}$	$4.20x10^{-4}$	$4.32x10^{-4}$
1.1	$4.37x10^{-4}$	$4.50x10^{-4}$	$4.65x10^{-4}$
1.2	$4.84x10^{-4}$	$5.08x10^{-4}$	$5.10x10^{-4}$
1.3	$5.41x10^{-4}$	$5.50x10^{-4}$	$5.68x10^{-4}$
1.4	$5.89x10^{-4}$	$5.95x10^{-4}$	$6.25x10^{-4}$
1.5	$6.39x10^{-4}$	$6.32x10^{-4}$	$6.33x10^{-4}$
1.6	$6.14x10^{-4}$	$6.27x10^{-4}$	$6.23x10^{-4}$
1.7	$6.36x10^{-4}$	$6.38x10^{-4}$	$6.52x10^{-4}$
1.8	$6.71x10^{-4}$	$6.99x10^{-4}$	$6.88x10^{-4}$
1.9	$7.11x10^{-4}$	$7.21x10^{-4}$	$7.41x10^{-4}$
2.0	$7.48x10^{-4}$	$7.63x10^{-4}$	$7.70x10^{-4}$
2.1	$7.95x10^{-4}$	$7.91x10^{-4}$	$8.00x10^{-4}$
2.2	$7.94x10^{-4}$	$7.86x10^{-4}$	$7.94x10^{-4}$
2.3	$8.20x10^{-4}$	$8.86x10^{-4}$	$9.11x10^{-4}$
2.4	$9.13x10^{-4}$	$8.72x10^{-4}$	$9.14x10^{-4}$
2.5	$9.27x10^{-4}$	$9.44x10^{-4}$	$9.59x10^{-4}$
2.6	$9.74x10^{-4}$	$9.60x10^{-4}$	$9.55x10^{-4}$
2.7	$9.66x10^{-4}$	$9.89x10^{-4}$	$1.00x10^{-3}$
2.8	$1.05x10^{-3}$	$1.07x10^{-3}$	$1.07x10^{-3}$
2.9	$1.04x10^{-3}$	$1.07x10^{-3}$	$1.06x10^{-3}$

(Temperature 26 ± 1 °C, Humidity 55 ± 1 %)

Table C4 Determination the correction factor of probe A1 with standard Si wafer (Temperature 26 ± 1 °C, Humidity 55 ± 1 %) ρ/t = 19.0107

Applied Voltage (V)	Measured Current (A)		
	Probe 4		
	1	2	3
1.00	7.31×10^{-6}	7.27×10^{-6}	7.44×10^{-6}
1.10	7.97×10^{-6}	8.01×10^{-6}	8.10×10^{-6}
1.20	9.03×10^{-6}	8.87×10^{-6}	8.92×10^{-6}
1.30	9.85×10^{-6}	9.90×10^{-6}	9.97×10^{-6}
1.40	1.09×10^{-5}	1.11×10^{-5}	1.10×10^{-5}
1.50	1.22×10^{-5}	1.24×10^{-5}	1.23×10^{-5}
1.60	1.36×10^{-5}	1.34×10^{-5}	1.36×10^{-5}
1.70	1.53×10^{-5}	1.53×10^{-5}	1.54×10^{-5}
1.80	1.68×10^{-5}	1.69×10^{-5}	1.69×10^{-5}
1.90	1.81×10^{-5}	1.82×10^{-5}	1.82×10^{-5}
2.00	1.92×10^{-5}	1.92×10^{-5}	1.93×10^{-5}
2.10	2.01×10^{-5}	2.01×10^{-5}	2.02×10^{-5}
2.20	2.10×10^{-5}	2.11×10^{-5}	2.10×10^{-5}
2.30	2.17×10^{-5}	2.17×10^{-5}	2.18×10^{-5}
2.40	2.26×10^{-5}	2.24×10^{-5}	2.25×10^{-5}
2.50	2.32×10^{-5}	2.35×10^{-5}	2.34×10^{-5}
2.60	2.40×10^{-5}	2.39×10^{-5}	2.40×10^{-5}
2.70	2.45×10^{-5}	2.48×10^{-5}	2.47×10^{-5}
2.80	2.52×10^{-5}	2.53×10^{-5}	2.52×10^{-5}
2.90	2.59×10^{-5}	2.59×10^{-5}	2.58×10^{-5}

(Temperature 26 ± 1 °C, Humidity 55 ± 1 %)

Table C5 Determination the correction factor of probe A2 with standard Si wafer (Temperature 26 ± 1 °C, Humidity 55 ± 1 %) ρ/t = 19.0107

Applied Voltage (V)	Measured Current (A)		
	Probe 4		
	1	2	3
1.00	$1.37x10^{-5}$	$1.39x10^{-5}$	$1.39x10^{-5}$
1.10	$1.45x10^{-5}$	$1.45x10^{-5}$	$1.46x10^{-5}$
1.20	$1.52x10^{-5}$	$1.51x10^{-5}$	$1.52x10^{-5}$
1.30	$1.58x10^{-5}$	$1.59x10^{-5}$	$1.61x10^{-5}$
1.40	$1.71x10^{-5}$	$1.71x10^{-5}$	$1.71x10^{-5}$
1.50	$1.75x10^{-5}$	$1.74x10^{-5}$	$1.72x10^{-5}$
1.60	$1.79x10^{-5}$	$1.78x10^{-5}$	$1.79x10^{-5}$
1.70	$1.87x10^{-5}$	$1.85x10^{-5}$	$1.85x10^{-5}$
1.80	$1.89x10^{-5}$	$1.93x10^{-5}$	$1.93x10^{-5}$
1.90	$1.95x10^{-5}$	$1.95x10^{-5}$	$1.99x10^{-5}$
2.00	$2.02x10^{-5}$	$2.00x10^{-5}$	$1.97x10^{-5}$
2.10	$2.05x10^{-5}$	$2.04x10^{-5}$	$2.03x10^{-5}$
2.20	$2.09x10^{-5}$	$2.09x10^{-5}$	$2.12x10^{-5}$
2.30	$2.16x10^{-5}$	$2.15x10^{-5}$	$2.12x10^{-5}$
2.40	$2.17x10^{-5}$	$2.18x10^{-5}$	$2.24x10^{-5}$
2.50	$2.25x10^{-5}$	$2.23x10^{-5}$	$2.23x10^{-5}$
2.60	$2.24x10^{-5}$	$2.26x10^{-5}$	$2.24x10^{-5}$
2.70	$2.26x10^{-5}$	$2.25x10^{-5}$	$2.28x10^{-5}$
2.80	$2.33x10^{-5}$	$2.33x10^{-5}$	$2.33x10^{-5}$
2.90	$2.36x10^{-5}$	$2.35x10^{-5}$	$2.35x10^{-5}$

(Temperature 26 ± 1 °C, Humidity 55 ± 1 %)

Table C6 Determination the correction factor of probe A3 with standard Si wafer (Temperature 26 ± 1 °C, Humidity 55 ± 1 %) ρ/t = 19.0107

Applied Voltage (V)	Measured Current (A)		
	Probe 4		
	1	2	3
1.00	$1.16x10^{-5}$	$1.20x10^{-5}$	$1.22x10^{-5}$
1.10	$1.41x10^{-5}$	$1.42x10^{-5}$	$1.44x10^{-5}$
1.20	$1.57x10^{-5}$	$1.56x10^{-5}$	$1.53x10^{-5}$
1.30	$1.74x10^{-5}$	$1.76x10^{-5}$	$1.74x10^{-5}$
1.40	$1.92x10^{-5}$	$1.92x10^{-5}$	$1.94x10^{-5}$
1.50	$2.14x10^{-5}$	$2.15x10^{-5}$	$2.18x10^{-5}$
1.60	$2.33x10^{-5}$	$2.34x10^{-5}$	$2.33x10^{-5}$
1.70	$2.49x10^{-5}$	$2.51x10^{-5}$	$2.52x10^{-5}$
1.80	$2.91x10^{-5}$	$2.93x10^{-5}$	$2.97x10^{-5}$
1.90	$3.21x10^{-5}$	$3.25x10^{-5}$	$3.39x10^{-5}$
2.00	$3.60x10^{-5}$	$3.58x10^{-5}$	$3.58x10^{-5}$
2.10	$3.55x10^{-5}$	$3.42x10^{-5}$	$3.43x10^{-5}$
2.20	$3.35x10^{-5}$	$3.29x10^{-5}$	$3.28x10^{-5}$
2.30	$3.27x10^{-5}$	$3.32x10^{-5}$	$3.33x10^{-5}$
2.40	$3.42x10^{-5}$	$3.43x10^{-5}$	$3.32x10^{-5}$
2.50	$3.39x10^{-5}$	$3.40x10^{-5}$	$3.43x10^{-5}$
2.60	$3.54x10^{-5}$	$3.57x10^{-5}$	$3.54x10^{-5}$
2.70	$3.64x10^{-5}$	$3.65x10^{-5}$	$3.65x10^{-5}$
2.80	$3.72x10^{-5}$	$3.75x10^{-5}$	$3.72x10^{-5}$
2.90	$3.76x10^{-5}$	$3.69x10^{-5}$	$3.68x10^{-5}$

(Temperature 26 ± 1 °C, Humidity 55 ± 1 %)

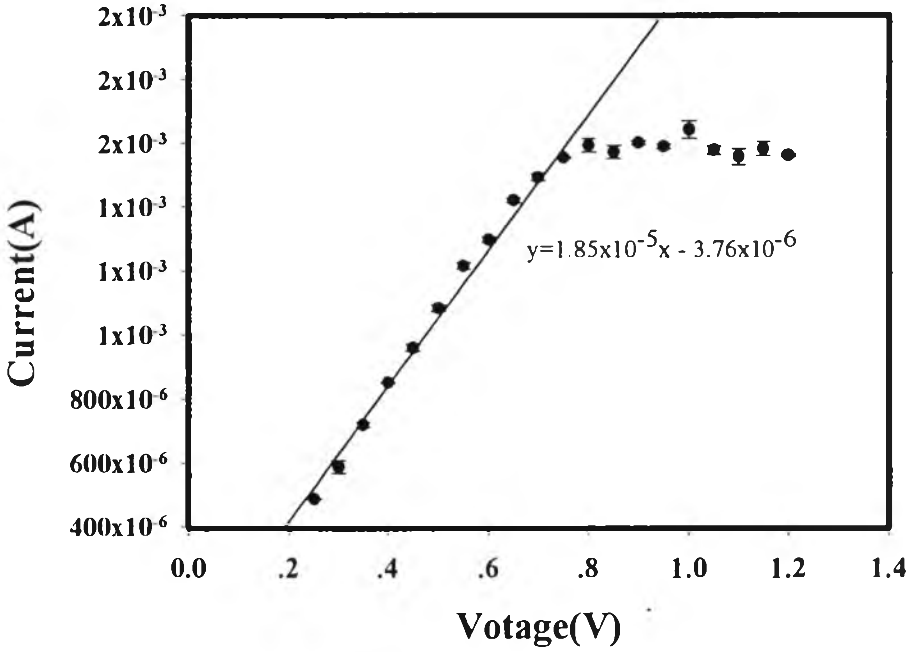


Figure C1 Ohmic regime of probe 4.

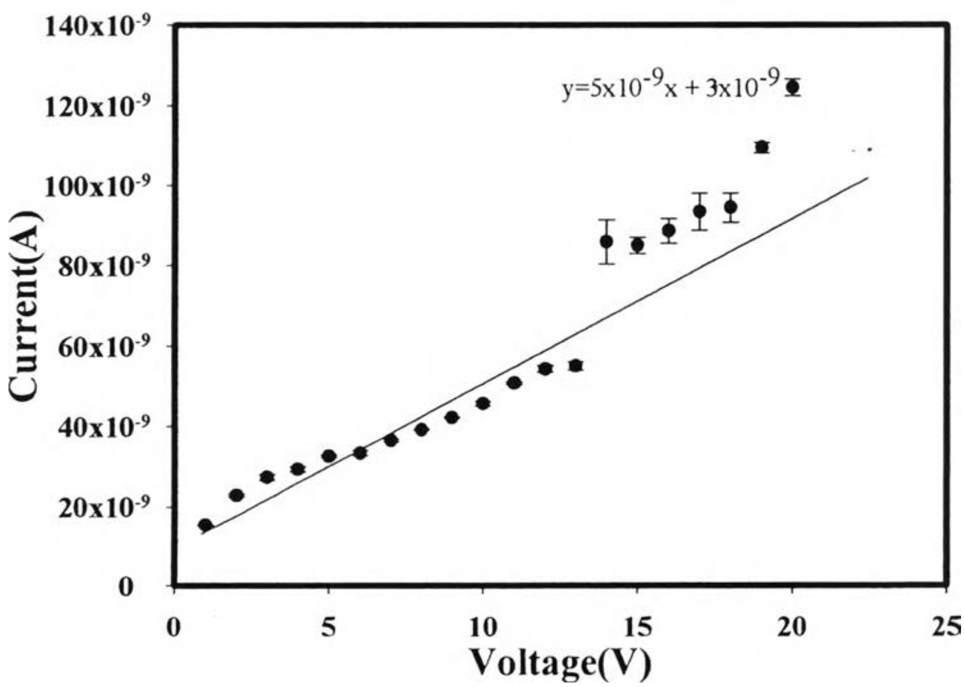


Figure C2 Ohmic regime of probe 6.

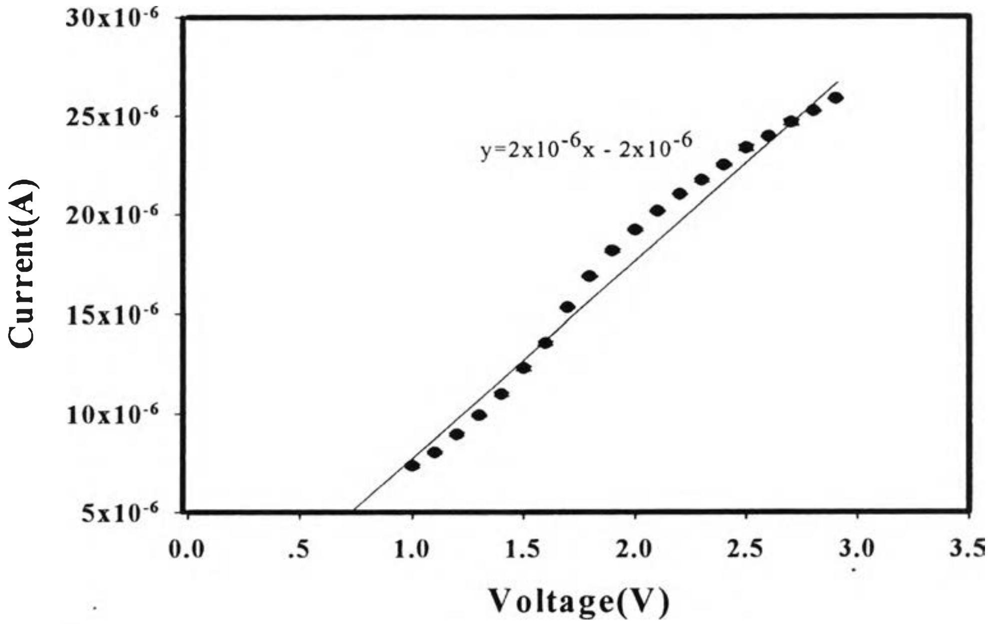


Figure C3 Linear regime of probe A1

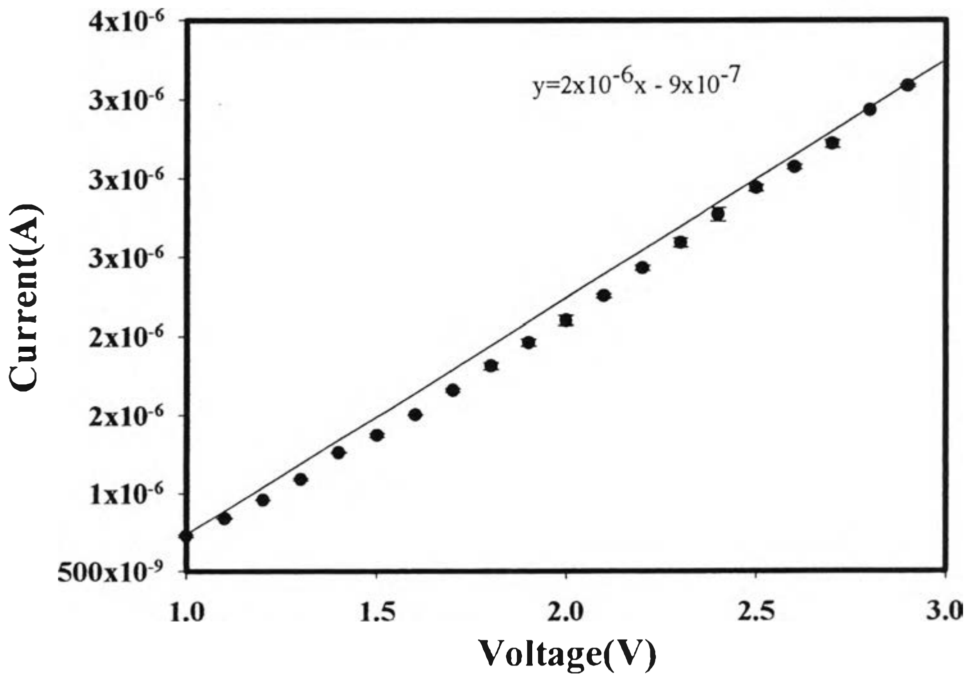


Figure C4 Linear regime of probe A2.

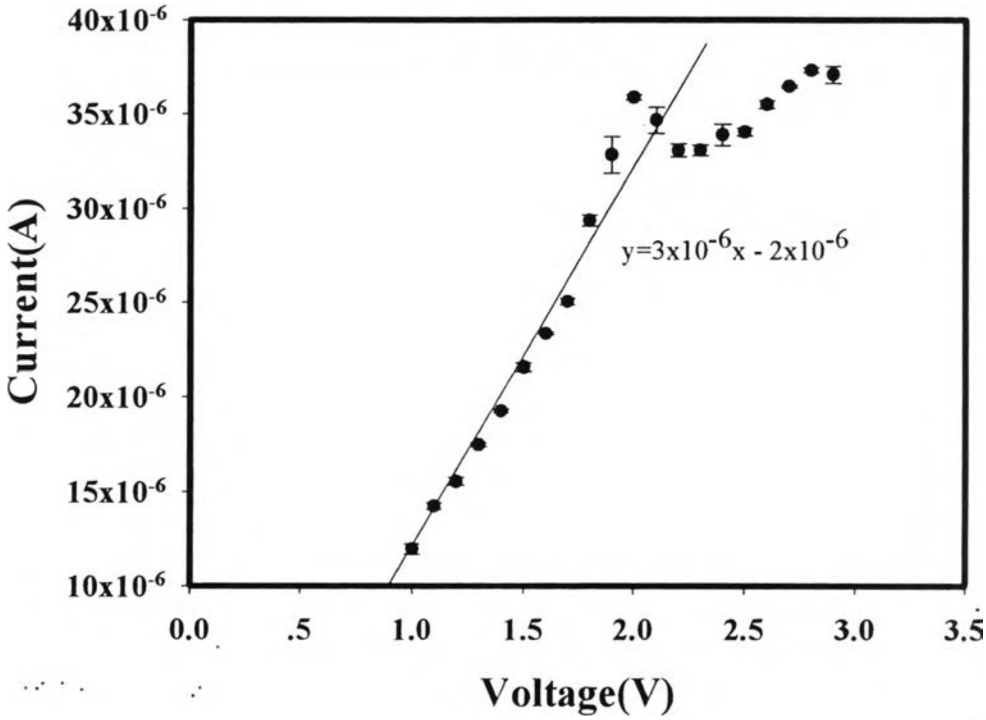


Figure C5 Linear regime of probe A3.

Appendix D Conductivity Measurement

The specific conductivity, which is the inversion of specific resistivity (ρ) of undoped PPV, doped PPV, Zeolite Y (Si/Al= 5.1 Na^{+}), Zeolite Y (Si/Al= 5.1 NH_3^{+}), Zeolite Y (Si/Al= 5.1 H^{+}), Zeolite Y (Si/Al= 30 H^{+}), Zeolite Y (Si/Al= 60 H^{+}), and Zeolite Y (Si/Al= 80 H^{+}) pellets were measured by using the two-point probe connected to a source meter (Keithley, Model 6517A) for a constant voltage source and reading resultant current . The thickness of pellets was measured by a thickness gauge. The applied voltage was plotted versus the current change to determine the linear ohmic regime of each sample. The applied voltage and the current change in the linear ohmic regime were converted to the electrical conductivity of the polymer by using equation (D.1) as follows:

$$\sigma = \frac{1}{\rho} = \frac{1}{R_s \times t} = \frac{I}{K \times V \times t} \qquad \text{(J.1)}$$

where
- σ = specific conductivity (S/cm)
- ρ = specific resistivity (Ω.cm),
- R_s = sheet resistivity (Ω)
- I = measured current (A)
- K = geometric correction factor
- V = applied voltage (voltage drop) (V)
- t = pellet thickness (cm).

Table D1 Determination the specific conductivity (S/cm) of undoped and doped PPV , Zeolite Y (Si/Al= 5.1 Na^+), Zeolite Y (Si/Al= 5.1 NH_3^+), Zeolite Y (Si/Al= 5.1 H^+), Zeolite Y (Si/Al= 30 H^+), Zeolite Y (Si/Al= 60 H^+), and Zeolite Y (Si/Al= 80 H^+)

Sample	Specific conductivity (S.cm)	STD
PPV	$1.97x10^{-6}$	$1.60x10^{-8}$
50 H_2SO_4 : PPV	$2.08x10^{-5}$	$6.17x10^{-8}$
100 H_2SO_4 : PPV	$5.03x10^{-1}$	$1.10x10^{-2}$
200 H_2SO_4 : PPV	$3.07x10^{1}$	$1.43x10^{-1}$
300 H_2SO_4 : PPV	$1.17x10^{3}$	$5.43x10^{-1}$
Zeolite Y (Si/Al = 5.1, Na^+)	$1.62x10^{-5}$	$4.43x10^{-7}$
Zeolite Y (Si/Al = 5.1,$NH3^+$)	$1.13x10^{-5}$	$3.44x10^{-6}$
Zeolite Y (Si/Al = 5.1, H^+)	$3.37x10^{-5}$	$7.01x10^{-6}$
Zeolite Y (Si/Al = 30, H^+)	$2.46x10^{-3}$	$2.54x10^{-3}$
Zeolite Y (Si/Al = 60, H^+)	$3.86x10^{-3}$	$3.33x10^{-3}$
Zeolite Y (Si/Al = 80, H^+)	$2.97x10^{-3}$	$2.24x10^{-3}$

Table D2 Determination the specific conductivity (S/cm) of PPV /10 Zeolite Y (Si/Al = 5.1, Na^+) , PPV /Zeolite Y (Si/Al= 5.1 $NH3^+$), PPV- /Zeolite Y (Si/Al= 5.1 H^+), PPV /Zeolite Y (Si/Al= 30 H^+), PPV /Zeolite Y (Si/Al= 60 H^+), and PPV /Zeolite Y (Si/Al= 80 H^+)

Sample	Specific conductivity (S.cm)	STD
PPV/90Zeolite Y (Si/Al = 5.1, Na^+)	$2.79x10^{-3}$	$7.22x10^{-6}$
PPV/90Zeolite Y (Si/Al= 5.1 $NH3^+$)	$2.49x10^{-5}$	$6.23x10^{-8}$
PPV/90Zeolite Y (Si/Al= 5.1 H^+)	$3.78x10^{-2}$	$6.92x10^{-7}$
PPV/90Zeolite Y (Si/Al= 30 H^+)	$1.06x10^{-2}$	$3.07x10^{-3}$
PPV/90Zeolite Y (Si/Al= 60 H^+)	$2.00x10^{-4}$	$2.83x10^{-7}$
PPV/90Zeolite Y (Si/Al= 80 H^+)	$2.53x10^{-4}$	$1.02x10^{-6}$

Table D3 Determination the specific conductivity (S/cm) of PPV_300 H_2SO_4/90 Zeolite Y (Si/Al = 5.1, Na^+) , PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 5.1 NH_3^+), PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 5.1 H^+), PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 30 H^+), PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 60 H^+), and PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 80 H^+).

Sample	Specific conductivity (S.cm)	STD
PPV_300H_2SO_4/90Zeolite Y (Si/Al = 5.1, Na^+)	$2.77x10^{-2}$	$4.86x10^{-4}$
PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 5.1 NH_3^+)	$1.31x10^{-3}$	$2.33x10^{-4}$
PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 5.1 H^+)	$2.71x10^{-2}$	$1.79x10^{-2}$
PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 30 H^+)	$6.15x10^{-2}$	$2.19x10^{-3}$
PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 60 H^+)	$1.47x10^{-2}$	$2.04x10^{-3}$
PPV_300 H_2SO_4/90Zeolite Y (Si/Al= 80 H^+)	$1.56x10^{-2}$	$4.98 x10^{-3}$

Table D4 The raw data of the determination of linear regime of poly*(para*-phenylene vinylene).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
PPV	0.0652	5	1.03 x10^{-9}	1.00 x10^{-9}	9.84 x10^{-10}	2.43 x10^{-6}	2.37 x10^{-6}	2.32 x10^{-6}
		6	1.15 x10^{-9}	1.13 x10^{-9}	1.12 x10^{-9}	2.27 x10^{-6}	2.23 x10^{-6}	2.21 x10^{-6}
		7	1.30 x10^{-9}	1.26 x10^{-9}	1.24 x10^{-9}	2.18 x10^{-6}	2.12 x10^{-6}	2.10 x10^{-6}
		8	1.45 x10^{-9}	1.42 x10^{-9}	1.41 x10^{-9}	2.14 x10^{-6}	2.09 x10^{-6}	2.08 x10^{-6}
		9	1.58 x10^{-9}	1.57 x10^{-9}	1.56 x10^{-9}	2.07 x10^{-6}	2.06 x10^{-6}	2.05 x10^{-6}
		10	1.73 x10^{-9}	1.72 x10^{-9}	1.70 x10^{-9}	2.04 x10^{-6}	2.03 x10^{-6}	2.01 x10^{-6}
		11	1.87 x10^{-9}	1.86 x10^{-9}	1.85 x10^{-9}	2.01 x10^{-6}	2.00 x10^{-6}	1.99 x10^{-6}
		12	2.03 x10^{-9}	2.00 x10^{-9}	1.98 x10^{-9}	1.99 x10^{-6}	1.96 x10^{-6}	1.95 x10^{-6}
		13	2.15 x10^{-9}	2.16 x10^{-9}	2.14 x10^{-9}	1.95 x10^{-6}	1.96 x10^{-6}	1.94 x10^{-6}
		14	2.30 x10^{-9}	2.26 x10^{-9}	2.25 x10^{-9}	1.94 x10^{-6}	1.91 x10^{-6}	1.90 x10^{-6}
		15	2.46 x10^{-9}	2.44 x10^{-9}	2.41 x10^{-9}	1.93 x10^{-6}	1.92 x10^{-6}	1.90 x10^{-6}
		16	2.59 x10^{-9}	2.56 x10^{-9}	2.55 x10^{-9}	1.91 x10^{-6}	1.89 x10^{-6}	1.88 x10^{-6}
		17	2.71 x10^{-9}	2.70 x10^{-9}	2.69 x10^{-9}	1.88 x10^{-6}	1.87 x10^{-6}	1.87 x10^{-6}
		18	2.85 x10^{-9}	2.83 x10^{-9}	2.82 x10^{-9}	1.87 x10^{-6}	1.85 x10^{-6}	1.85 x10^{-6}
		19	2.97 x10^{-9}	2.96 x10^{-9}	2.96 x10^{-9}	1.84 x10^{-6}	1.84 x10^{-6}	1.84 x10^{-6}
		20	3.18 x10^{-9}	3.20 x10^{-9}	3.17 x10^{-9}	1.88 x10^{-6}	1.89 x10^{-6}	1.87 x10^{-6}
		21	3.35 x10^{-9}	3.34 x10^{-9}	3.32 x10^{-9}	1.88 x10^{-6}	1.88 x10^{-6}	1.87 x10^{-6}
		22	3.48 x10^{-9}	3.48 x10^{-9}	3.46 x10^{-9}	1.87 x10^{-6}	1.86 x10^{-6}	1.85 x10^{-6}
		23	3.63 x10^{-9}	3.60 x10^{-9}	3.59 x10^{-9}	1.86 x10^{-6}	1.85 x10^{-6}	1.84 x10^{-6}
		24	3.74 x10^{-9}	3.73 x10^{-9}	3.74 x10^{-9}	1.84 x10^{-6}	1.83 x10^{-6}	1.84 x10^{-6}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 2.366x10^{-3}, Probe 4)

Table D5 The raw data of the determination of linear regime of Doped poly*(para*-phenylene vinylene) at 50 H_2SO_4 : PPV.

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
Doped PPV 1:50	0.0038	1.00×10^{-1}	1.68×10^{-11}	1.71×10^{-11}	1.71×10^{-11}	3.40×10^{-5}	3.46×10^{-5}	3.46×10^{-5}
		2.00×10^{-1}	2.59×10^{-11}	2.56×10^{-11}	2.59×10^{-11}	2.62×10^{-5}	2.59×10^{-5}	2.62×10^{-5}
		3.00×10^{-1}	3.46×10^{-11}	3.42×10^{-11}	3.43×10^{-11}	2.33×10^{-5}	2.31×10^{-5}	2.31×10^{-5}
		4.00×10^{-1}	4.20×10^{-11}	4.47×10^{-11}	4.38×10^{-11}	2.12×10^{-5}	2.26×10^{-5}	2.22×10^{-5}
		5.00×10^{-1}	5.00×10^{-11}	4.99×10^{-11}	4.99×10^{-11}	2.02×10^{-5}	2.02×10^{-5}	2.02×10^{-5}
		6.00×10^{-1}	5.88×10^{-11}	5.86×10^{-11}	5.97×10^{-11}	1.98×10^{-5}	1.98×10^{-5}	2.01×10^{-5}
		7.00×10^{-1}	6.60×10^{-11}	6.60×10^{-11}	6.64×10^{-11}	1.91×10^{-5}	1.91×10^{-5}	1.92×10^{-5}
		8.00×10^{-1}	7.31×10^{-11}	7.35×10^{-11}	7.43×10^{-11}	1.85×10^{-5}	1.86×10^{-5}	1.88×10^{-5}
		9.00×10^{-1}	7.97×10^{-11}	8.08×10^{-11}	8.26×10^{-11}	1.79×10^{-5}	1.82×10^{-5}	1.86×10^{-5}
		1.00	1.09×10^{-10}	1.04×10^{-10}	1.09×10^{-10}	2.21×10^{-5}	2.11×10^{-5}	2.21×10^{-5}
		1.10	1.13×10^{-10}	1.11×10^{-10}	1.11×10^{-10}	2.07×10^{-5}	2.03×10^{-5}	2.04×10^{-5}
		1.20	1.18×10^{-10}	1.17×10^{-10}	1.20×10^{-10}	1.99×10^{-5}	1.97×10^{-5}	2.02×10^{-5}
		1.30	1.27×10^{-10}	1.25×10^{-10}	1.25×10^{-10}	1.97×10^{-5}	1.95×10^{-5}	1.94×10^{-5}
		1.40	1.34×10^{-10}	1.34×10^{-10}	1.33×10^{-10}	1.93×10^{-5}	1.94×10^{-5}	1.92×10^{-5}
		1.50	1.41×10^{-10}	1.41×10^{-10}	1.42×10^{-10}	1.91×10^{-5}	1.90×10^{-5}	1.91×10^{-5}
		1.60	1.49×10^{-10}	1.49×10^{-10}	1.49×10^{-10}	1.89×10^{-5}	1.88×10^{-5}	1.88×10^{-5}
		1.70	1.57×10^{-10}	1.58×10^{-10}	1.58×10^{-10}	1.87×10^{-5}	1.88×10^{-5}	1.88×10^{-5}
		1.80	1.66×10^{-10}	1.68×10^{-10}	1.66×10^{-10}	1.86×10^{-5}	1.89×10^{-5}	1.86×10^{-5}
		1.90	1.76×10^{-10}	1.75×10^{-10}	1.75×10^{-10}	1.87×10^{-5}	1.86×10^{-5}	1.86×10^{-5}
		2.00	1.86×10^{-10}	1.84×10^{-10}	1.86×10^{-10}	1.88×10^{-5}	1.86×10^{-5}	1.88×10^{-5}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 2.366×10^{-3}, Probe 4)

Table D6 The raw data of the determination of linear regime of Doped poly*(para-*phenylene vinylene) at 100 H_2SO_4 : PPV.

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (s/cm)		
Doped PPV 1:100	1.19×10^{-2}	1.00×10^{-2}	3.21×10^{-11}	3.20×10^{-11}	3.16×10^{-11}	8.08×10^{-2}	8.05×10^{-2}	7.94×10^{-2}
		4.00×10^{-2}	3.50×10^{-11}	3.50×10^{-11}	3.49×10^{-11}	8.81×10^{-2}	8.80×10^{-2}	8.78×10^{-2}
		7.00×10^{-2}	3.87×10^{-11}	3.86×10^{-11}	3.86×10^{-11}	9.74×10^{-2}	9.72×10^{-2}	9.71×10^{-2}
		1.00×10^{-1}	4.28×10^{-11}	4.29×10^{-11}	4.26×10^{-11}	1.08×10^{-1}	1.08×10^{-1}	1.07×10^{-1}
		2.00×10^{-1}	5.47×10^{-11}	5.45×10^{-11}	5.45×10^{-11}	1.38×10^{-1}	1.37×10^{-1}	1.37×10^{-1}
		3.00×10^{-1}	6.44×10^{-11}	6.44×10^{-11}	6.51×10^{-11}	1.62×10^{-1}	1.62×10^{-1}	1.64×10^{-1}
		4.00×10^{-1}	7.53×10^{-11}	7.56×10^{-11}	7.53×10^{-11}	1.90×10^{-1}	1.90×10^{-1}	1.89×10^{-1}
		5.00×10^{-1}	8.62×10^{-11}	8.64×10^{-11}	8.62×10^{-11}	2.17×10^{-1}	2.17×10^{-1}	2.17×10^{-1}
		6.00×10^{-1}	9.69×10^{-11}	9.69×10^{-11}	9.66×10^{-11}	2.44×10^{-1}	2.44×10^{-1}	2.43×10^{-1}
		7.00×10^{-1}	1.07×10^{-10}	1.07×10^{-10}	1.07×10^{-10}	2.69×10^{-1}	2.70×10^{-1}	2.70×10^{-1}
		8.00×10^{-1}	1.18×10^{-10}	1.18×10^{-10}	1.18×10^{-10}	2.97×10^{-1}	2.97×10^{-1}	2.96×10^{-1}
		9.00×10^{-1}	1.27×10^{-10}	1.28×10^{-10}	1.29×10^{-10}	3.20×10^{-1}	3.22×10^{-1}	3.23×10^{-1}
		1.00E+00	1.34×10^{-10}	1.36×10^{-10}	1.39×10^{-10}	3.38×10^{-1}	3.41×10^{-1}	3.49×10^{-1}
		1.10E+00	1.33×10^{-10}	1.35×10^{-10}	1.37×10^{-10}	3.35×10^{-1}	3.39×10^{-1}	3.46×10^{-1}
		1.20E+00	1.53×10^{-10}	1.49×10^{-10}	1.45×10^{-10}	3.85×10^{-1}	3.75×10^{-1}	3.65×10^{-1}
		1.30E+00	1.64×10^{-10}	1.64×10^{-10}	1.64×10^{-10}	4.13×10^{-1}	4.11×10^{-1}	4.14×10^{-1}
		1.40E+00	1.77×10^{-10}	1.77×10^{-10}	1.75×10^{-10}	4.46×10^{-1}	4.45×10^{-1}	4.41×10^{-1}
		1.50E+00	1.90×10^{-10}	1.88×10^{-10}	1.88×10^{-10}	4.79×10^{-1}	4.73×10^{-1}	4.72×10^{-1}
		1.60E+00	1.92×10^{-10}	1.95×10^{-10}	1.96×10^{-10}	4.84×10^{-1}	4.91×10^{-1}	4.93×10^{-1}
		1.70E+00	2.04×10^{-10}	2.01×10^{-10}	1.95×10^{-10}	5.13×10^{-1}	5.05×10^{-1}	4.91×10^{-1}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 2.366×10^{-3}, Probe 4)

Table D7 The raw data of the determination of linear regime of Doped poly*(para*-phenylene vinylene) at 200 H_2SO_4 : PPV.

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (s/cm)		
Doped PPV 1:200	0.0325	1.00	$1.27 x10^{-7}$	$1.371 x10^{-7}$	$1.22 x10^{-7}$	$7.22 x10^{1}$	$7.79 x10^{1}$	$6.95 x10^{1}$
		1.10	$1.40 x10^{-7}$	$1.41 x10^{-7}$	$1.40 x10^{-7}$	$7.95 x10^{1}$	$8.01 x10^{1}$	$7.94 x10^{1}$
		1.20	$1.60 x10^{-7}$	$1.612 x10^{-7}$	$1.62 x10^{-7}$	$9.12 x10^{1}$	$9.16 x10^{1}$	$9.23 x10^{1}$
		1.30	$1.81 x10^{-7}$	$1.884 x10^{-7}$	$1.84 x10^{-7}$	$1.03 x10^{2}$	$1.07 x10^{2}$	$1.05 x10^{2}$
		1.40	$2.14 x10^{-7}$	$2.087 x10^{-7}$	$2.10 x10^{-7}$	$1.21 x10^{2}$	$1.19 x10^{2}$	$1.19 x10^{2}$
		1.50	$2.43 x10^{-7}$	$2.403 x10^{-7}$	$2.40 x10^{-7}$	$1.38 x10^{2}$	$1.37 x10^{2}$	$1.37 x10^{2}$
		1.60	$2.73 x10^{-7}$	$2.647 x10^{-7}$	$2.45 x10^{-7}$	$1.55 x10^{2}$	$1.50 x10^{2}$	$1.39 x10^{2}$
		1.70	$2.81 x10^{-7}$	$2.892 x10^{-7}$	$2.89 x10^{-7}$	$1.60 x10^{2}$	$1.64 x10^{2}$	$1.64 x10^{2}$
		1.80	$3.06 x10^{-7}$	$3.028 x10^{-7}$	$3.03 x10^{-7}$	$1.74 x10^{2}$	$1.72 x10^{2}$	$1.72 x10^{2}$
		1.90	$3.29 x10^{-7}$	$3.216 x10^{-7}$	$3.19 x10^{-7}$	$1.87 x10^{2}$	$1.83 x10^{2}$	$1.81 x10^{2}$
		2.00	$3.42 x10^{-7}$	$3.375 x10^{-7}$	$3.56 x10^{-7}$	$1.94 x10^{2}$	$1.92 x10^{2}$	$2.02 x10^{2}$
		2.10	$3.61 x10^{-7}$	$3.712 x10^{-7}$	$3.61 x10^{-7}$	$2.05 x10^{2}$	$2.11 x10^{2}$	$2.05 x10^{2}$
		2.20	$3.83 x10^{-7}$	$3.856 x10^{-7}$	$3.85 x10^{-7}$	$2.18 x10^{2}$	$2.19 x10^{2}$	$2.19 x10^{2}$
		2.30	$4.43 x10^{-7}$	$4.469 x10^{-7}$	$4.48 x10^{-7}$	$2.51 x10^{2}$	$2.54 x10^{2}$	$2.54 x10^{2}$
		2.40	$5.57 x10^{-7}$	$5.567 x10^{-7}$	$5.59 x10^{-7}$	$3.16 x10^{2}$	$3.16 x10^{2}$	$3.18 x10^{2}$
		2.50	$6.93 x10^{-7}$	$7.058 x10^{-7}$	$7.06 x10^{-7}$	$3.94 x10^{2}$	$4.01 x10^{2}$	$4.01 x10^{2}$
		2.60	$8.43 x10^{-7}$	$8.367 x10^{-7}$	$8.12 x10^{-7}$	$4.79 x10^{2}$	$4.75 x10^{2}$	$4.61 x10^{2}$
		2.70	$9.16 x10^{-7}$	$9.188 x10^{-7}$	$8.82 x10^{-7}$	$5.20 x10^{2}$	$5.22 x10^{2}$	$5.01 x10^{2}$
		2.80	$9.79 x10^{-7}$	$9.64 x10^{-7}$	$9.79 x10^{-7}$	$5.56 x10^{2}$	$5.47 x10^{2}$	$5.56 x10^{2}$
		2.90	$1.08 x10^{-6}$	$1.034 x10^{-6}$	$1.07 x10^{-6}$	$6.13 x10^{2}$	$5.87 x10^{2}$	$6.10 x10^{2}$

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = $2.366x10^{-3}$, Probe 4)

Table D8 The raw data of the determination of linear regime of Doped poly*(para*-phenylene vinylene) at 300 H_2SO_4 : PPV.

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
Doped PPV 1:300	0.00326	1.00	1.67 x10^{-7}	1.72 x10^{-7}	1.75 x10^{-7}	1.03 x10^{3}	1.06 x10^{3}	1.07 x10^{3}
		1.10	2.02 x10^{-7}	2.19 x10^{-7}	2.22 x10^{-7}	1.12 x10^{3}	1.22 x10^{3}	1.24 x10^{3}
		1.20	2.40 x10^{-7}	2.40 x10^{-7}	2.45 x10^{-7}	1.23 x10^{3}	1.23 x10^{3}	1.25 x10^{3}
		1.30	2.70 x10^{-7}	2.69 x10^{-7}	2.68 x10^{-7}	1.27 x10^{3}	1.27 x10^{3}	1.26 x10^{3}
		1.40	2.89 x10^{-7}	2.86 x10^{-7}	2.89 x10^{-7}	1.27 x10^{3}	1.25 x10^{3}	1.26 x10^{3}
		1.50	3.09 x10^{-7}	3.07 x10^{-7}	3.03 x10^{-7}	1.26 x10^{3}	1.26 x10^{3}	1.24 x10^{3}
		1.60	3.34 x10^{-7}	3.31 x10^{-7}	3.28 x10^{-7}	1.28 x10^{3}	1.27 x10^{3}	1.26 x10^{3}
		1.70	3.50 x10^{-7}	3.46 x10^{-7}	3.43 x10^{-7}	1.26 x10^{3}	1.25 x10^{3}	1.24 x10^{3}
		1.80	3.58 x10^{-7}	3.53 x10^{-7}	3.50 x10^{-7}	1.22 x10^{3}	1.20 x10^{3}	1.19 x10^{3}
		1.90	3.70 x10^{-7}	3.67 x10^{-7}	3.64 x10^{-7}	1.20 x10^{3}	1.18 x10^{3}	1.18 x10^{3}
		2.00	3.84 x10^{-7}	3.70 x10^{-7}	3.79 x10^{-7}	1.18 x10^{3}	1.14 x10^{3}	1.16 x10^{3}
		2.10	3.79 x10^{-7}	3.79 x10^{-7}	3.79 x10^{-7}	1.11 x10^{3}	1.11 x10^{3}	1.11 x10^{3}
		2.20	3.80 x10^{-7}	3.80 x10^{-7}	3.80 x10^{-7}	1.06 x10^{3}	1.06 x10^{3}	1.06 x10^{3}
		2.30	4.02 x10^{-7}	4.00 x10^{-7}	4.00 x10^{-7}	1.07 x10^{3}	1.07 x10^{3}	1.07 x10^{3}
		2.40	4.29 x10^{-7}	4.11 x10^{-7}	4.23 x10^{-7}	1.10 x10^{3}	1.05 x10^{3}	1.08 x10^{3}
		2.50	4.40 x10^{-7}	4.47 x10^{-7}	4.31 x10^{-7}	1.08 x10^{3}	1.10 x10^{3}	1.06 x10^{3}
		2.60	4.74 x10^{-7}	4.75 x10^{-7}	4.73 x10^{-7}	1.12 x10^{3}	1.12 x10^{3}	1.12 x10^{3}
		2.70	5.35 x10^{-7}	5.27 x10^{-7}	5.22 x10^{-7}	1.21 x10^{3}	1.20 x10^{3}	1.19 x10^{3}
		2.80	5.57 x10^{-7}	5.42 x10^{-7}	5.38 x10^{-7}	1.22 x10^{3}	1.19 x10^{3}	1.18 x10^{3}
		2.90	5.68 x10^{-7}	5.62 x10^{-7}	5.55 x10^{-7}	1.20 x10^{3}	1.19 x10^{3}	1.17 x10^{3}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 2.366x10^{-3}, Probe 4)

Table D9 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 5.1, Na^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 100	0.031	5	2.79 x10^{-9}	2.88 x10^{-9}	2.89 x10^{-9}	1.38 x10^{-5}	1.43 x10^{-5}	1.43 x10^{-5}
		6	3.52 x10^{-9}	3.54 x10^{-9}	3.49 x10^{-9}	1.46 x10^{-5}	1.47 x10^{-5}	1.44 x10^{-5}
		7	4.06 x10^{-9}	4 x10^{-9}	3.95 x10^{-9}	1.44 x10^{-5}	1.42 x10^{-5}	1.40 x10^{-5}
		8	4.69 x10^{-9}	4.87 x10^{-9}	4.87 x10^{-9}	1.45 x10^{-5}	1.51 x10^{-5}	1.51 x10^{-5}
		9	5.11 x10^{-9}	6.03 x10^{-9}	6.05 x10^{-9}	1.41 x10^{-5}	1.66 x10^{-5}	1.67 x10^{-5}
		10	6.75 x10^{-9}	6.71 x10^{-9}	6.7 x10^{-9}	1.67 x10^{-5}	1.66 x10^{-5}	1.66 x10^{-5}
		11	7.38 x10^{-9}	7.28 x10^{-9}	7.21 x10^{-9}	1.66 x10^{-5}	1.64 x10^{-5}	1.63 x10^{-5}
		12	7.94 x10^{-9}	7.84 x10^{-9}	7.75 x10^{-9}	1.64 x10^{-5}	1.62 x10^{-5}	1.60 x10^{-5}
		13	8.32 x10^{-9}	8.3 x10^{-9}	8.18 x10^{-9}	1.59 x10^{-5}	1.58 x10^{-5}	1.56 x10^{-5}
		14	8.83 x10^{-9}	8.68 x10^{-9}	8.67 x10^{-9}	1.56 x10^{-5}	1.54 x10^{-5}	1.54 x10^{-5}
		15	9.3 x10^{-9}	9.13 x10^{-9}	9.09 x10^{-9}	1.54 x10^{-5}	1.51 x10^{-5}	1.50 x10^{-5}
		16	9.65 x10^{-9}	9.81 x10^{-9}	9.85 x10^{-9}	1.50 x10^{-5}	1.52 x10^{-5}	1.53 x10^{-5}
		17	1.08 x10^{-8}	1.14 x10^{-8}	1.14 x10^{-8}	1.58 x10^{-5}	1.66 x10^{-5}	1.66 x10^{-5}
		18	1.25 x10^{-8}	1.27 x10^{-8}	1.28 x10^{-8}	1.73 x10^{-5}	1.75 x10^{-5}	1.76 x10^{-5}
		19	1.36 x10^{-8}	1.36 x10^{-8}	1.36 x10^{-8}	1.78 x10^{-5}	1.78 x10^{-5}	1.78 x10^{-5}
		20	1.45 x10^{-8}	1.45 x10^{-8}	1.45 x10^{-8}	1.80 x10^{-5}	1.80 x10^{-5}	1.80 x10^{-5}
		21	1.53 x10^{-8}	1.52 x10^{-8}	1.52 x10^{-8}	1.80 x10^{-5}	1.80 x10^{-5}	1.80 x10^{-5}
		22	1.59 x10^{-8}	1.59 x10^{-8}	1.57 x10^{-8}	1.80 x10^{-5}	1.79 x10^{-5}	1.78 x10^{-5}
		23	1.64 x10^{-8}	1.63 x10^{-8}	1.62 x10^{-8}	1.76 x10^{-5}	1.76 x10^{-5}	1.75 x10^{-5}
		24	1.69 x10^{-8}	1.68 x10^{-8}	1.67 x10^{-8}	1.74 x10^{-5}	1.74 x10^{-5}	1.72 x10^{-5}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.38x10^{-3}, Probe 4)

Table D10 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 5.1, NH_3^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 300	0.031	5	3.34 x10^{-9}	3.31 x10^{-9}	3.3 x10^{-9}	1.66 x10^{-5}	1.64 x10^{-5}	1.64 x10^{-5}
		6	3.89 x10^{-9}	3.9 x10^{-9}	3.82 x10^{-9}	1.61 x10^{-5}	1.61 x10^{-5}	1.58 x10^{-5}
		7	4.29 x10^{-9}	4.19 x10^{-9}	4.18 x10^{-9}	1.52 x10^{-5}	1.49 x10^{-5}	1.48 x10^{-5}
		8	4.67 x10^{-9}	4.58 x10^{-9}	4.55 x10^{-9}	1.45 x10^{-5}	1.42 x10^{-5}	1.41 x10^{-5}
		9	5.01 x10^{-9}	5 x10^{-9}	4.89 x10^{-9}	1.38 x10^{-5}	1.38 x10^{-5}	1.35 x10^{-5}
		10	5.27 x10^{-9}	5.19 x10^{-9}	5.18 x10^{-9}	1.31 x10^{-5}	1.29 x10^{-5}	1.29 x10^{-5}
		11	5.65 x10^{-9}	5.64 x10^{-9}	5.56 x10^{-9}	1.27 x10^{-5}	1.27 x10^{-5}	1.26 x10^{-5}
		12	6.04 x10^{-9}	5.76 x10^{-9}	5.71 x10^{-9}	1.25 x10^{-5}	1.19 x10^{-5}	1.18 x10^{-5}
		13	6.05 x10^{-9}	5.95 x10^{-9}	5.98 x10^{-9}	1.15 x10^{-5}	1.14 x10^{-5}	1.14 x10^{-5}
		14	5.93 x10^{-9}	5.99 x10^{-9}	5.91 x10^{-9}	1.05 x10^{-5}	1.06 x10^{-5}	1.05 x10^{-5}
		15	6.28 x10^{-9}	6.27 x10^{-9}	6.23 x10^{-9}	1.04 x10^{-5}	1.04 x10^{-5}	1.03 x10^{-5}
		16	6.47 x10^{-9}	6.25 x10^{-9}	6.32 x10^{-9}	1.00 x10^{-5}	9.70 x10^{-6}	9.81 x10^{-6}
		17	6.56 x10^{-9}	6.6 x10^{-9}	6.59 x10^{-9}	9.58 x10^{-6}	9.63 x10^{-6}	9.62 x10^{-6}
		18	6.64 x10^{-9}	6.7 x10^{-9}	6.71 x10^{-9}	9.16 x10^{-6}	9.24 x10^{-6}	9.25 x10^{-6}
		19	7.02 x10^{-9}	7.07 x10^{-9}	7.09 x10^{-9}	9.17 x10^{-6}	9.24 x10^{-6}	9.25 x10^{-6}
		20	7.52 x10^{-9}	7.51 x10^{-9}	7.47 x10^{-9}	9.33 x10^{-6}	9.32 x10^{-6}	9.27 x10^{-6}
		21	7.76 x10^{-9}	7.64 x10^{-9}	7.67 x10^{-9}	9.17 x10^{-6}	9.02 x10^{-6}	9.07 x10^{-6}
		22	7.89 x10^{-9}	7.85 x10^{-9}	7.81 x10^{-9}	8.90 x10^{-6}	8.86 x10^{-6}	8.81 x10^{-6}
		23	8.15 x10^{-9}	8.14 x10^{-9}	8.07 x10^{-9}	8.79 x10^{-6}	8.78 x10^{-6}	8.71 x10^{-6}
		24	8.38 x10^{-9}	8.26 x10^{-9}	8.26 x10^{-9}	8.67 x10^{-6}	8.54 x10^{-6}	8.54 x10^{-6}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.38x10^{-3}, Probe 4)

Table D11 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 5.1, H^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 400	0.032	5	2.58 x10^{-9}	2.56 x10^{-9}	2.47 x10^{-9}	1.13 x10^{-8}	1.12 x10^{-8}	1.08 x10^{-8}
		6	2.9 x10^{-9}	2.91 x10^{-9}	2.88 x10^{-9}	1.06 x10^{-8}	1.06 x10^{-8}	1.05 x10^{-8}
		7	3.34 x10^{-9}	3.32 x10^{-9}	3.27 x10^{-9}	1.04 x10^{-8}	1.04 x10^{-8}	1.02 x10^{-8}
		8	3.8 x10^{-9}	3.8 x10^{-9}	3.77 x10^{-9}	1.04 x10^{-8}	1.04 x10^{-8}	1.03 x10^{-8}
		9	4.4 x10^{-9}	4.39 x10^{-9}	4.34 x10^{-9}	1.07 x10^{-8}	1.07 x10^{-8}	1.05 x10^{-8}
		10	4.82 x10^{-9}	4.83 x10^{-9}	4.82 x10^{-9}	1.05 x10^{-8}	1.06 x10^{-8}	1.05 x10^{-8}
		11	5.32 x10^{-9}	5.32 x10^{-9}	5.29 x10^{-9}	1.06 x10^{-8}	1.06 x10^{-8}	1.05 x10^{-8}
		12	5.79 x10^{-9}	5.77 x10^{-9}	5.76 x10^{-9}	1.05 x10^{-8}	1.05 x10^{-8}	1.05 x10^{-8}
		13	6.35 x10^{-9}	6.34 x10^{-9}	6.35 x10^{-9}	1.07 x10^{-8}	1.07 x10^{-8}	1.07 x10^{-8}
		14	7.08 x10^{-9}	7.13 x10^{-9}	7.12 x10^{-9}	1.10 x10^{-8}	1.11 x10^{-8}	1.11 x10^{-8}
		15	7.65 x10^{-9}	7.54 x10^{-9}	7.51 x10^{-9}	1.11 x10^{-8}	1.10 x10^{-8}	1.09 x10^{-8}
		16	8.1 x10^{-9}	8.05 x10^{-9}	8 x10^{-9}	1.11 x10^{-8}	1.10 x10^{-8}	1.09 x10^{-8}
		17	8.49 x10^{-9}	8.47 x10^{-9}	8.51 x10^{-9}	1.09 x10^{-8}	1.09 x10^{-8}	1.09 x10^{-8}
		18	9.12 x10^{-9}	9.13 x10^{-9}	9.17 x10^{-9}	1.11 x10^{-8}	1.11 x10^{-8}	1.11 x10^{-8}
		19	9.89 x10^{-9}	9.9 x10^{-9}	9.96 x10^{-9}	1.14 x10^{-8}	1.14 x10^{-8}	1.15 x10^{-8}
		20	1.05 x10^{-8}	1.04 x10^{-8}	1.03 x10^{-8}	1.14 x10^{-8}	1.14 x10^{-8}	1.13 x10^{-8}
		21	1.09 x10^{-8}	1.09 x10^{-8}	1.08 x10^{-8}	1.14 x10^{-8}	1.14 x10^{-8}	1.13 x10^{-8}
		22	1.14 x10^{-8}	1.14 x10^{-8}	1.13 x10^{-8}	1.13 x10^{-8}	1.13 x10^{-8}	1.12 x10^{-8}
		23	1.19 x10^{-8}	1.19 x10^{-8}	1.2 x10^{-8}	1.13 x10^{-8}	1.13 x10^{-8}	1.14 x10^{-8}
		24	1.26 x10^{-8}	1.25 x10^{-8}	1.24 x10^{-8}	1.14 x10^{-8}	1.14 x10^{-8}	1.13 x10^{-8}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.43x10^{-5}, Probe 4)

Table D12 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 30, H^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 720	0.05	5	6.57×10^{-8}	6.38×10^{-8}	6.46×10^{-8}	2.02×10^{-4}	2.58×10^{-4}	2.61×10^{-4}
		6	7.48×10^{-8}	7.43×10^{-8}	7.39×10^{-8}	2.75×10^{-4}	2.73×10^{-4}	2.72×10^{-4}
		7	8.50×10^{-8}	8.17×10^{-8}	8.45×10^{-8}	2.87×10^{-4}	2.76×10^{-4}	2.85×10^{-4}
		8	9.51×10^{-8}	9.39×10^{-8}	9.50×10^{-8}	2.96×10^{-4}	2.92×10^{-4}	2.96×10^{-4}
		9	1.04×10^{-7}	1.03×10^{-7}	1.03×10^{-7}	3.00×10^{-4}	2.98×10^{-4}	2.99×10^{-4}
		10	1.14×10^{-7}	1.13×10^{-7}	1.13×10^{-7}	3.07×10^{-4}	3.04×10^{-4}	3.06×10^{-4}
		11	1.23×10^{-7}	1.22×10^{-7}	1.23×10^{-7}	3.12×10^{-4}	3.10×10^{-4}	3.12×10^{-4}
		12	1.32×10^{-7}	1.31×10^{-7}	1.30×10^{-7}	3.14×10^{-4}	3.11×10^{-4}	3.10×10^{-4}
		13	1.41×10^{-7}	1.40×10^{-7}	1.40×10^{-7}	3.17×10^{-4}	3.15×10^{-4}	3.15×10^{-4}
		14	1.50×10^{-7}	1.49×10^{-7}	1.49×10^{-7}	3.19×10^{-4}	3.18×10^{-4}	3.17×10^{-4}
		15	1.59×10^{-7}	1.58×10^{-7}	1.60×10^{-7}	3.23×10^{-4}	3.20×10^{-4}	3.23×10^{-4}
		16	1.69×10^{-7}	1.68×10^{-7}	1.68×10^{-7}	3.25×10^{-4}	3.25×10^{-4}	3.24×10^{-4}
		17	1.78×10^{-7}	1.77×10^{-7}	1.76×10^{-7}	3.28×10^{-4}	3.25×10^{-4}	3.24×10^{-4}
		18	1.87×10^{-7}	1.86×10^{-7}	1.86×10^{-7}	3.29×10^{-4}	3.28×10^{-4}	3.27×10^{-4}
		19	1.91×10^{-7}	1.94×10^{-7}	1.91×10^{-7}	3.23×10^{-4}	3.27×10^{-4}	3.23×10^{-4}
		20	2.01×10^{-7}	2.00×10^{-7}	2.00×10^{-7}	3.26×10^{-4}	3.24×10^{-4}	3.23×10^{-4}
		21	2.08×10^{-7}	2.07×10^{-7}	2.06×10^{-7}	3.24×10^{-4}	3.23×10^{-4}	3.21×10^{-4}
		22	2.16×10^{-7}	2.15×10^{-7}	2.14×10^{-7}	3.23×10^{-4}	3.22×10^{-4}	3.21×10^{-4}
		23	2.22×10^{-7}	2.21×10^{-7}	2.21×10^{-7}	3.21×10^{-4}	3.20×10^{-4}	3.19×10^{-4}
		24	2.29×10^{-3}	2.28×10^{-7}	2.27×10^{-7}	3.20×10^{-4}	3.19×10^{-4}	3.17×10^{-4}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.38×10^{-3})

Table D13 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 60, H^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 760	0.05	5	9.21 x10^{-9}	9.43 x10^{-9}	9.43 x10^{-9}	2.83 x10^{-5}	2.90 x10^{-5}	2.90 x10^{-5}
		6	1.12 x10^{-8}	1.14 x10^{-8}	1.16 x10^{-8}	3.14 x10^{-5}	3.19 x10^{-5}	3.23 x10^{-5}
		7	1.34 x10^{-8}	1.36 x10^{-8}	1.38 x10^{-8}	3.43 x10^{-5}	3.49 x10^{-5}	3.54 x10^{-5}
		8	1.58 x10^{-8}	1.59 x10^{-8}	1.61 x10^{-8}	3.73 x10^{-5}	3.77 x10^{-5}	3.82 x10^{-5}
		9	1.82 x10^{-8}	1.83 x10^{-8}	1.83 x10^{-8}	4.00 x10^{-5}	4.02 x10^{-5}	4.03 x10^{-5}
		10	2.02 x10^{-8}	2.03 x10^{-8}	2.06 x10^{-8}	4.15 x10^{-5}	4.16 x10^{-5}	4.22 x10^{-5}
		11	2.28 x10^{-8}	2.30 x10^{-8}	2.33 x10^{-8}	4.38 x10^{-5}	4.42 x10^{-5}	4.48 x10^{-5}
		12	2.59 x10^{-8}	2.68 x10^{-8}	2.74 x10^{-8}	4.69 x10^{-5}	4.85 x10^{-5}	4.96 x10^{-5}
		13	2.98 x10^{-8}	2.93 x10^{-8}	2.95 x10^{-8}	5.09 x10^{-5}	5.01 x10^{-5}	5.05 x10^{-5}
		14	3.21 x10^{-8}	2.34 x10^{-8}	2.47 x10^{-8}	5.19 x10^{-5}	3.78 x10^{-5}	3.99 x10^{-5}
		15	3.51 x10^{-8}	3.59 x10^{-8}	3.60 x10^{-8}	5.40 x10^{-5}	5.53 x10^{-5}	5.53 x10^{-5}
		16	3.87 x10^{-8}	3.92 x10^{-8}	3.86 x10^{-8}	5.67 x10^{-5}	5.74 x10^{-5}	5.65 x10^{-5}
		17	4.04 x10^{-8}	4.09 x10^{-8}	4.09 x10^{-8}	5.65 x10^{-5}	5.72 x10^{-5}	5.72 x10^{-5}
		18	4.41 x10^{-8}	4.43 x10^{-8}	4.41 x10^{-8}	5.90 x10^{-5}	5.93 x10^{-5}	5.89 x10^{-5}
		19	4.65 x10^{-8}	4.68 x10^{-8}	4.70 x10^{-8}	5.96 x10^{-5}	6.00 x10^{-5}	6.03 x10^{-5}
		20	4.98 x10^{-8}	5.03 x10^{-8}	5.08 x10^{-8}	6.12 x10^{-5}	6.19 x10^{-5}	6.25 x10^{-5}
		21	5.48 x10^{-8}	5.48 x10^{-8}	5.41 x10^{-8}	6.49 x10^{-5}	6.49 x10^{-5}	6.40 x10^{-5}
		22	5.71 x10^{-8}	5.71 x10^{-8}	5.72 x10^{-8}	6.51 x10^{-5}	6.51 x10^{-5}	6.51 x10^{-5}
		23	6.09 x10^{-8}	6.02 x10^{-8}	6.05 x10^{-8}	6.69 x10^{-5}	6.61 x10^{-5}	6.65 x10^{-5}
		24	6.39 x10^{-8}	6.50 x10^{-8}	6.54 x10^{-8}	6.78 x10^{-5}	6.89 x10^{-5}	6.94 x10^{-5}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.38x10^{-3})

Table D14 The raw data of the determination of linear regime of Zeolite Y (Si/Al = 80, H^+).

Sample	Thickness (cm)	Applied Voltage (V)	Current(A)			Conductivity (S/cm)		
CVB 780	0.08	5	4.26 x10^{-9}	4.52 x10^{-9}	4.54 x10^{-9}	4.10 x10^{-5}	4.35 x10^{-5}	4.37 x10^{-5}
		6	5.31 x10^{-9}	5.33 x10^{-9}	5.26 x10^{-9}	4.87 x10^{-6}	4.88 x10^{-6}	4.82 x10^{-6}
		7	5.96 x10^{-9}	5.90 x10^{-9}	5.94 x10^{-9}	5.21 x10^{-6}	5.16 x10^{-6}	5.20 x10^{-6}
		8	6.66 x10^{-9}	6.45 x10^{-9}	6.55 x10^{-9}	5.57 x10^{-6}	5.39 x10^{-6}	5.48 x10^{-6}
		9	7.07 x10^{-9}	6.96 x10^{-9}	6.91 x10^{-9}	5.66 x10^{-6}	5.58 x10^{-6}	5.53 x10^{-6}
		10	7.56 x10^{-9}	7.40 x10^{-9}	7.16 x10^{-9}	5.82 x10^{-6}	5.69 x10^{-6}	5.51 x10^{-6}
		11	7.70 x10^{-9}	7.48 x10^{-9}	7.36 x10^{-9}	5.69 x10^{-6}	5.54 x10^{-6}	5.44 x10^{-6}
		12	7.80 x10^{-9}	7.77 x10^{-9}	7.91 x10^{-9}	5.56 x10^{-6}	5.53 x10^{-6}	5.63 x10^{-6}
		13	8.30 x10^{-9}	8.24 x10^{-9}	8.22 x10^{-9}	5.70 x10^{-6}	5.66 x10^{-6}	5.65 x10^{-6}
		14	8.77 x10^{-9}	8.86 x10^{-9}	8.61 x10^{-9}	5.82 x10^{-6}	5.87 x10^{-6}	5.71 x10^{-6}
		15	9.32 x10^{-9}	9.15 x10^{-9}	9.35 x10^{-9}	5.98 x10^{-6}	5.87 x10^{-6}	6.00 x10^{-6}
		16	9.58 x10^{-9}	1.05 x10^{-8}	9.89 x10^{-9}	5.94 x10^{-6}	6.53 x10^{-6}	6.14 x10^{-6}
		17	1.03 x10^{-8}	1.05 x10^{-8}	1.06 x10^{-8}	6.21 x10^{-6}	6.32 x10^{-6}	6.40 x10^{-6}
		18	1.15 x10^{-8}	1.29 x10^{-8}	1.16 x10^{-8}	6.72 x10^{-6}	7.54 x10^{-6}	6.73 x10^{-6}
		19	1.42 x10^{-8}	1.44 x10^{-8}	1.48 x10^{-8}	8.05 x10^{-6}	8.17 x10^{-6}	8.36 x10^{-6}
		20	1.58 x10^{-8}	1.68 x10^{-8}	1.62 x10^{-8}	8.68 x10^{-6}	9.25 x10^{-6}	8.90 x10^{-6}
		21	1.69 x10^{-8}	1.68 x10^{-8}	1.62 x10^{-8}	9.04 x10^{-6}	8.97 x10^{-6}	8.66 x10^{-6}
		22	1.60 x10^{-8}	1.58 x10^{-8}	1.60 x10^{-8}	8.33 x10^{-6}	8.23 x10^{-6}	8.33 x10^{-6}
		23	1.81 x10^{-8}	1.82 x10^{-8}	1.79 x10^{-8}	9.17 x10^{-6}	9.22 x10^{-6}	9.06 x10^{-6}
		24	1.94 x10^{-8}	1.92 x10^{-8}	1.92 x10^{-8}	9.57 x10^{-6}	9.46 x10^{-6}	9.47 x10^{-6}

(Temperature 26 ± 1 °C, Humidity 50 ± 1 %, K = 1.38x10^{-3})

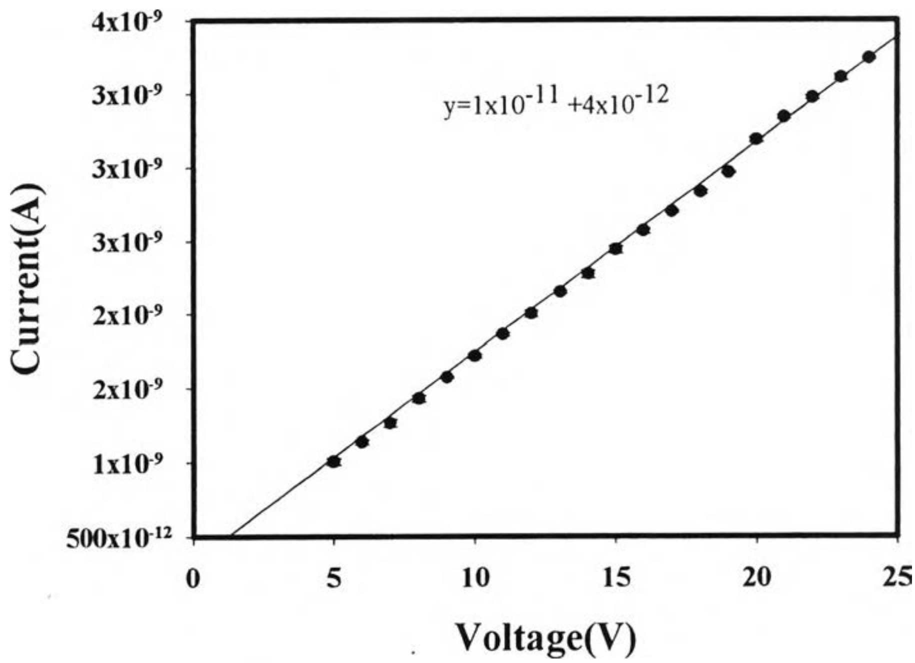


Figure D1 Ohmic Regime of PPV.

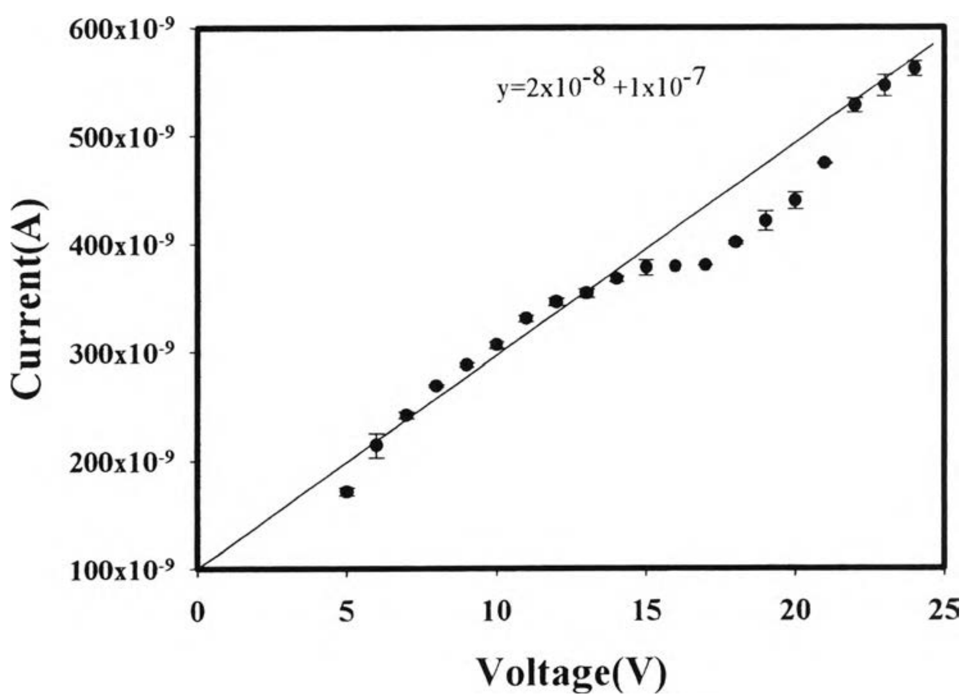


Figure D2 Ohmic Regime of dPPV.

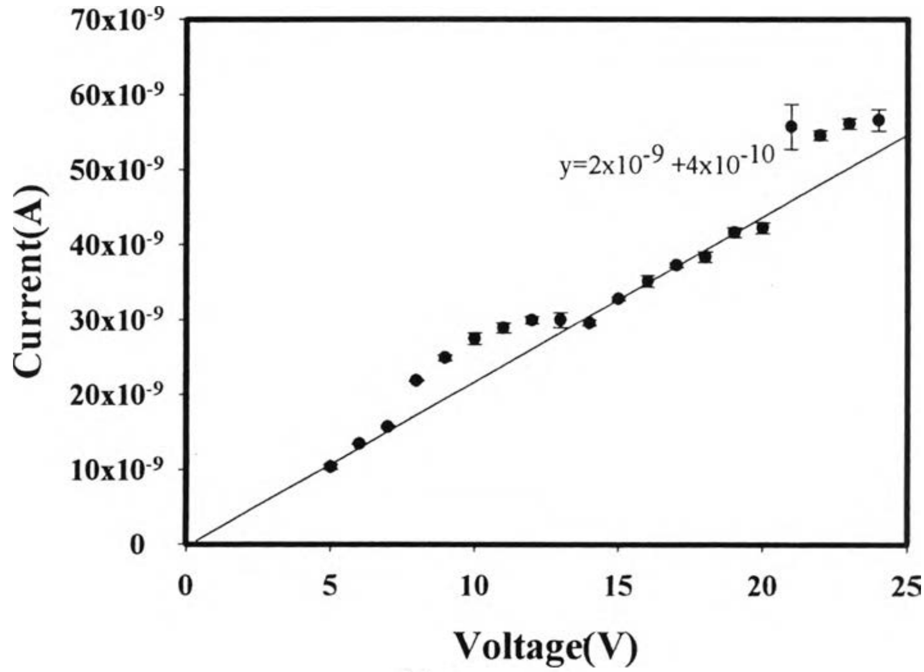


Figure D3 Ohmic Regime of CVB100.

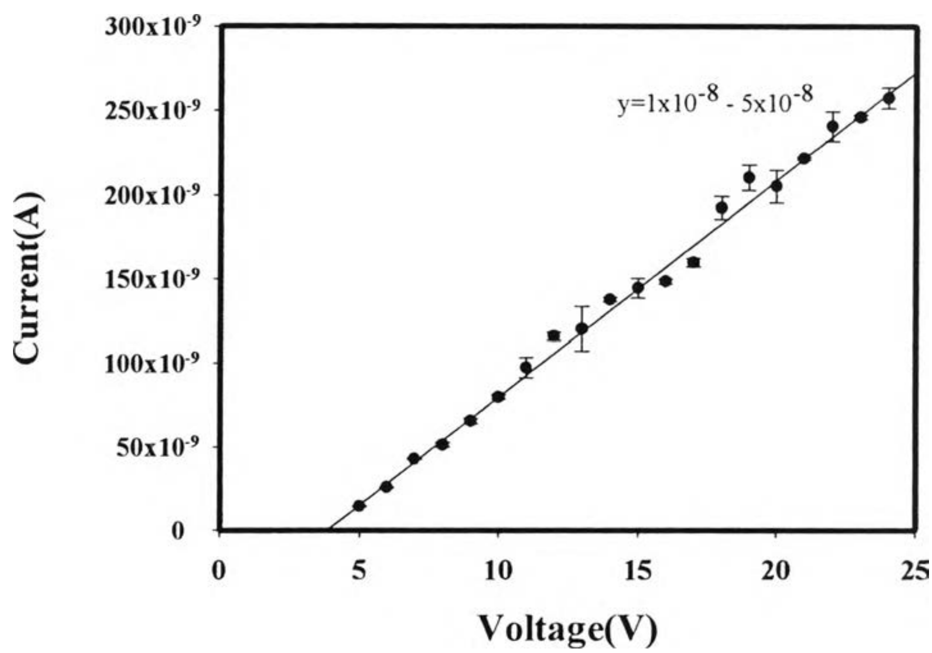


Figure D4 Ohmic Regime of CVB300.

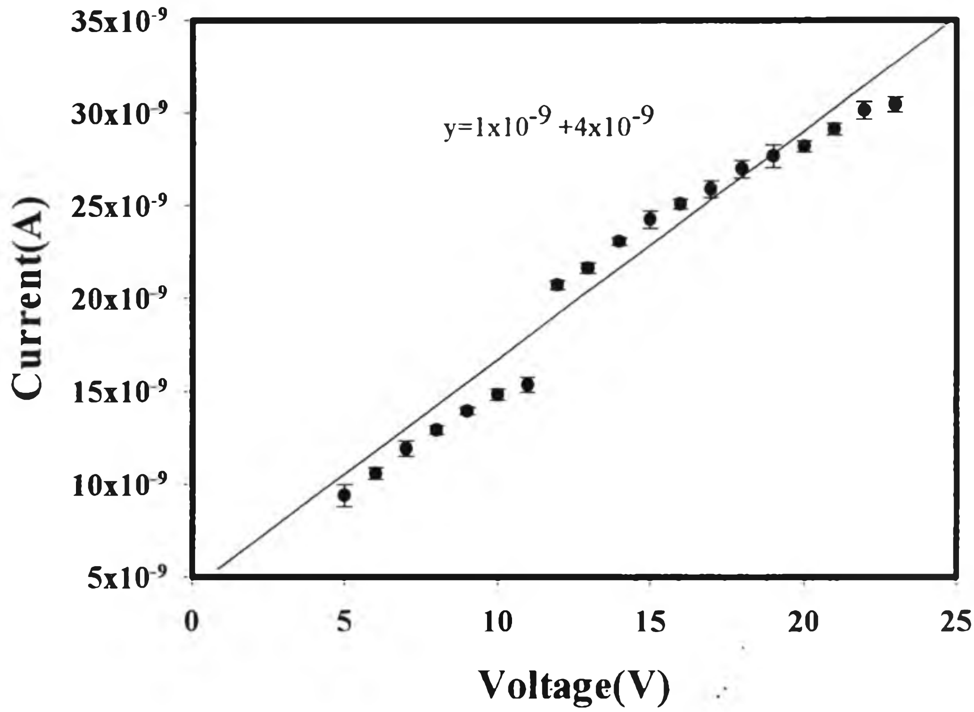


Figure D5 Ohmic Regime of CVB400.

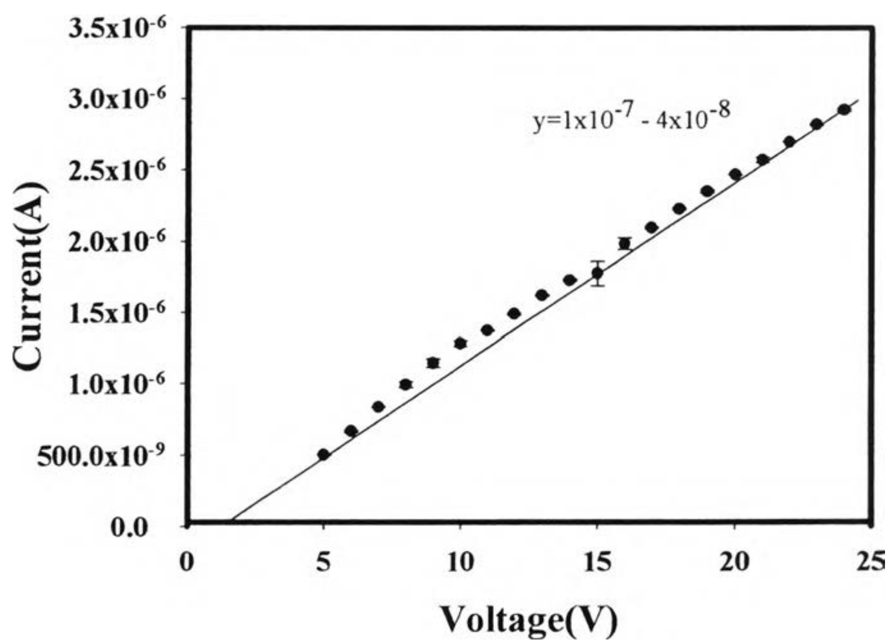


Figure D6 Ohmic Regime of CVB720.

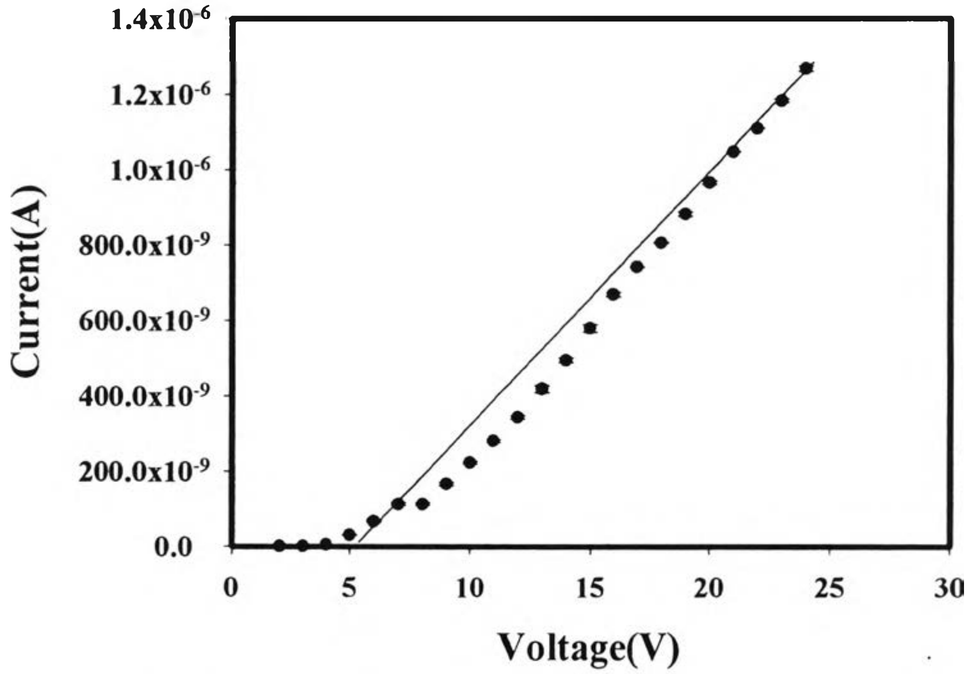


Figure D7 Ohmic Regime of CVB760.

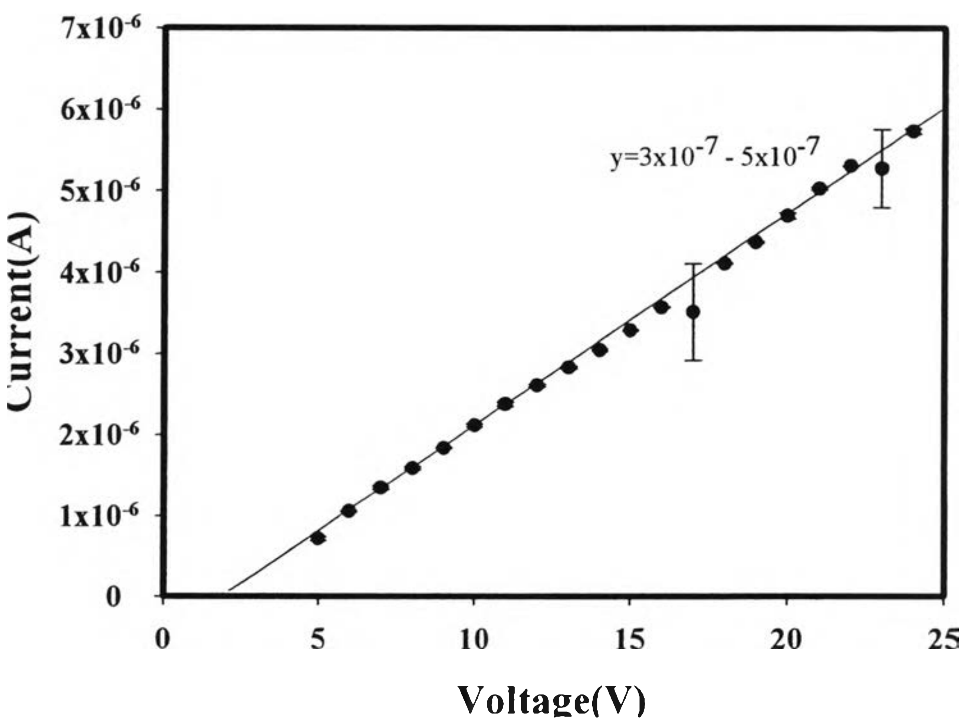


Figure D8 Ohmic Regime of CVB780.

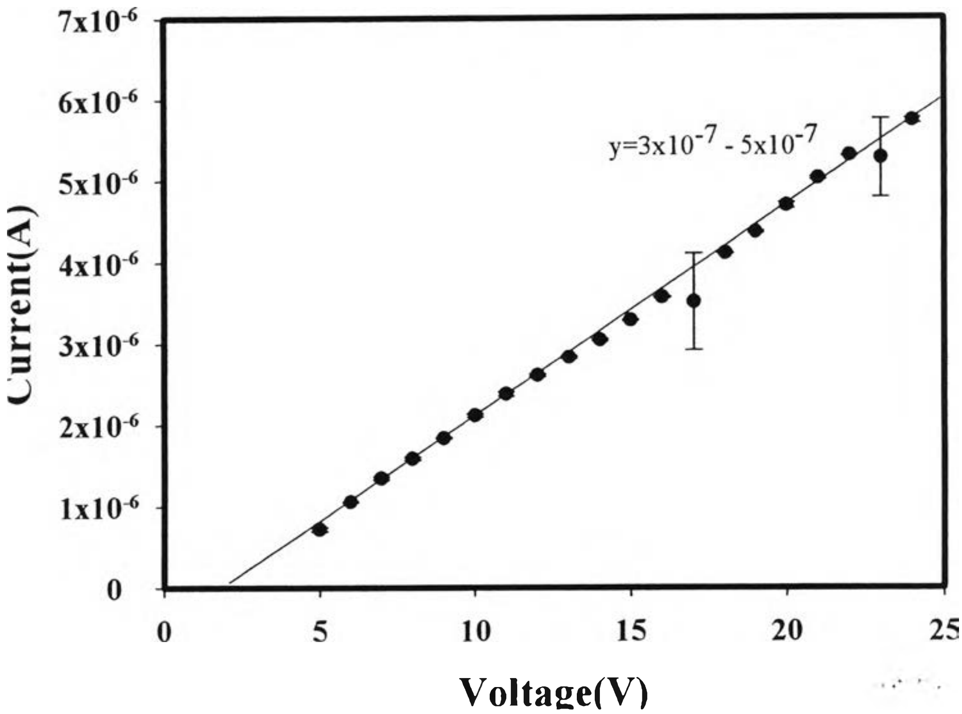


Figure D8 Ohmic Regime of CVB780.

Appendix E Determination of Particle Sizes of PPV, Doped PPV, Zeolites Y ($Si/Al = 5.1, Na^+$), Zeolites Y ($Si/Al = 5.1, NH_3^+$), Zeolites Y ($Si/Al = 5.1, H^+$), Zeolites Y ($Si/Al = 30, H^+$), Zeolites Y ($Si/Al = 60, H^+$), Zeolites Y ($Si/Al = 80, H^+$) by Particle Size Analyzer

Table E1 Summarized the particle diameter and specific surface area of PPV, doped PPV, Zeolites Y (Si/Al = 5.1, Na^+), Zeolites Y (Si/Al = 5.1, NH_3^+), Zeolites Y (Si/Al = 5.1, H^+), Zeolites Y (Si/Al = 30, H^+), Zeolites Y (Si/Al = 60, H^+), Zeolites Y (Si/Al = 80, H^+)

Sample	Particle diameter (μm)					Specific surface area (m^2/g)				
	1	2	3	Avg	STD	1	2	3	Avg	STD
PPV	37.29	37.94	36.52	37.52	0.71	0.3686	0.3829	0.3921	0.3812	0.012
300 H_2SO_4:PPV	31.18	29.06	29.13	30.00	1.57	0.4198	0.4474	0.5132	0.4601	0.047
Zeolites Y (Si/Al = 5.1,Na^+)	10.55	10.61	9.00	10.05	0.91	1.2826	1.2713	1.3457	1.2999	0.040
Zeolites Y (Si/Al = 5.1, NH_3^+)	9.11	9.86	9.46	9.48	0.38	1.5569	1.5020	1.5127	1.5238	0.029
Zeolites Y (Si/Al = 5.1, H^+)	9.32	10.54	10.65	10.17	0.73	1.5183	1.4739	1.4907	1.4943	0.022
Zeolites Y (Si/Al = 30, H^+)	8.86	9.62	8.9	9.13	0.35	1.5728	1.6042	1.6334	1.6034	0.025
Zeolites Y (Si/Al = 60, H^+)	10.07	9.37	9.10	9.51	0.50	1.5327	1.4904	1.5041	1.5091	0.022
Zeolites Y (Si/Al = 80, H^+)	9.43	5.74	5.01	6.72	1.93	2.0556	2.0566	2.5689	2.2270	0.241

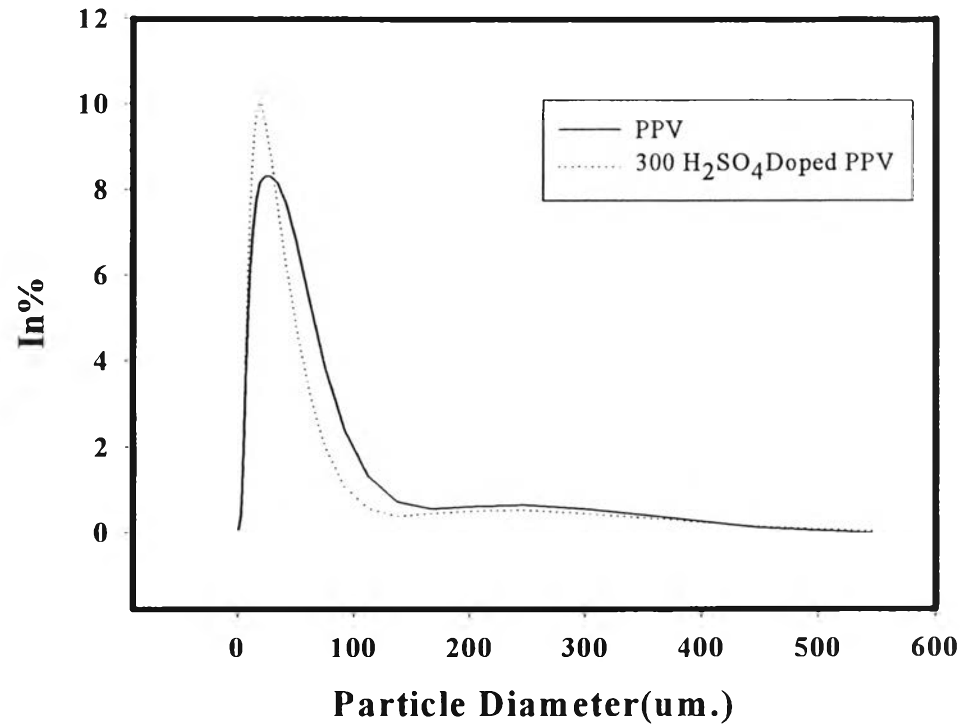


Figure E1 Particle diameters of PPV and $300H_2SO_4$:PPV.

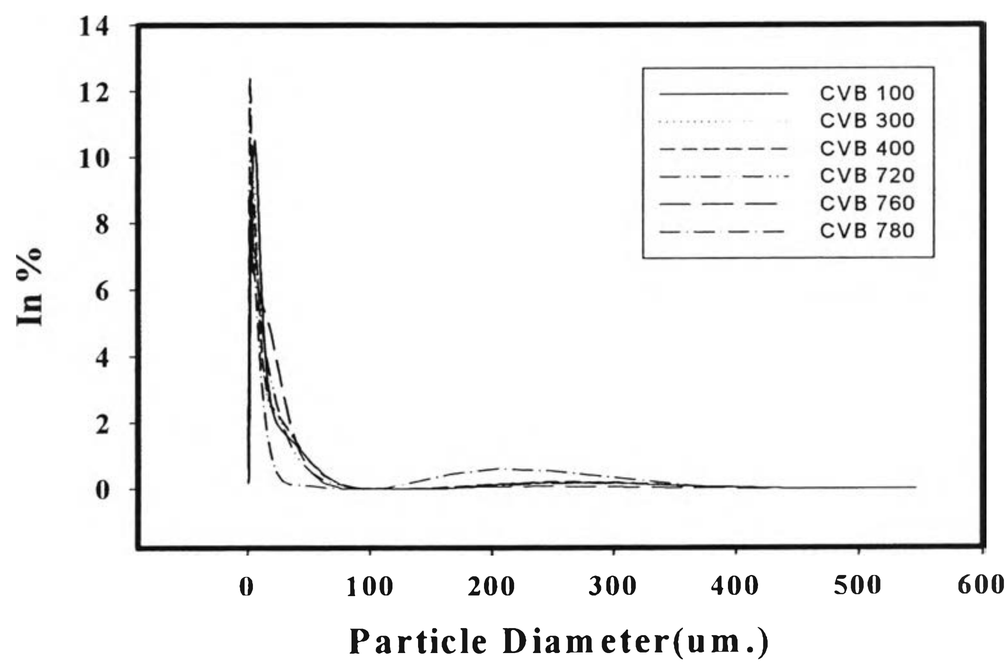


Figure E2 Particle diameters of Zeolites Y (Si/Al = 5.1, Na^+), Zeolites Y (Si/Al = 5.1, NH_3^+), Zeolites Y (Si/Al = 5.1, H^+), Zeolites Y (Si/Al = 30, H^+), Zeolites Y (Si/Al = 60, H^+), Zeolites Y (Si/Al = 80, H^+).

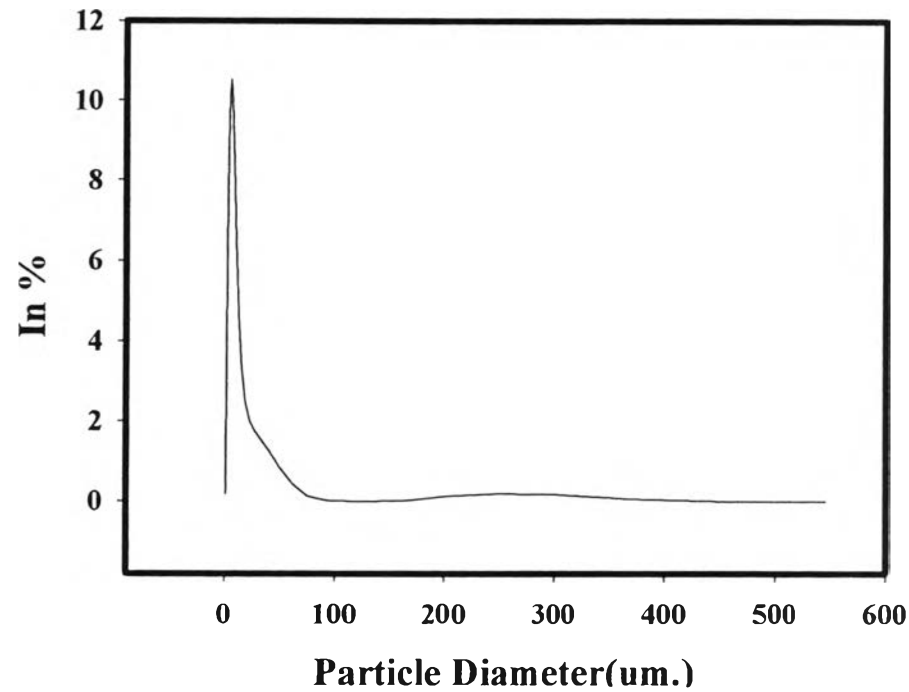


Figure E3 Particle diameter of Zeolites Y (Si/Al = 5.1, Na^{+}).

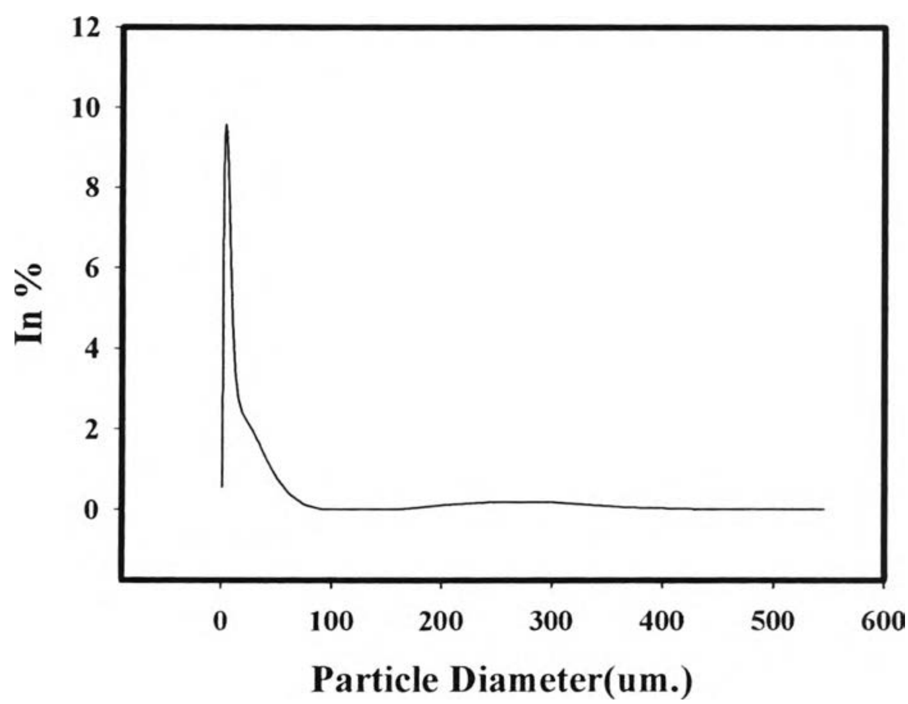


Figure E4 Particle diameters of Zeolites Y (Si/Al = 5.1, NH_3^{+}).

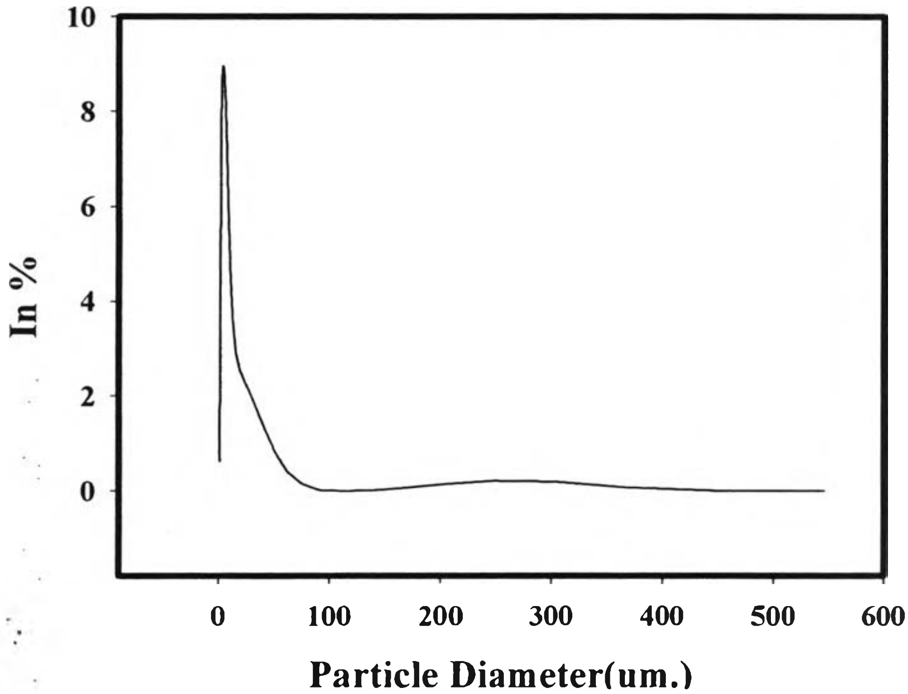


Figure E5 Particle diameters of Zoelite Y (Si/Al = 5.1, H^+).

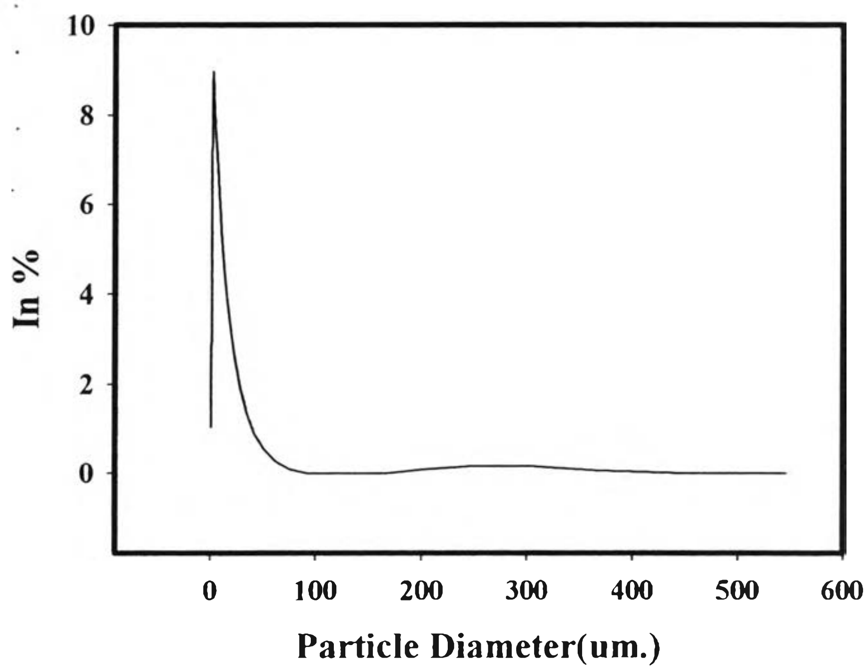


Figure E6 Particle diameters of Zoelite Y (Si/Al = 30, H^+).

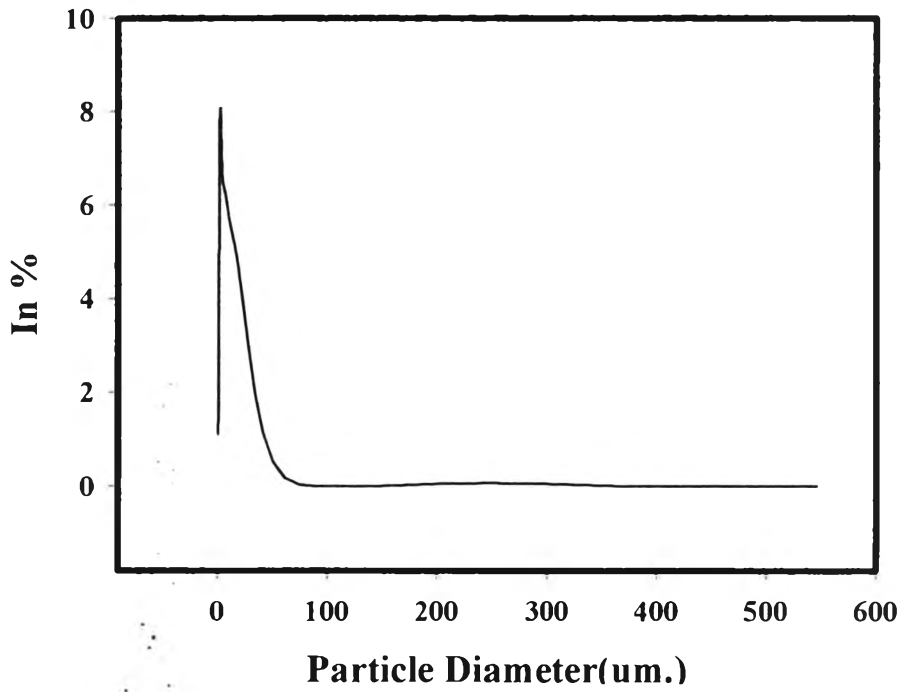


Figure E7 Particle diameters of Zoelite Y (Si/Al = 60, H^+).

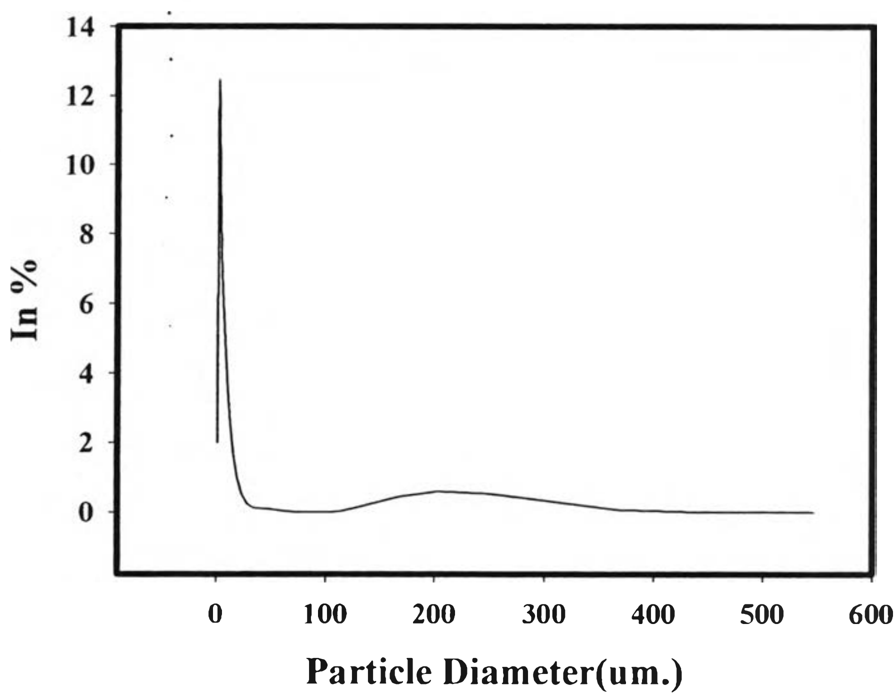


Figure E8 Particle diameters of Zoelite Y (Si/Al = 80, H^+).

Table E2 Raw data from particle size analysis of PPV

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.07	0.08	0.08	0.07	0.09	0.09
1.32	1.60	0.15	0.20	0.20	0.23	0.28	0.29
1.60	1.95	0.19	0.26	0.28	0.42	0.54	0.56
1.95	2.38	0.23	0.29	0.31	0.65	0.83	0.88
2.38	2.90	0.33	0.35	0.38	0.98	1.18	1.26
2.90	3.53	0.55	0.53	0.58	1.53	1.71	1.83
3.53	4.30	0.92	0.92	0.98	2.45	2.62	2.82
4.30	5.24	1.50	1.58	1.67	3.95	4.20	4.49
5.24	6.39	2.38	2.52	2.64	6.33	6.72	7.12
6.39	7.78	3.49	3.68	3.80	9.82	10.41	10.93
7.78	9.48	4.64	4.89	5.01	14.46	15.30	15.94
9.48	11.55	5.89	6.06	6.17	20.35	21.36	22.11
11.55	14.08	6.86	7.03	7.13	27.21	28.40	29.25
14.08	17.15	7.60	7.75	7.85	34.81	36.15	37.09
17.15	20.90	8.04	8.19	8.28	42.85	44.34	45.37
20.90	25.49	8.20	8.35	8.40	51.05	52.69	53.77
25.49	31.01	8.25	8.36	8.36	59.29	61.05	62.12
31.01	37.79	8.16	8.18	8.12	67.46	69.23	70.24
37.79	46.03	7.79	7.70	7.56	75.25	76.93	77.80
46.03	56.09	6.98	6.74	6.55	82.23	83.67	84.35
56.09	68.33	5.72	5.35	5.13	87.95	89.02	89.48
68.33	83.26	4.21	3.74	3.56	92.16	92.75	93.03
83.26	101.44	2.76	2.27	2.16	94.92	95.02	95.19
101.44	123.59	1.62	1.19	1.17	96.54	96.21	96.37
123.59	150.57	0.90	0.62	0.68	97.45	96.83	97.05
150.57	183.44	0.62	0.50	0.58	98.07	97.33	97.63
183.44	223.51	0.61	0.60	0.65	98.67	97.93	98.28
223.51	272.31	0.62	0.69	0.66	99.29	98.62	98.94
272.31	331.77	0.48	0.64	0.55	99.76	99.26	99.49
331.77	404.21	0.24	0.49	0.37	100.00	99.75	99.86
404.21	492.47	0.00	0.25	0.14	100.00	100.00	100.00
492.47	600.00	0.00	0.00	0.00	100.00	100.00	100.00

Table E3 Raw data from particle size analysis of doped PPV

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.09	0.11	0.11	0.09	0.11	0.12
1.32	1.60	0.23	0.27	0.28	0.32	0.38	0.39
1.60	1.95	0.31	0.36	0.38	0.63	0.75	0.77
1.95	2.38	0.34	0.39	0.40	0.97	1.13	1.18
2.38	2.90	0.39	0.41	0.44	1.36	1.54	1.61
2.90	3.53	0.55	0.56	0.59	1.90	2.10	2.20
3.53	4.30	0.93	0.94	0.98	2.83	3.04	3.19
4.30	5.24	1.62	1.67	1.73	4.45	4.71	4.91
5.24	6.39	2.67	2.79	2.87	7.12	7.50	7.78
6.39	7.78	4.04	4.26	4.35	11.17	11.77	12.14
7.78	9.48	5.60	5.93	6.02	16.77	17.70	18.16
9.48	11.55	7.20	7.62	7.72	23.96	25.31	25.87
11.55	14.08	8.58	9.08	9.16	32.54	34.40	35.04
14.08	17.15	9.52	10.04	10.12	42.06	44.44	45.15
17.15	20.90	9.87	10.31	10.38	51.92	54.75	55.53
20.90	25.49	9.54	9.84	9.90	61.46	64.58	65.43
25.49	31.01	8.76	8.89	8.92	70.21	73.47	74.34
31.01	37.79	7.66	7.63	7.61	77.87	81.10	81.96
37.79	46.03	6.34	6.18	6.09	84.21	87.27	88.04
46.03	56.09	4.91	4.59	4.45	89.12	91.87	92.50
56.09	68.33	3.49	3.03	2.85	92.61	94.90	95.35
68.33	83.26	2.25	1.69	1.51	94.86	95.59	96.86
83.26	101.44	1.32	0.76	0.62	96.18	97.35	97.48
101.44	123.59	0.76	0.29	0.20	96.95	97.64	97.69
123.59	150.57	0.51	0.19	0.14	97.46	97.83	97.83
150.57	183.44	0.49	0.31	0.28	97.95	98.14	98.11
183.44	223.51	0.56	0.46	0.42	98.51	98.60	98.53
223.51	272.31	0.57	0.51	0.46	99.09	99.11	98.98
272.31	331.77	0.47	0.43	0.39	99.56	99.54	99.37
331.77	404.21	0.32	0.31	0.30	99.88	99.84	99.67
404.21	492.47	0.12	0.16	0.21	100.00	100.00	99.88
492.47	600.00	0.00	0.00	0.12	100.00	100.00	100.00

Table E4 Raw data from particle size analysis of Zeolites Y (Si/Al = 5.1, Na^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.17	0.17	0.17	0.18	0.19	0.18
1.32	1.60	1.97	1.99	2.17	2.14	2.17	2.34
1.60	1.95	3.64	3.67	4.04	5.77	5.83	6.38
1.95	2.38	5.16	5.17	5.73	10.94	11.00	12.10
2.38	2.90	6.57	6.53	7.23	17.51	17.54	19.34
2.90	3.53	7.9	7.79	8.57	25.40	25.33	27.91
3.53	4.30	9.15	8.94	9.71	34.56	34.27	37.62
4.30	5.24	10.17	9.86	10.49	44.73	44.13	48.11
5.24	6.39	10.65	10.28	10.64	55.38	54.41	58.75
6.39	7.78	10.17	9.84	9.83	65.55	64.25	68.57
7.78	9.48	8.96	8.51	8.12	74.23	72.75	76.69
9.48	11.55	6.71	6.73	6.1	80.95	79.49	82.79
11.55	14.08	4.79	4.97	4.31	85.73	84.45	87.10
14.08	17.15	3.34	3.58	3.06	89.07	88.04	90.16
17.15	20.90	2.44	2.65	2.34	91.51	90.69	92.50
20.90	25.49	1.95	2.07	1.95	93.46	92.76	94.45
25.49	31.01	1.71	1.78	1.71	95.16	94.54	96.16
31.01	37.79	1.5	1.58	1.45	96.67	96.12	97.61
37.79	46.03	1.22	1.35	1.09	97.88	97.47	98.70
46.03	56.09	0.83	1	0.67	98.71	98.47	99.37
56.09	68.33	0.42	0.62	0.28	99.13	99.09	99.64
68.33	83.26	0.1	0.28	0.01	99.23	99.37	99.66
83.26	101.44	0	0.05	0	99.23	99.42	99.66
101.44	123.59	0	0	0	99.23	99.42	99.66
123.59	150.57	0	0	0	99.23	99.42	99.66
150.57	183.44	0.05	0.02	0	99.29	99.44	99.66
183.44	223.51	0.17	0.13	0.08	99.45	99.57	99.73
223.51	272.31	0.24	0.2	0.12	99.70	99.77	99.85
272.31	331.77	0.22	0.18	0.11	99.91	99.95	99.96
331.77	404.21	0.09	0.05	0.04	100.00	100.00	100.00
404.21	492.47	0	0	0	100.00	100.00	100.00
492.47	600.00	0	0	0	100.00	100.00	100.00

Table E5 Raw data from particle size analysis of Zeolites Y (Si/Al = 5.1, NH_3^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.62	0.52	0.54	0.63	0.53	0.54
1.32	1.60	3.67	3.35	3.40	4.31	3.88	3.94
1.60	1.95	6.21	5.75	5.82	10.51	9.62	9.76
1.95	2.38	8.01	7.52	7.60	18.52	17.15	17.36
2.38	2.90	9.06	8.67	8.74	27.57	25.81	26.10
2.90	3.53	9.52	9.29	9.35	37.09	35.10	35.44
3.53	4.30	9.59	9.55	9.58	46.68	44.65	45.02
4.30	5.24	9.36	9.47	9.48	56.04	54.11	54.49
5.24	6.39	8.75	8.95	8.95	64.79	63.06	63.44
6.39	7.78	7.61	7.84	7.84	72.40	70.90	71.27
7.78	9.48	6.08	6.27	6.27	78.47	77.17	77.54
9.48	11.55	4.56	4.68	4.69	83.04	81.85	82.23
11.55	14.08	3.40	3.45	3.47	86.44	85.30	85.70
14.08	17.15	2.74	2.74	2.76	89.18	88.04	88.46
17.15	20.90	2.42	2.42	2.43	91.60	90.46	90.89
20.90	25.49	2.19	2.24	2.22	93.79	92.70	93.11
25.49	31.01	1.93	2.06	2.01	95.72	94.76	95.12
31.01	37.79	1.56	1.77	1.70	97.28	96.53	96.82
37.79	46.03	1.11	1.35	1.29	98.39	97.87	98.11
46.03	56.09	0.67	0.87	0.83	99.06	98.74	98.95
56.09	68.33	0.33	0.45	0.42	99.39	99.20	99.37
68.33	83.26	0.09	0.16	0.12	99.48	99.35	99.48
83.26	101.44	0.00	0.00	0.00	99.48	99.35	99.48
101.44	123.59	0.00	0.00	0.00	99.48	99.35	99.48
123.59	150.57	0.00	0.00	0.00	99.48	99.35	99.48
150.57	183.44	0.01	0.04	0.00	99.49	99.39	99.48
183.44	223.51	0.11	0.14	0.10	99.60	99.53	99.59
223.51	272.31	0.18	0.22	0.18	99.78	99.75	99.77
272.31	331.77	0.16	0.20	0.18	99.94	99.95	99.94
331.77	404.21	0.06	0.05	0.06	100.00	100.00	100.00
404.21	492.47	0.00	0.00	0.00	100.00	100.00	100.00
492.47	600.00	0.00	0.00	0.00	100.00	100.00	100.00

Table E6 Raw data from particle size analysis of Zeolites Y (Si/Al = 5.1, H^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.61	0.64	0.64	0.61	0.65	0.64
1.32	1.60	3.42	3.59	3.51	4.04	4.24	4.16
1.60	1.95	5.74	6.01	5.88	9.77	10.25	10.03
1.95	2.38	7.37	8.63	7.5	17.14	17.93	17.54
2.38	2.90	8.31	9.04	8.42	25.45	26.57	25.96
2.90	3.53	8.76	9.13	8.83	34.21	35.61	34.78
3.53	4.30	8.92	9.00	8.94	43.13	44.73	43.72
4.30	5.24	8.87	8.59	8.85	51.99	53.73	52.57
5.24	6.39	8.52	7.72	8.49	60.52	62.33	61.06
6.39	7.78	7.68	6.41	7.65	68.19	70.04	68.70
7.78	9.48	6.39	5.01	6.36	74.58	76.45	75.06
9.48	11.55	4.98	3.84	4.97	79.57	81.46	80.04
11.55	14.08	3.80	3.07	3,81	83.37	85.29	83.85
14.08	17.15	3.03	2.65	3.05	86.70	88.36	86.90
17.15	20.90	2.62	2.37	2.64	89.02	91.01	89.54
20.90	25.49	2.38	2.1	2.39	91.40	93.37	91.93
25.49	31.01	2.22	1.74	2.18	93.63	95.48	94.11
31.01	37.79	2.0	1.25	1.90	95.62	97.22	96.02
37.79	46.03	1.63	0.73	1.50	97.25	98.47	97.51
46.03	56.09	1.15	0.3	0.99	98.41	99.20	98.50
56.09	68.33	0.66	0.02	0.51	99.07	99.50	99.02
68.33	83.26	0.28	0.00	0.16	99.35	99.52	99.18
83.26	101.44	0.03	0.00	0.00	99.38	99.52	99.18
101.44	123.59	0.00	0.00	0.00	99.38	99.52	99.18
123.59	150.57	0.00	0.02	0.00	99.38	99.52	99.18
150.57	183.44	0.02	0.10	0.06	99.40	99.54	99.24
183.44	223.51	0.14	0.10	0.18	00.54	99.64	99.42
223.51	272.31	0.21	0.16	0.26	99.75	99.79	99.68
272.31	331.77	0.19	0.15	0.23	99.94	99.94	99.92
331.77	404.21	0.06	0.06	0.08	100.00	100.00	100.00
404.21	492.47	0.00	0.00	0.00	100.00	100.00	100.00
492.47	600.00	0.00	0.00	0.00	100.00	100.00	100.00

Table E7 Raw data from particle size analysis of Zeolites Y (Si/Al = 30, H^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	0.92	1.08	1.13	0.93	1.09	1.14
1.32	1.60	4.21	4.57	4.73	5.15	5.66	5.87
1.60	1.95	6.77	7.21	7.43	11.91	12.86	13.28
1.95	2.38	8.28	8.65	8.86	20.19	21.51	22.14
2.38	2.90	8.80	8.98	9.15	28.99	30.49	31.29
2.90	3.53	8.68	8.63	8.72	37.68	39.12	40.01
3.53	4.30	8.31	8.05	8.09	45.99	47.17	48.10
4.30	5.24	7.94	7.55	7.57	53.62	54.72	55.67
5.24	6.39	7.58	7.15	7.17	61.51	61.87	62.84
6.39	7.78	7.07	6.63	6.67	68.58	68.49	69.51
7.78	9.48	6.33	5.90	5.94	74.91	74.39	75.45
9.48	11.55	5.52	5.11	5.15	80.43	79.50	80.60
11.55	14.08	4.74	4.40	4.42	85.17	83.90	85.02
14.08	17.15	4.04	3.80	3.80	89.21	87.70	88.82
17.15	20.90	3.34	3.25	3.21	92.55	90.96	92.03
20.90	25.49	2.55	2.66	2.56	95.10	93.61	94.58
25.49	31.01	1.80	2.07	1.93	96.90	95.68	96.51
31.01	37.79	1.18	1.53	1.36	98.09	97.22	97.88
37.79	46.03	0.73	1.06	0.89	98.82	98.28	98.76
46.03	56.09	0.44	0.66	0.51	99.26	98.94	99.27
56.09	68.33	0.24	0.35	0.23	99.50	99.30	99.50
68.33	83.26	0.09	0.14	0.05	99.59	99.43	99.55
83.26	101.44	0.00	0.00	0.00	99.59	99.44	99.55
101.44	123.59	0.00	0.00	0.00	99.59	99.44	99.55
123.59	150.57	0.00	0.00	0.00	99.59	99.44	99.55
150.57	183.44	0.00	0.00	0.00	99.59	99.44	99.56
183.44	223.51	0.08	0.10	0.09	99.67	99.55	99.65
223.51	272.31	0.14	0.19	0.15	99.81	99.73	99.80
272.31	331.77	0.14	0.19	0.15	99.94	99.93	99.95
331.77	404.21	0.06	0.07	0.05	100.00	100.00	100.00
404.21	492.47	0.00	0.00	0.00	100.00	100.00	100.00
492.47	600.00	0.00	0.00	0.00	100.00	100.00	100.00

Table E8 Raw data from particle size analysis of Zeolites Y (Si/Al = 60, H^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	1.16	1.07	1.10	1.17	1.08	1.11
1.32	1.60	4.52	4.29	4.37	5.68	5.37	5.48
1.60	1.95	6.97	6.66	6.76	12.64	12.03	12.23
1.95	2.38	8.15	7.85	7.94	20.79	19.87	20.18
2.38	2.90	8.21	7.99	8.05	29.00	27.86	28.22
2.90	3.53	7.65	7.51	7.53	36.65	35.36	35.75
3.53	4.30	6.98	6.91	6.91	43.63	42.27	42.66
4.30	5.24	6.56	6.50	6.50	50.19	48.77	49.16
5.24	6.39	6.42	6.34	6.35	56.61	55.11	55.51
6.39	7.78	6.31	6.21	6.24	62.92	61.32	61.74
7.78	9.48	6.06	5.97	6.01	68.98	67.29	67.76
9.48	11.55	5.76	5.69	5.75	74.75	72.98	73.50
11.55	14.08	5.45	5.42	5.49	80.19	78.40	78.99
14.08	17.15	5.09	5.17	5.21	85.28	83.57	84.20
17.15	20.90	4.55	4.76	4.76	89.84	88.33	88.96
20.90	25.49	3.71	4.05	4.00	93.54	92.37	92.96
25.49	31.01	2.71	3.14	3.06	96.25	95.51	96.02
31.01	37.79	1.72	2.16	2.06	97.97	97.68	98.08
37.79	46.03	0.93	1.29	1.19	98.90	98.97	99.27
46.03	56.09	0.39	0.65	0.54	99.28	9.63	99.81
56.09	68.33	0.09	0.27	0.17	99.37	99.90	99.99
68.33	83.26	0.00	0.09	0.01	99.37	99.99	100.00
83.26	101.44	0.00	0.01	0.00	99.37	100.00	100.00
101.44	123.59	0.00	0.00	0.00	99.37	100.00	100.00
123.59	150.57	0.00	0.00	0.00	99.38	100.00	100.00
150.57	183.44	0.07	0.00	0.00	99.44	100.00	100.00
183.44	223.51	0.17	0.00	0.00	99.61	100.00	100.00
223.51	272.31	0.21	0.00	0.00	99.82	100.00	100.00
272.31	331.77	0.16	0.00	0.00	99.98	100.00	100.00
331.77	404.21	0.02	0.00	0.00	100.00	100.00	100.00
404.21	492.47	0.00	0.00	0.00	100.00	100.00	100.00
492.47	600.00	0.00	0.00	0.00	100.00	100.00	100.00

Table E9 Raw data from particle size analysis of Zeolites Y (Si/Al = 80, H^+).

Size		In %			Under %		
Low (μm)	High (μm)	1	2	3	1	2	3
0.50	1.32	2.00	0.19	0.00	2.01	0.19	0.00
1.32	1.60	7.27	0.75	0.00	9.28	0.94	0.00
1.60	1.95	10.96	1.16	0.00	20.23	2.10	0.00
1.95	2.38	12.47	1.40	0.00	32.69	3.50	0.00
2.38	2.90	12.03	1.56	0.00	44.72	5.06	0.00
2.90	3.53	10.48	1.84	0.00	55.20	6.90	0.00
3.53	4.30	8.72	2.50	0.12	63.91	9.40	0.12
4.30	5.24	7.33	3.69	0.70	71.24	13.09	0.82
5.24	6.39	6.39	5.42	1.49	77.64	18.50	2.30
6.39	7.78	5.58	7.28	2.49	83.22	25.79	4.79
7.78	9.48	4.62	8.68	3.63	87.84	34.46	8.42
9.48	11.55	3.57	9.68	4.72	91.41	44.14	13.14
11.55	14.08	2.54	10.09	5.74	93.95	54.23	18.88
14.08	17.15	1.68	9.85	7.11	95.63	64.07	25.99
17.15	20.90	1.01	8.99	8.55	96.65	73.05	34.54
20.90	25.49	0.52	7.65	9.47	97.17	80.71	44.01
25.49	31.01	0.24	6.29	9.65	97.42	10.27	53.66
31.01	37.79	0.13	4.75	9.14	97.54	12.43	62.80
37.79	46.03	0.11	3.43	8.32	97.65	15.05	71.12
46.03	56.09	0.09	2.30	7.27	97.74	18.21	78.39
56.09	68.33	0.04	1.40	6.08	97.78	22.04	84.47
68.33	83.26	0.00	0.76	4.83	97.78	26.68	89.29
83.26	101.44	0.00	0.34	3.61	97.78	32.29	92.90
101.44	123.59	0.02	0.11	2.49	97.80	39.08	95.39
123.59	150.57	0.21	0.02	1.57	98.01	47.30	96.96
150.57	183.44	0.45	0.00	0.95	98.46	57.25	97.92
183.44	223.51	0.60	0.00	0.65	99.06	69.30	98.56
223.51	272.31	0.54	0.00	0.53	99.61	83.87	99.09
272.31	331.77	0.33	0.00	0.46	99.93	101.52	99.55
331.77	404.21	0.07	0.00	0.32	100.00	122.87	99.87
404.21	492.47	0.00	0.00	0.13	100.00	148.72	100.00
492.47	600.00	0.00	0.00	0.00	100.00	180.00	100.00

Appendix F Density Determination by Pycnometer

The density of water is determined at 20 °C under ambient pressure by following equation:

$$D_w = \frac{(W_2 - W_1)}{100} \tag{F.1}$$

where :

D_w = the density of water (g/cm^3)

W_1 = the weight of pycnometer (g)

W_2 = the weight of pycnometer flask and water (g)

Table F1 shows the density of water from the experiment.

Table F1 The density of water

W_1 (g)	W_2 (g)	D_z (g/cm3)
20.49	70.16	0.9934
20.51	70.12	0.9922
20.52	70.13	0.9922
	average	0.9926

The density of undoped and doped poly (*p*-phenylene vinylene) are determined at 20 °C under ambient pressure by following equation:

$$D_p = \frac{(W_3 - W_1)}{100 - \left(\frac{W_4 - W_3}{D_w}\right)} \tag{F.2}$$

where :

D_p = the density of polymer (g/cm^3)

W_3 = the weight of polymer and pycnometer flask (g)

W_4 = the weight of polymer, water, and pycnometer flask (g)

Table F2 and F3 show the density of undoped and doped poly (*p*-phenylene vinylene) from the experiment.

Table F2 The density of undoped poly (*p*-phenylene vinylene)

W_1 (g)	W_3 (g)	W_4 (g)	D_p (g/cm^3)
20.5501	21.2607	70.26	1.13
20.5507	21.2408	70.24	1.09
20.5211	21.2456	70.24	1.31
		average	1.17±0.12

Table F3 The density of doped poly(*p*-phenylene vinylene)

W_1 (g)	W_3 (g)	W_4 (g)	D_p (g/cm^3)
34.9038	35.0217	134.5142	1.07
34.9035	35.0155	134.5131	1.12
34.9031	35.0101	134.5130	1.10
		average	1.09±0.12

The density of zeolite is determined at 20 °C under ambient pressure by following equation:

$$D_z = \frac{(W_5 - W_1)}{100 - \left(\frac{W_6 - W_5}{D_w}\right)} \tag{F.3}$$

where:

D_z = the density of zeolite (g/cm^3)

W_5 = the weight of zeolite and pycnometer flask (g)

W_6 = the weight of zeolite, water, and pycnometer flask (g)

Table F4 shows the density of zeolites from the experiment.

Table F4 The density of zeolites

Zeolites	W_1 (g)	W_5 (g)	W_6 (g)	D_p (g/cm^3)
CVB100	35.1364	35.2543	134.3493	0.7090
	35.0334	35.1473	134.2592	0.7638
	35.2077	35.3447	134.4029	0.7165
			average	0.7298±0.03
CVB 300	34.9044	36.1467	134.7940	2.0034
	34.8952	36.1422	134.7244	1.8779
	34.9151	36.0944	134.7655	1.9988
			average	1.9601±0.07
CVB 400	35.0239	36.4693	134.9493	1.8390
	35.0203	35.9379	134.7512	2.3911
	35.0167	36.0155	134.7228	1.7836
			average	2.0046±0.34
CVB 720	35.0742	36.1371	134.9193	2.0413
	35.0628	36.0238	134.7910	1.9355
	35.1321	36.0831	134.7231	1.5224
			average	1.8331±0.27
CVB 760	35.0471	36.0459	134.8183	1.9581
	35.0441	36.0811	134.8477	2.0861
	35.0657	36.0844	134.8354	1.9865
			average	2.0102±0.07

Zeolites	W1 (g)	W5 (g)	W6 (g)	Dp (g/cm^3)
CVB 780	35.0457	36.1570	134.7612	1.6820
	35.0494	36.1242	134.8347	1.9415
	35.0008	35.9397	134.8099	2.3909
			average	2.0048±0.36

Appendix G Determination of Surface Area and Pore Size of Zeolites Y (Si/Al = 5 ,Na^+), Zeolites Y (Si/Al = 5 ,NH_3^+) ,Zeolites Y (Si/Al = 5 ,H^+) ,Zeolites Y (Si/Al = 30 ,H^+) ,Zeolites Y (Si/Al = 60 ,H^+) ,Zeolites Y (Si/Al = 80 ,H^+)

The surface areas of all zeolites were measured by BET method using a Sorptomatic 1990. Before measurement, an absorbent sample was outgassed by heating at 573 K for 12 hours under vacuum to eliminate volatile adsorbates on the surface. BET surface area was determined by measuring the quantity of gas adsorbed onto or desorbed from solid surface by the static volumetric method. The data were obtained by admitting or removing a known absorbate gas, nitrogen, into or out of a sample cell containing the solid adsorbent maintained at a constant temperature of the adsorbate, that is 77 K for nitrogen.

The adsorption data were calculated using the Brunauer-Emmett-Teller (BET) equation as shown in equation G.1 and G.2.

$$\frac{P}{V(P_o - P)} = \frac{1}{V_m C} + \frac{(C-1)P}{V_m C P_o} \qquad \text{(G.1)}$$

where :

V = volume of gas adsorbed at pressure P

V_m = volume of gas adsorbed in monolayer, same units as V

P_o = saturation pressure of adsorbate gas at the experimental temperature

C = a constant related exponentially to the heats of adsorption and liquefaction of the gas

$$C = e^{(q_1 - q_L)/RT} \qquad \text{(G.2)}$$

where :

q_1 = heat of adsorption on the first layer

q_L = heat of liquefaction of adsorbed gas on all other layers

R = the gas constant

The term V_m represents the volume of gas adsorbed as a monolayer. Once V_m has been determined it is necessary to convert this term from volume unit to surface unit in order to calculate the adsorbent specific surfaces (Satterfield, 1991).

$$SS = \frac{S}{W} = \frac{So \times V_m}{W} = \frac{Z \times a \times V_m}{W} \qquad G.3$$

where :

SS = Specific surface

W = Sample mass

V_m = Monolayer volume

Z = Avogadronumber

a = average molecular area of the adsorbate

S = $So \times V_m$

So = $Z \times a$

Table G1 Specific Surface Area and Median Pore Width summary

Sample : Zeolites	Specific Surface area (m^2/g)	Median Pore Width (Å)
Zeolites Y (Si/Al = 5, Na^+)	750.07 (900)	6.423
Zeolites Y (Si/Al = 5, NH_3^+)	771.56 (935)	6.726
Zeolites Y (Si/Al = 5, H^+)	864±5.65 (730)	10.75±0.0025
Zeolites Y (Si/Al = 30, H^+)	780±0.35 (780)	9.56±0.0982
Zeolites Y (Si/Al = 60, H^+)	740±28.99 (720)	10.74±0.0254
Zeolites Y (Si/Al = 80, H^+)	1222±25.45 (780)	10.10±0.0212

Appendix H Detemination of the Crystallinity of Poly(*p*-phenylene vinylene) and Doped Poly(*p*-phenylene vinylene)

XRD technique was used to investigate the interchain distances and the degree of crystallinity of poly(*p*-phenylene vinylene). X-ray diffractogram was obtained on a Rigaku RINT X-ray Diffractometer (Rigaku Corp., Japan). The diffraction patterns of undoped and doped poly(*p*-phenylene vinylene) were typical of semi-crystalline polymers. They were identified as follow: the crystalline one corresponds to a relative sharp peak, and the amorphous one is visible as a broad pattern (Lunzy and Bang, 2000). The percentage of cryatallinity was determined by integrating area under assumed Guassian curves. Quantitatively, the percentage of crystallinity was calculated from the ratio of the integrated crystalline component intensity to the integrated total intensity.

$$\%Crystallinity = \frac{A_{cryst}}{A_{cryst} + A_{amorphous}} \times 100 \qquad (H.1)$$

where :

A_{cryst} = the area of crystalline peak

$A_{amorphous}$ = the are of amorphous peak

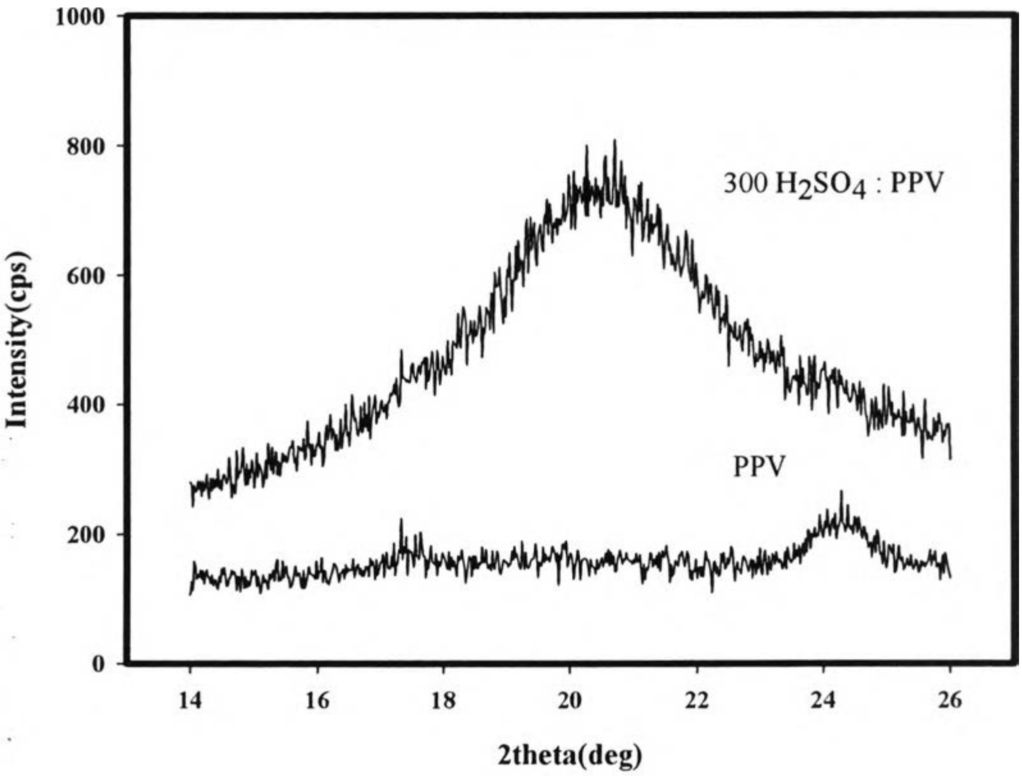


Figure H1 X-ray pattern of PPV and doped PPV with mole ratio of H_2SO_4 to monomer unit equal to 10 :1.

Table H1 Values of 2θ and d-spacing (Å) of PPV and doped PPV

Sample	2theta (deg.)	d-spacing (Å)	Assignment	Reference
PPV	24.38 [22.1]	3.648 [0.4]	layer of polymer chain	Kim *et al.*, (2004)
doped PPV	20.38 [18.9]	4.3540 [4.691]	layer of polymer chain	Masse *et al.*, (1989)
	28.30 [23.96]	3.1509 [3.7109]	layer of chemical dopant	Masse *et al.*, (1989)

Table H2 Calculated crystallinity of PPV and doped PPV

Sample	%Amorphous	%Crystalline
PPV	73	27
doped PPV	62	38

Appendix I Characterization of Zeolites Y (Si/Al =5.1, H^+), Zeolites Y (Si/Al =30, H^+), Zeolites Y (Si/Al =60, H^+), Zeolites Y (Si/Al =80, H^+)

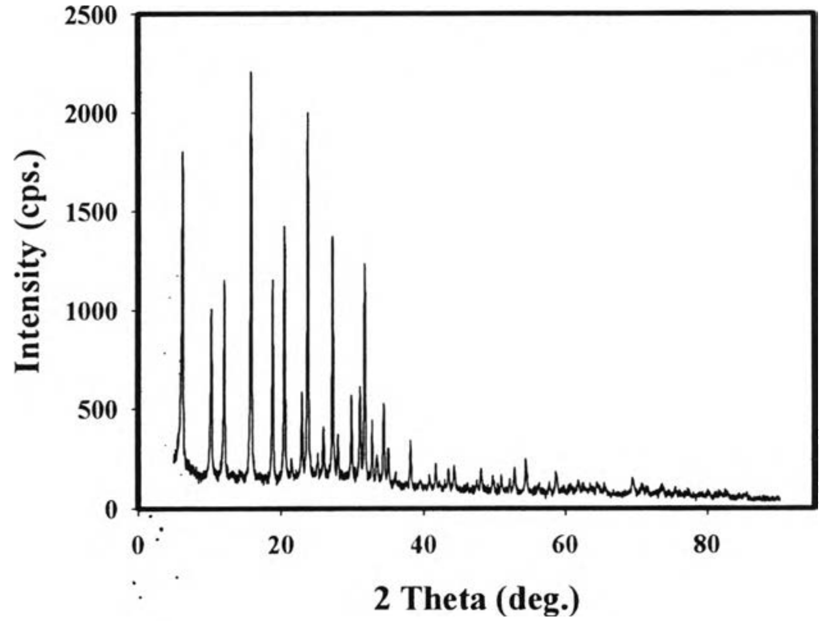


Figure I1 XRD pattern of zeolite Y (Si/Al =5.1, H^+).

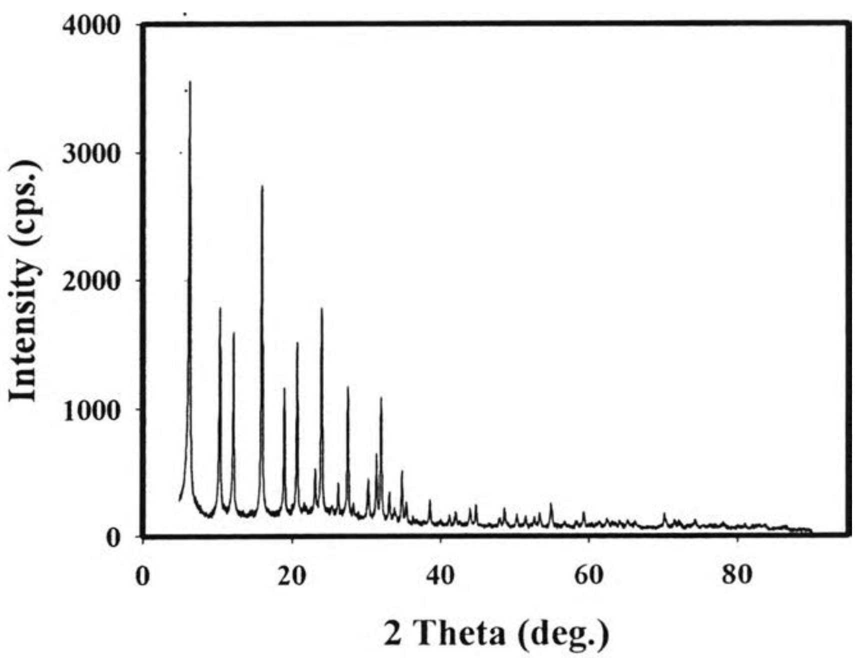


Figure I2 XRD pattern of zeolite Y (Si/Al =30, H^+).

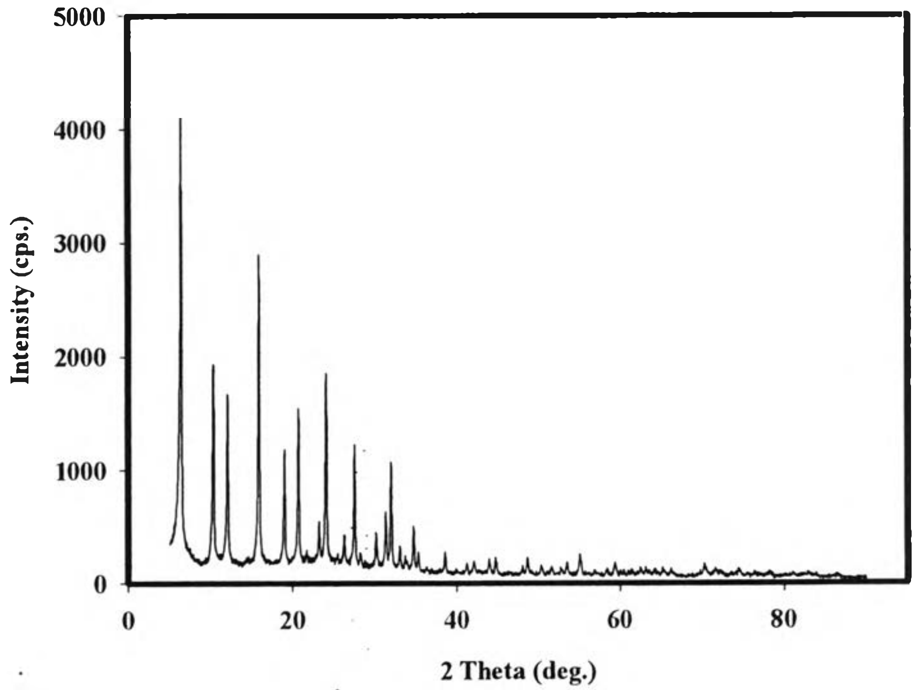


Figure I3 XRD pattern of zeolite Y (Si/Al =60, H^+).

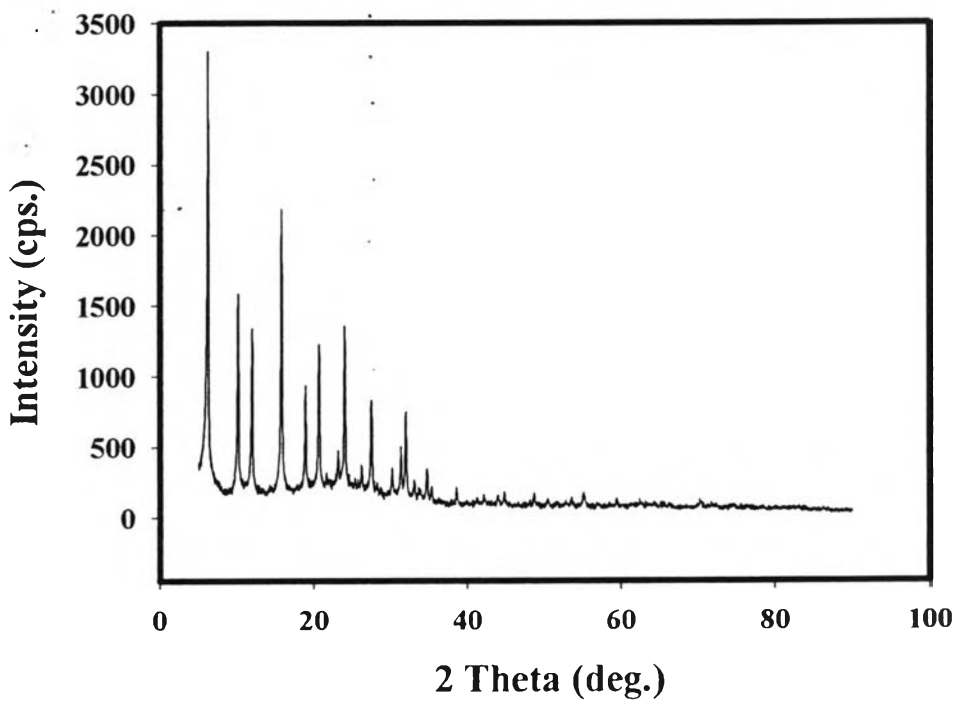


Figure I4 XRD pattern of zeolite Y (Si/Al =80, H^+).

Table I1 X-Ray Powder Data of zeolite Y (Si/Al =5.1, H^+)

Sample	*hkl*	d-value (Å)	Reference*
Zeolite Y	111	14.107	14.418
(Si/Al =5.1, H^+)	220	8.648	8.784
	311	7.381	7.487
	331	5.625	5.695
	333	4.716	4.772
	440	4.330	4.387
	620	3.874	3.951
	533	3.739	3.779
	444	3.534	3.580
	711	3.432	3.468
	642	3.276	3.311
	731	3.191	3.227
	733	2.994	3.025
	822	2.888	2.919
	751	2.829	2.860
	840	2.740	2.767
	911	2.692	2.719
	664	2.674	2.641
	931	2.612	2.600
	10,2,2	2.359	2.382
	880	2.221	2.189

*Breck, 1973.

Table I2 X-Ray Powder Data of zeolite Y (Si/Al =30, H^+)

Sample	*hkl*	d-value (Å)	Reference*
Zeolite Y (Si/Al =30, H^+)	111	13.930	14.418
	220	8.548	8.784
	311	7.296	7.487
	331	5.562	5.695
	333	4.667	4.772
	440	4.287	4.387
	620	3.834	3.951
	533	3.834	3.779
	444	3.699	3.580
	711	3.396	3.468
	642	3.241	3.311
	733	2.963	3.025
	822	2.859	2.919
	751	2.801	2.860
	10,2,2	2.334	2.382
	880	2.188	2.189

*Breck, 1973.

Table I3 X-Ray Powder Data of zeolite Y (Si/Al =60, H^+)

Sample	*hkl*	d-value (Å)	Reference*
Zeolite Y (Si/Al =60, H^+)	111	15.384	14.418
	220	8.565	8.784
	311	7.308	7.487
	331	5.562	5.695
	333	4.662	4.772
	440	4.283	4.387
	620	3.834	3.951
	533	3.696	3.779
	711	3.393	3.468
	642	3.238	3.311
	731	3.155	3.227
	733	2.963	3.025
	751	2.857	2.860
	840	2.780	2.767
	911	2.710	2.719
	664	2.662	2.641
	931	2.583	2.600
	10,2,2	2.334	2.382
	880	2.185	2.189

*Breck, 1973.

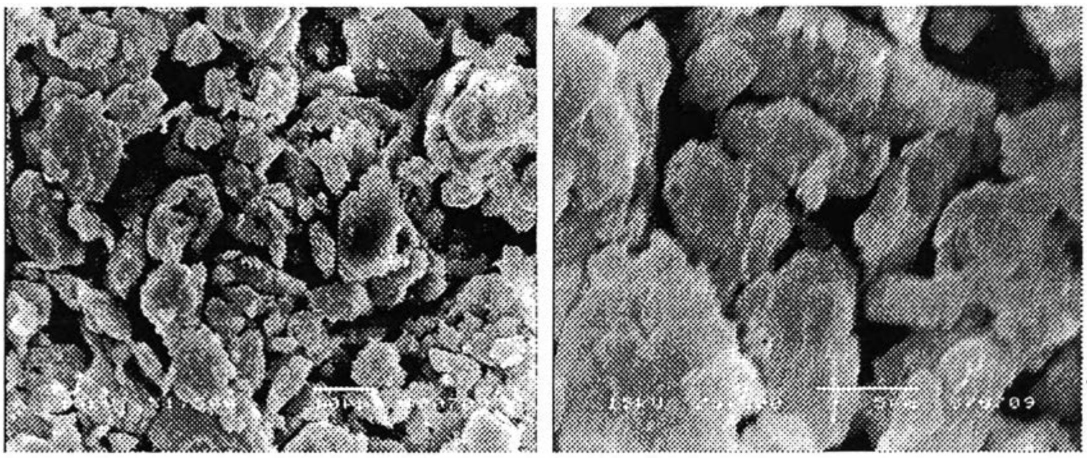
Table I4 X-Ray Powder Data of zeolite Y (Si/Al =80, H^+)

Sample	*hkl*	d-value (Å)	Reference*
Zeolite Y (Si/Al =80, H^+)	111	14.062	14.418
	220	8.598	8.784
	311	7.333	7.487
	331	5.557	5.695
	333	4.679	4.772
	440	4.292	4.387
	620	3.837	3.951
	533	3.702	3.779
	642	3.396	3.311
	731	3.241	3.227
	733	2.963	3.025
	751	2.855	2.860
	911	2.712	2.719
	10,2,2	2.333	2.382
	880	2.185	2.189

*Breck, 1973.

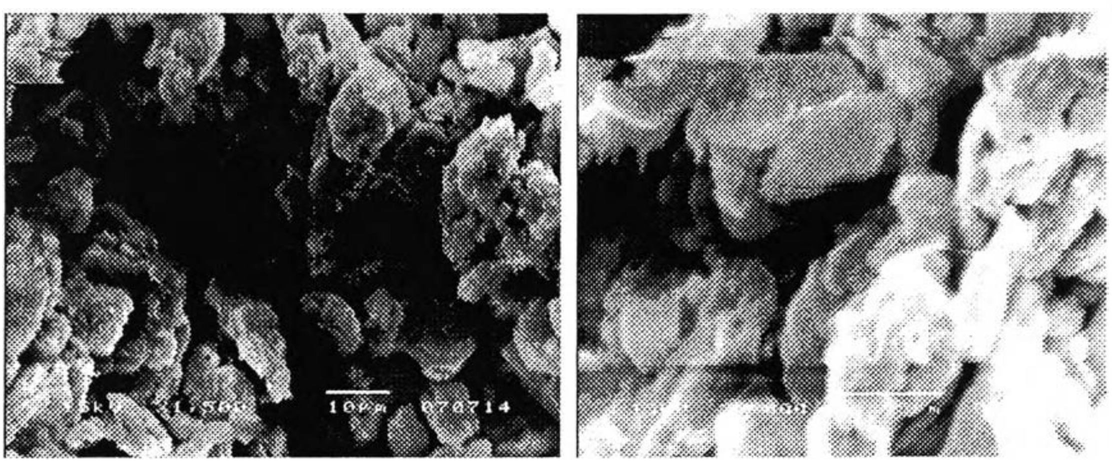
Appendix J Scanning Electron Microscope

Scanning Electron Microscope (SEM) (JEOL/JSM 5200) was utilized to examine the morphology of materials. Samples were coated with gold before being characterized in order to suppress the charge up phenomena.



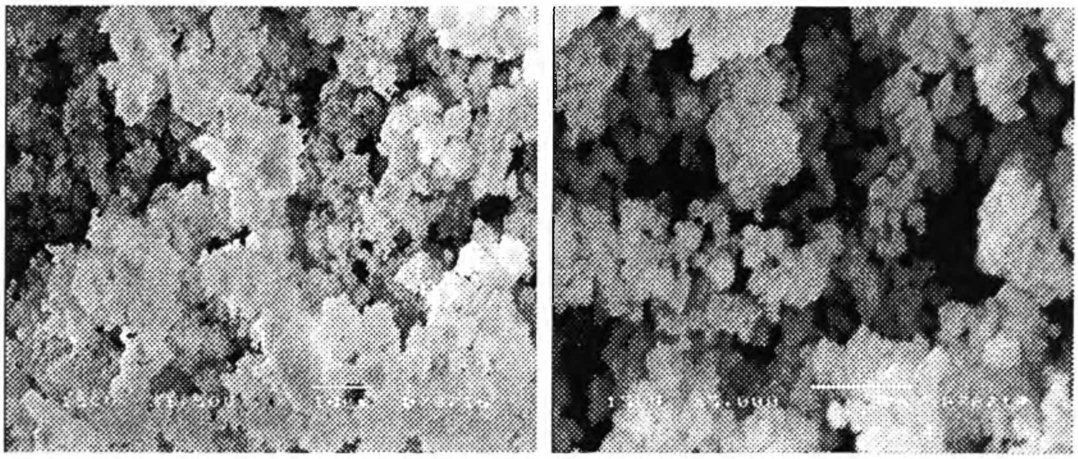
a) b)

Figure J1 The morphology of poly(*p*-phenylene vinylene) powder at magnification : a) x 1500 and b) x 5000.



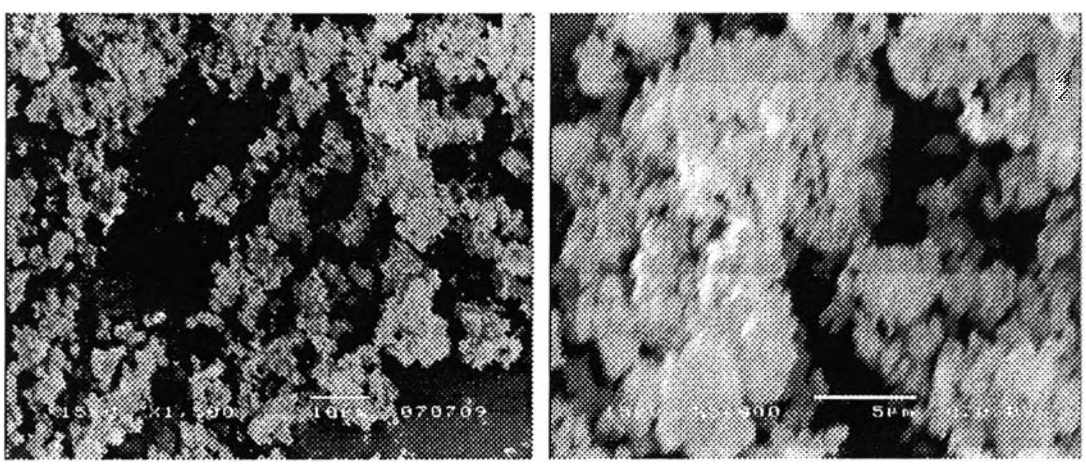
a) b)

Figure J2 The morphology of doped poly(*p*-phenylene vinylene) powder with the mole ratio of sulfuric acid to monomer unit equal to 300 : 1 at magnification : a) x 1500 and b) x 5000, 15 kV.



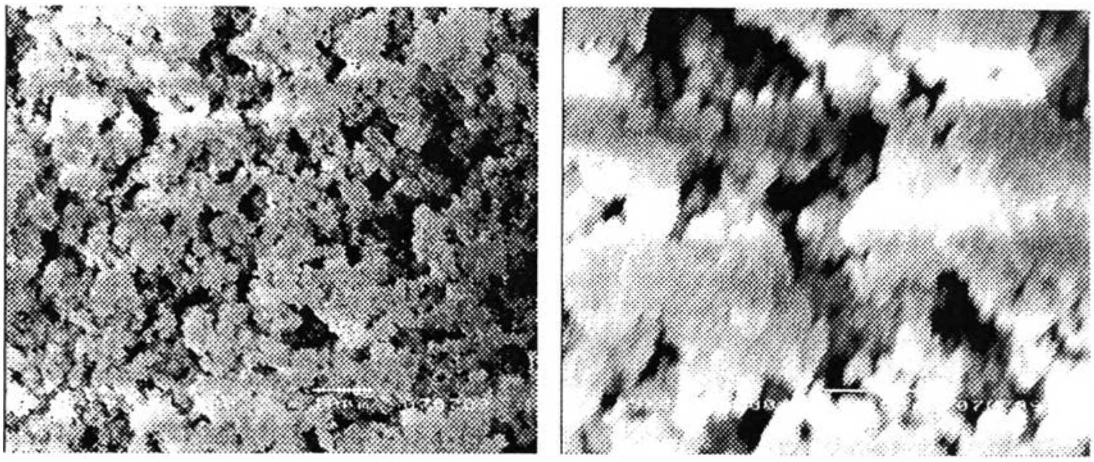
a) b)

Figure J3 The morphology of zeolite Y(Si/Al = 5.1, NH_3^+) powder at magnification : a) x 1500 and b) x 5000, 15kV.



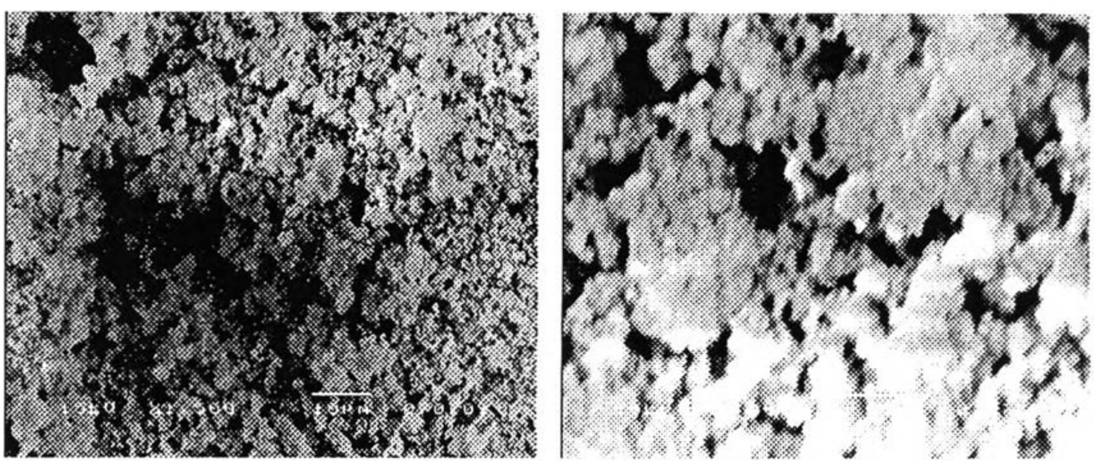
a) b)

Figure J4 The morphology of zeolite Y(Si/Al = 5.1, Na^+) powder at magnification : a) x 1500 and b) x 5000,15kV.



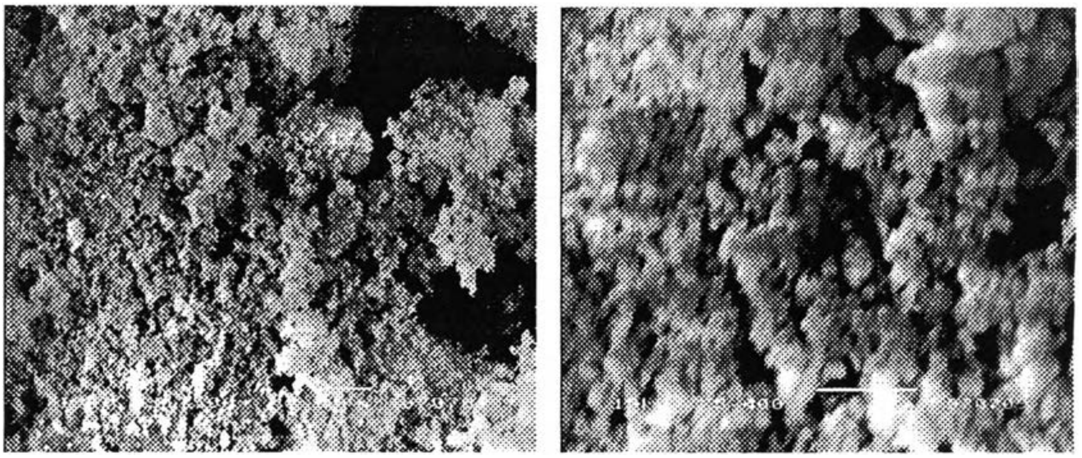
a) b)

Figure J5 The morphology of zeolite Y(Si/Al = 5.1, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



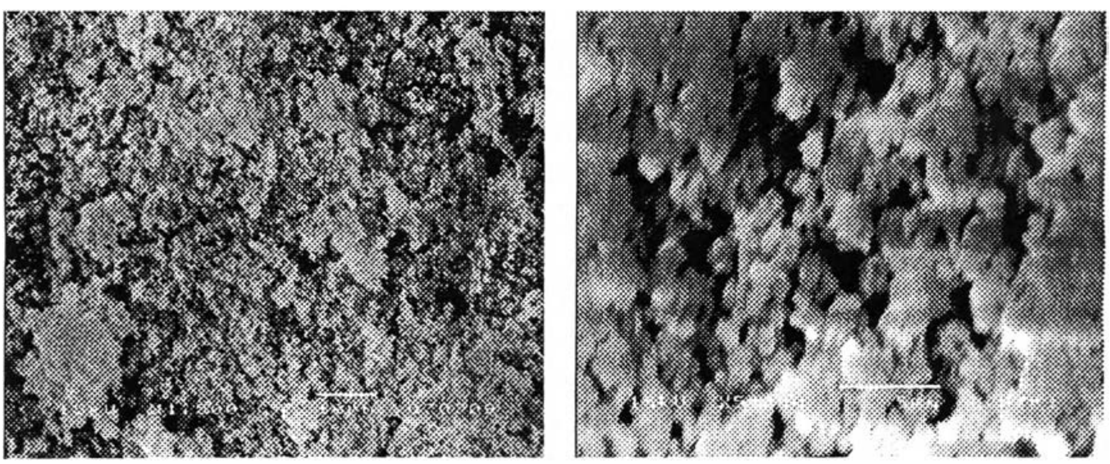
a) b)

Figure J6 The morphology of zeolite Y(Si/Al = 30, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



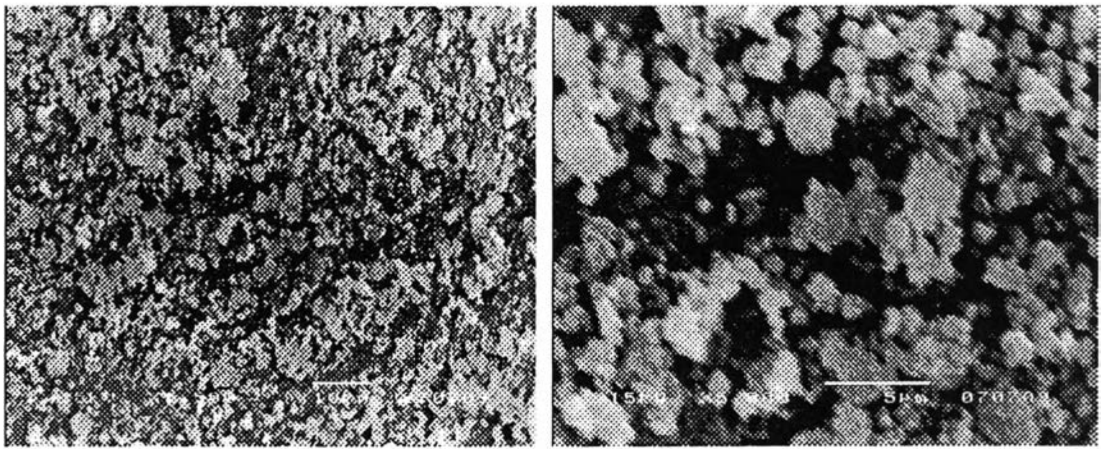
a) b)

Figure J7 The morphology of zeolite Y(Si/Al = 60, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



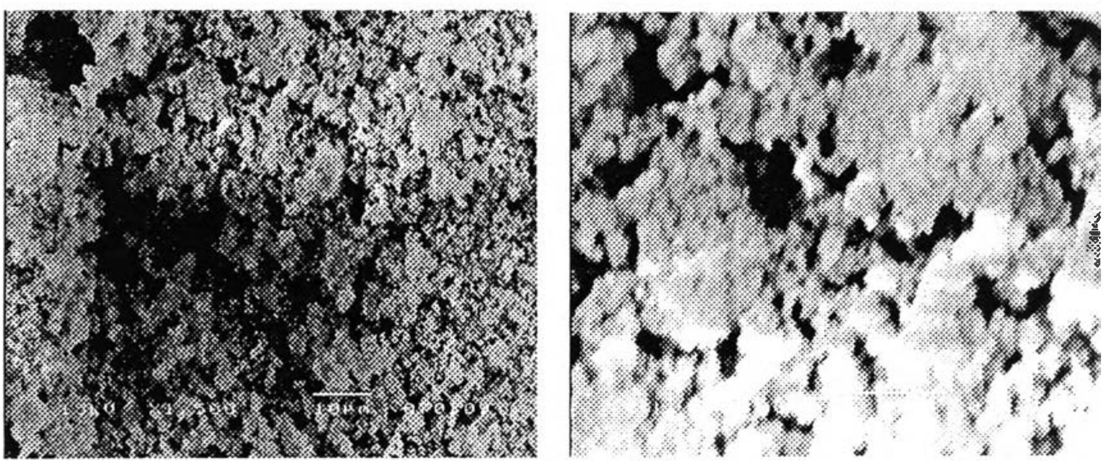
a) b)

Figure J8 The morphology of zeolite Y(Si/Al = 80, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



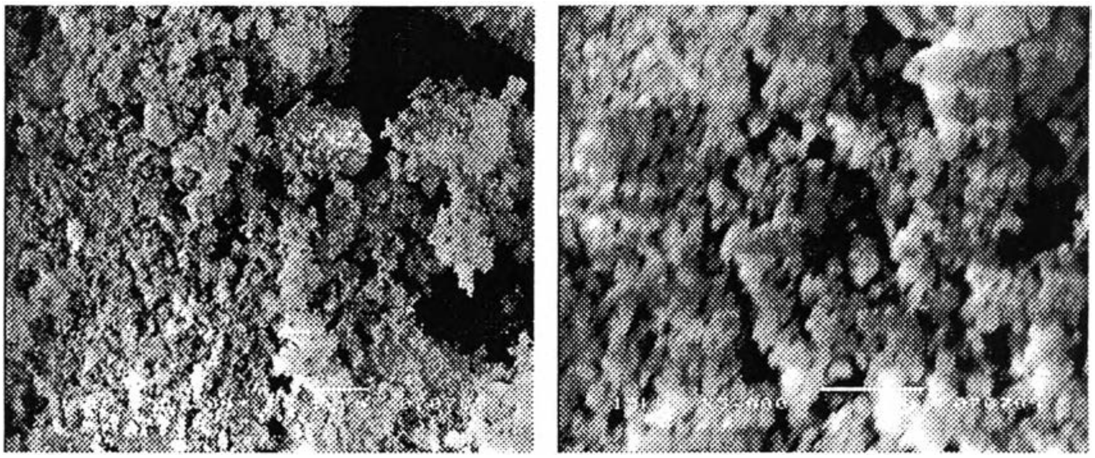
a) b)

Figure J9 The morphology of dPPV/Zeolite Y(Si/Al = 5.1, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



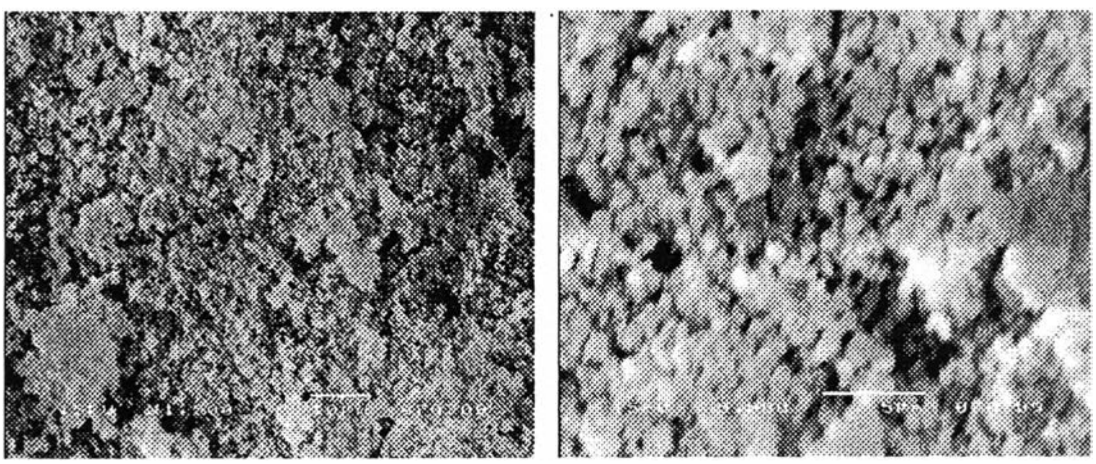
a) b)

Figure J10 The morphology of dPPV/Zeolite Y(Si/Al = 30, H^+) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



a) b)

Figure J11 The morphology of dPPV/Zeolite Y(Si/Al = 60, H^{+}) powder at magnification : a) x 1500 and b) x 5000, 15 kV.



a) b)

Figure J12 The morphology of dPPV/Zeolite Y(Si/Al = 80, H^{+}) powder at magnification : a) x 1500 and b) x 5000, 15 kV.

Appendix K FTIR investigations of reactions of adsorbed NH_4NO_3

FTIR spectra of PPV, dPPV, Zeolite Y and dPPV/Zeolite Y were taken using the KBr pellets. The sample pellet was located on the sample holder and put in the gas cell. The spectra of samples were collected before, during and after NH_4NO_3 exposure, in order to study the interaction between these samples and NH_4NO_3.

The IR spectra in the 700-3500 cm^{-1} region identifies the NH_4NO_3 adsorption at 1 atm and at room temperature. The vibrational stretching frequencies of free NH_4^+ molecule are (ν = 3330, 3300 cm^{-1}) and of free NO_3^- molecule are (ν = 1300-1350 cm^{-1}, 815-840 cm^{-1}) (Zecchina *et al.* 1997).

Figure K2 shows the IR spectrum of dPPV before NH_4NO_3 exposure, during NH_4NO_3 exposure and after NH_4NO_3 exposure. Before NH_4NO_3 exposure, the IR spectrum shows a peak at 1170 cm^{-1} which is assigned to the quinoid structure, at 1519 and 3022 cm^{-1} which can be assigned to the phenylene characteristics. During NH_4NO_3 exposure, the IR spectrum shows a new peak at 3336 cm^{-1} which can be assigned to the vibration of NH_4^+ interacting with carbon cation on the quinoid structure of doped PPV (Zecchina *et al.* 1997). The new two peaks at 1333 and 830 cm^{-1} can be assigned to the vibration of NO_3^- interacting with cation on the quiniod structure of doped PPV (Cziczo *et al.* 1999). Increasing intensity at wavenumber 1172 cm^{-1} during NH_4NO_3 exposure is assigned to the increase on the quinoid structure in doped PPV. The intensities of peaks at 3019, 1517 cm^{-1} decrease after NH_4NO_3 exposure and the peaks at wavenumbers 3336, 1333 cm^{-1} disappear. The decreases of intensity at wavenumbers 3019, 1517 cm^{-1} after NH_4NO_3 exposure confirm that NH_4NO_3 molecule may act as a secondary dopant and the number of the quinoid structure increases in dPPV (Densakulprasert *et al.* 2005). This is the FTIR evidence for the previously proposed interaction schematic of Figure K2.

Figure K3 shows the IR spectra of Zeolite Y (Si/Al=5.1, H^+) before NH_4NO_3 exposure, during NH_4NO_3 exposure and after NH_4NO_3 exposure. Before NH_4NO_3 exposure, the IR spectrum shows a peak at 3640 cm^{-1} which can be assigned to the silanol group. During NH_4NO_3 exposure, the IR spectrum show new two peaks at 3334 and 1625 cm^{-1} which can be assigned to the NH_4^+ interacting with oxygen molecules on Si molecule (Zecchina *et al.* 1997). The new peak at 1380 cm^{-1} can be assigned to the NO_3^- interacting with oxygen molecules on Si molecule (Cziczo *et al.* 1999). A peak at 3663 cm^{-1} which can be assigned to characteristic of zeolite after NH_4NO_3 exposure confirm that no interaction between the zeolite and NH_4NO_3. There is no significant band pattern difference between before and after exposed to NH_4NO_3 (Venkatathri *et al.* 2006).

Figure K4 show the IR spectra of Zeolite Y (Si/Al=80, H^+) before NH_4NO_3 exposure, during NH_4NO_3 exposure and after NH_4NO_3 exposure. The IR spectrum of Zeolite Y (Si/Al=80, H^+) is the same as that of the IR spectrum of Zeolite Y (Si/Al=5.1, H^+). There are the same significant bands but of higher intensities.

Figure K6 show the IR spectra of NH_4NO_3 (pressure at 1 atm and at room temperature) adsorbed on dPPV/Zeolite Y (Si/Al=80, H^+) before NH_4NO_3 exposure, during NH_4NO_3 exposure and after NH_4NO_3 exposure. Before NH_4NO_3 exposure, the IR spectrum shows a peak at 1160 cm^{-1} which can be assigned to the quinoid structure, at 1517 and 3010 cm^{-1} which can be assigned to the phenylene characteristic and at 3660 cm^{-1} which can be assigned to the silanol group. During NH_4NO_3 exposure, the IR spectrum shows a new peak at 3340 cm^{-1} which can be assigned to NH_4^+ interacting with cation on dPPV and oxygen on Si molecule (Zecchina *et al.* 1997). The new peak at 1330 cm^{-1} can be assigned to NO_3^- interacting with cation on dPPV and oxygen on Si molecule (Cziczo *et al.* 1999). The intensities of the peaks at 3023, 1520 cm^{-1} decrease during and after exposure. The decreases of intensity at wavenumber 3023, 1520 cm^{-1} during and after exposure confirms that NH_4NO_3 molecule may act as a secondary dopant. The number of the quinoid structure increases in dPPV structure corresponding to the intensity increase in peaks at 1170 cm^{-1} during NH_4NO_3 exposure (Densakulprasert *et al.* 2005). After NH_4NO_3 exposure, the peaks at 3340, 1330 cm^{-1} disappear. A peak at 3663 cm^{-1} can be assigned to characteristic of zeolite after NH_4NO_3 exposure, confirms that no interaction between zeolite and NH_4NO_3. This is the FTIR evidence for the previously proposed mechanism that Zeolite Y induces a larger volume of NH_4NO_3 vapor for interact with dPPV and NH_4NO_3 molecules may act as a secondary dopant. This clearly suggests that the interactions are further induced by the presence of Zeolite Y (Si/Al=80, H^+). Figure K9 shows a schematic of the proposed interactions between NH_4NO_3 and dPPV/Zeolite Y.

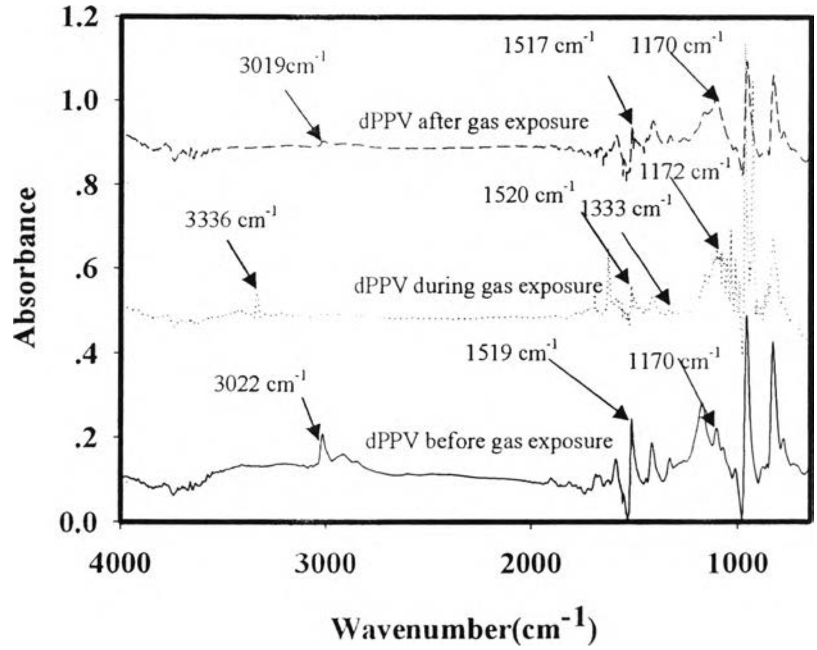


Figure K1 IR spectra of doped PPV exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

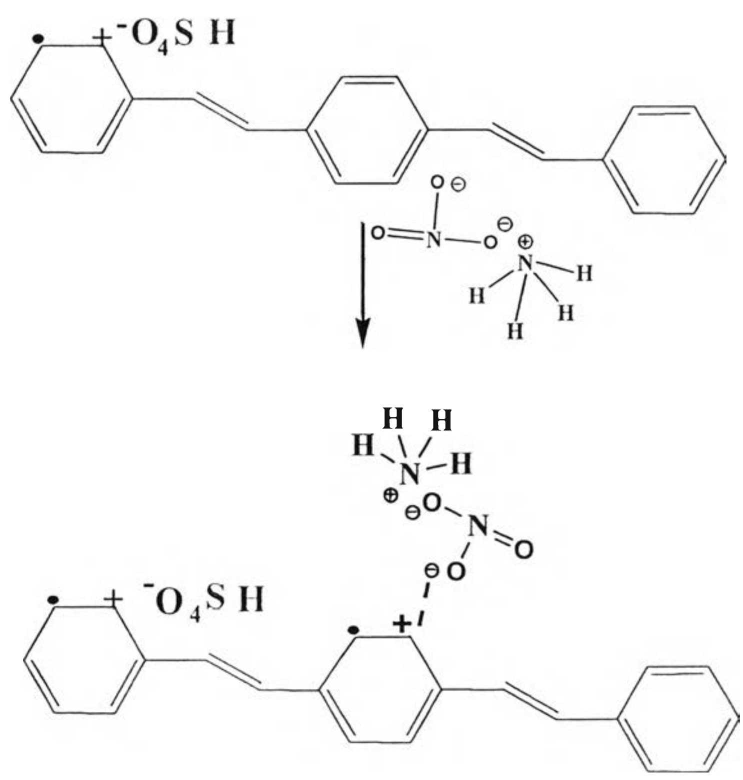


Figure K2 Proposed mechanism of the NH_4NO_3-dPPV.

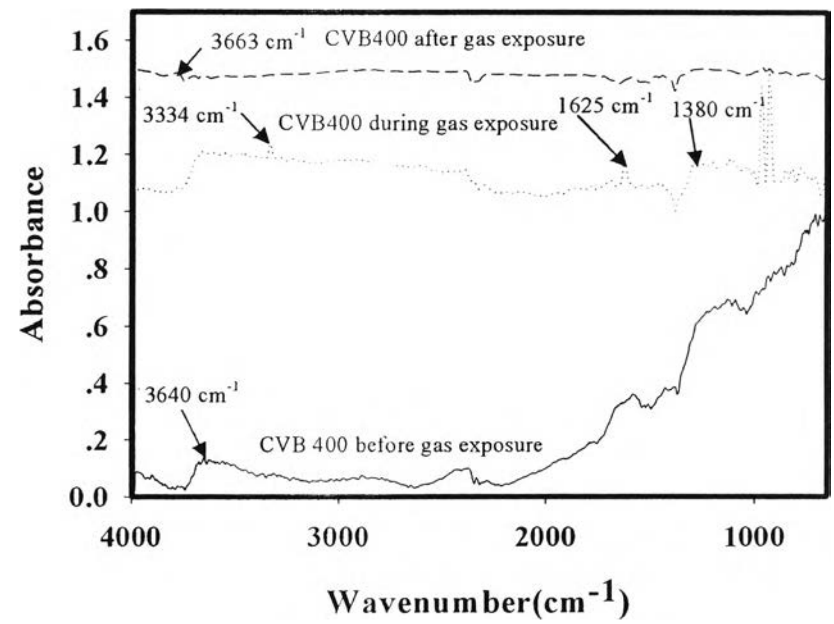


Figure K3 IR spectra of Zeolite Y (Si/Al=5.1, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

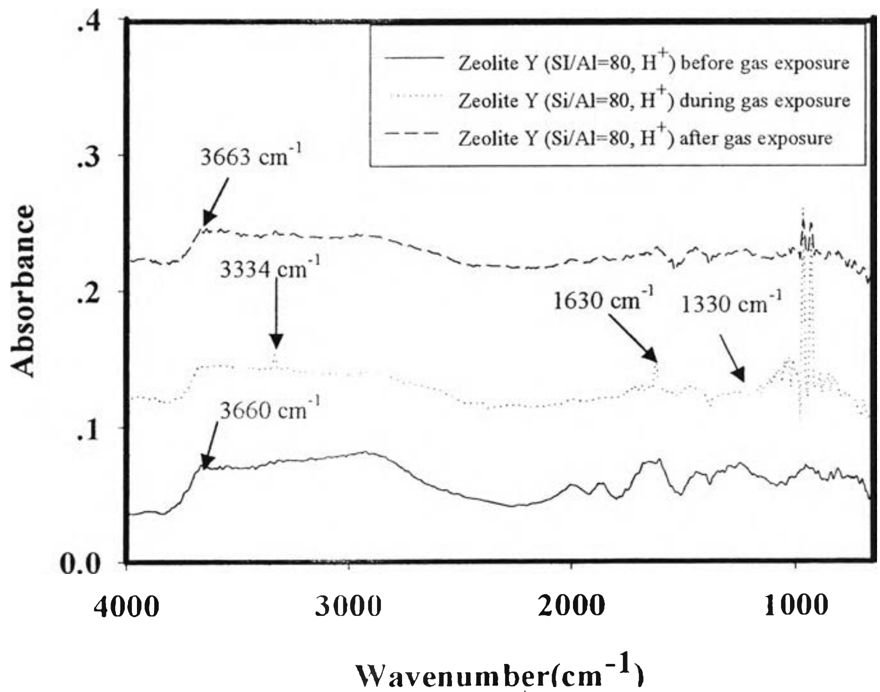


Figure K4 IR spectra of Zeolite Y (Si/Al=80, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

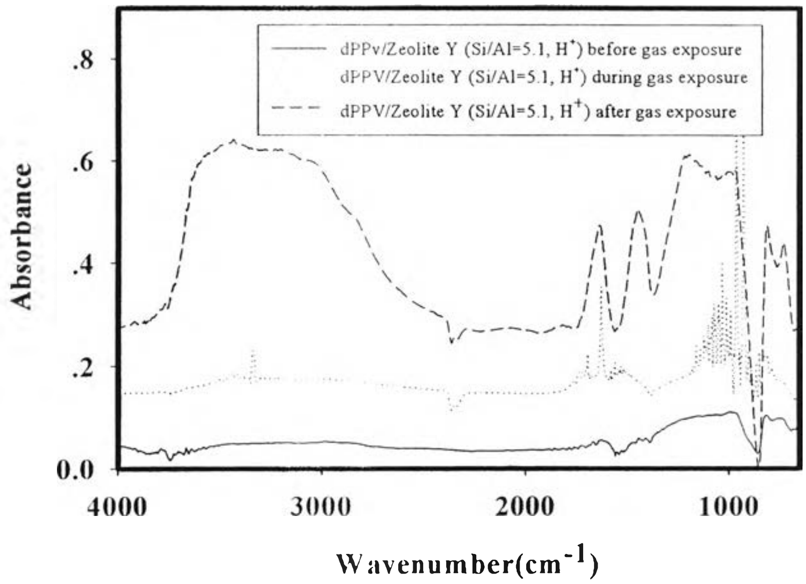


Figure K5 IR spectra of dPPV/Zeolite Y (Si/Al=5.1, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

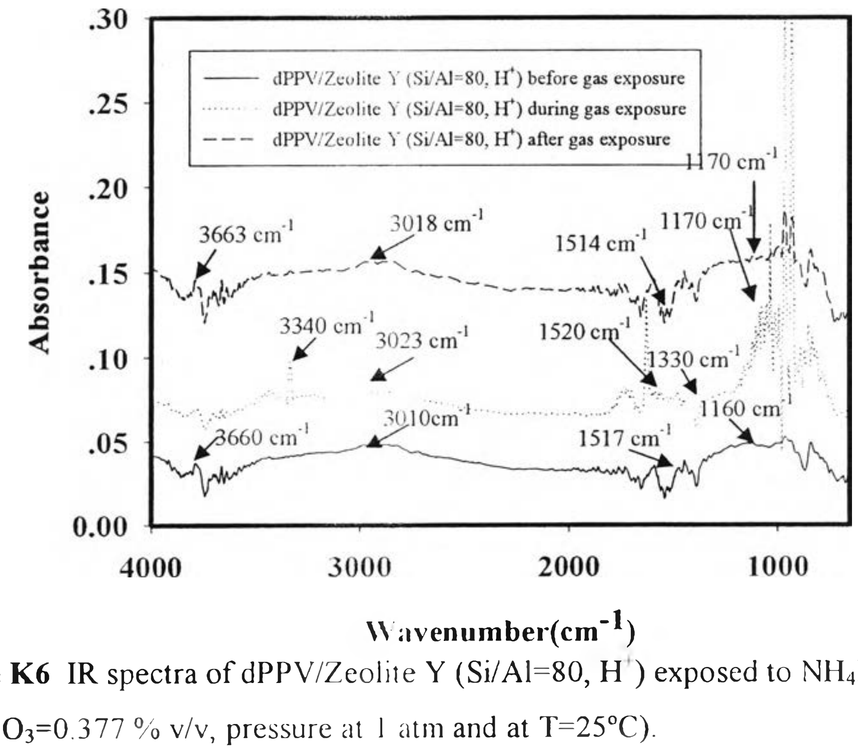


Figure K6 IR spectra of dPPV/Zeolite Y (Si/Al=80, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

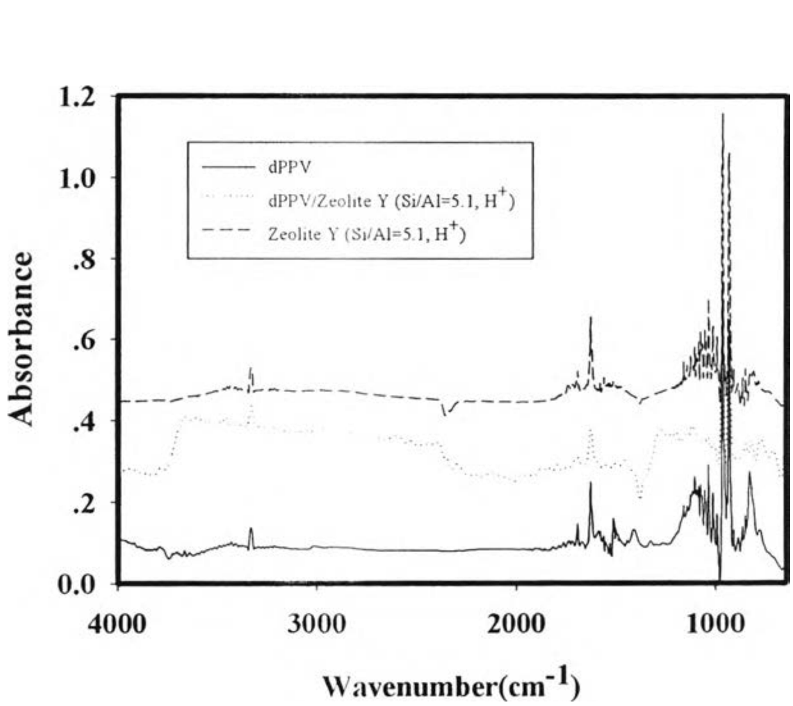


Figure K7 IR spectra of doped PPV, dPPV/Zeolite Y (Si/Al=5.1, H^+) and Zeolite Y (Si/Al=5.1, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

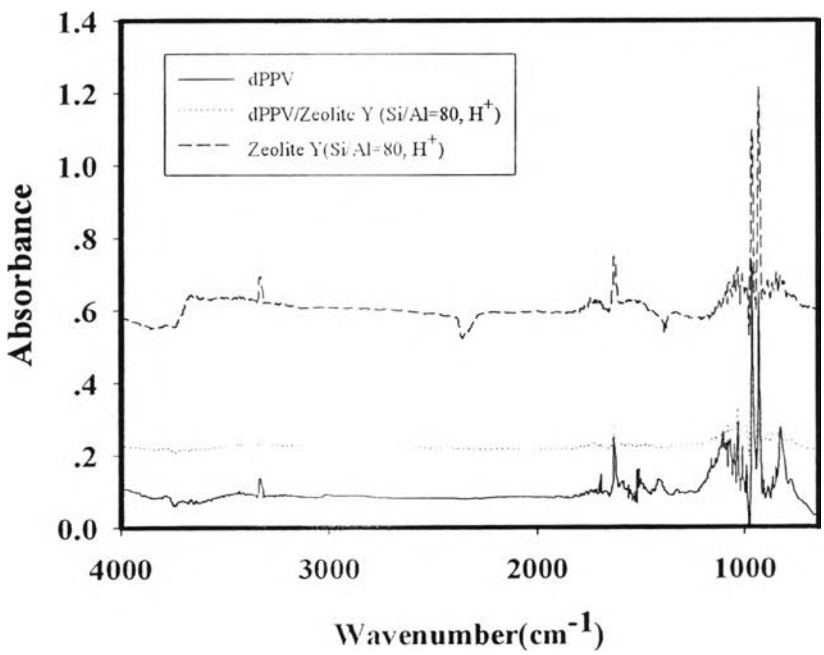


Figure K8 IR spectra of doped PPV, dPPV/Zeolite Y (Si/Al=80, H^+) and Zeolite Y (Si/Al=80, H^+) exposed to NH_4NO_3 (NH_4NO_3=0.377 % v/v, pressure at 1 atm and at T=25°C).

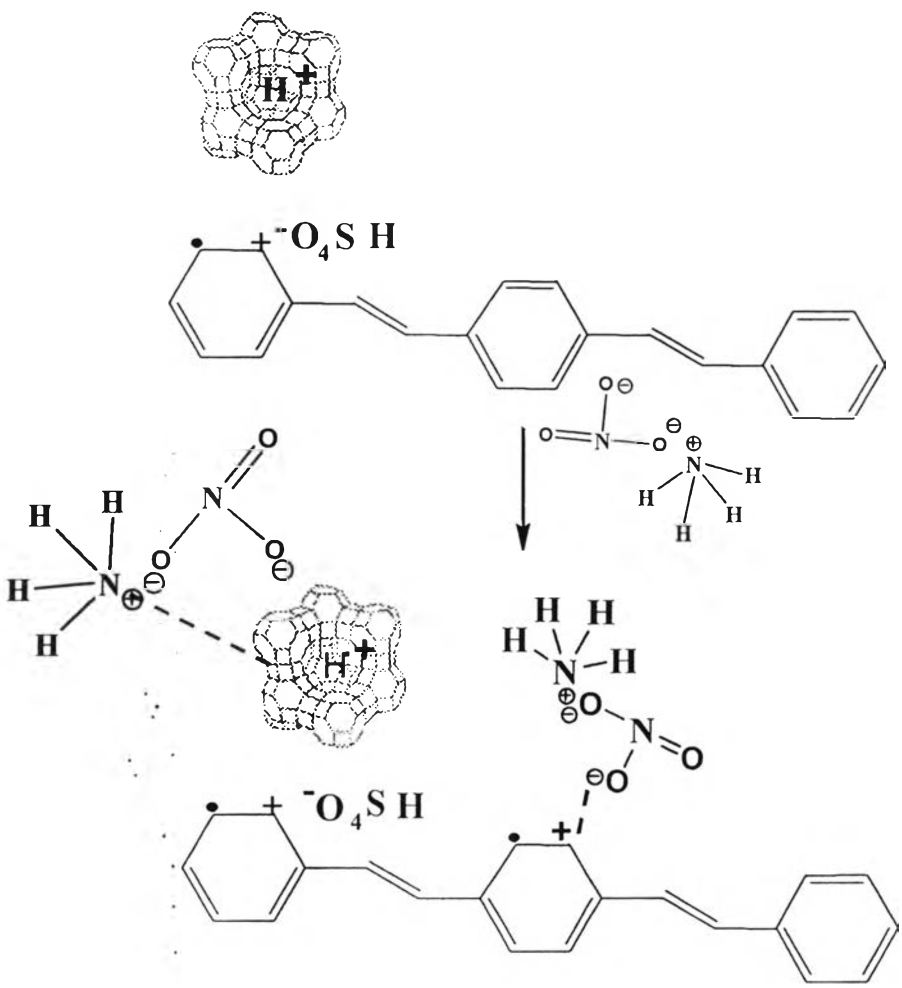


Figure K9 Show the schematic of the proposed interactions between NH_4NO_3 and the doped PPV/ Zeolite Y.

Table K1 Peak positions from FT-IR spectra of dPPV before NH_4NO_3 exposure, NH_4NO_3 exposure and after NH_4NO_3 exposure (NH_4NO_3=0.377 % v/v, pressure=1 atm, T=25 °C)

Functional groups	Wavenumber (cm^{-1})			References
	Before NH_4NO_3 exposure	NH_4NO_3 exposure	After NH_4NO_3 exposure	
Para-phenylene ring C-H out of plane bending	830 ± 10 (835)	830 ± 10 (835)	830 ± 10 (835)	Peres *et al.*,(2006)
NO_3^- vibration	-	830 ± 10 (840)		
C-H out of plane bending	960 ± 10 (964)	960 ± 10 (964)	960 ± 10 (964)	Peres *et al.*,(2006)
S=O symmetric stretching	1050 ± 10 (1040)	1050 ± 10 (1047)	1050 ± 10 (1047)	Fernandes *et al.*,(2004)
Quinoid ring C=C stretching	1170 ± 10 (1170)	1170 ± 10 (1172)	1170 ± 10 (1170)	Fernandes *et al.*,(2004)
S=O asymmetric stretching	1200 ± 10 (1210)	1200 ± 10 (1210)	1200 ± 10 (1200)	Fernandes *et al.*,(2004)
NO_3^- strectching	-	1340 ± 10 (1333)	-	Cziczo *et al.*,(1999)
C-C ring stretching	1517 ± 10 (1519)	1517 ± 10 (1520)	1517 ± 10 (1517)	Peres *et al.*,(2006)
NH_4^+ vibration	-	1630 ± 10 (1630)	-	Zecchina *et al.*,(1997)
CH_3 symmetric stretching	2872 ± 10 (2882)	2872 ± 10 (2882)	2872 ± 10 (2882)	Çirpan *et al.*,(2002)
CH_3 asymmetric stretching	2960 ± 10 (2950)	2960 ± 10 (2950)	2960 ± 10 (2950)	Çirpan *et al.*,(2002)
Trans vinylene C-H strectching	3022 ± 10 (3022)	3022 ± 10 (3023)	3022 ± 10 (3019)	Peres *et al.*,(2006)
NH_4^+ strectching	-	3330 ± 10 (3336)	-	Zecchina *et al.*,(1997)

Table K2 Peak positions from FT-IR spectra of Zeolite Y (Si/Al=5.1, H^+) before NH_4NO_3 exposure, NH_4NO_3 exposure and after NH_4NO_3 exposure (NH_4NO_3=0.377 % v/v, P=1 atm, T=25 °C)

Functional groups	**Wavenumber (cm^{-1})**			**References**
	Before NH_4NO_3 exposure	**NH_4NO_3 exposure**	**After NH_4NO_3 exposure**	
Vibrations of Si-O-Si linkages	1010±10 (1022)	1010±10 (1010)	1010±10 (1003)	Venkatathri N., (2006)
Vibrations of Si-O-Si linkages	1200±10 (1228)	1200±10 (1220)	1200±10 (1238)	Venkatathri N., (2006)
NO_3^- strectching	-	1340±10 (1380)	-	Cziczo *et al.*,(1999)
NH_4^+ vibration	-	1630±10 (1625)	-	Zecchina *et al.*,(1997)
NH_4^+ strectching	-	3330±10 (3334)	-	Zecchina *et al.*,(1997)
Silanol group	3630±10 (3640)	-	3630±10 (3663)	Venkatathri N., (2006)

Table K3 Peak positions from FT-IR spectra of dPPV/Zeolite Y (Si/Al=5.1, H^+) before NH_4NO_3 exposure, NH_4NO_3 exposure and after NH_4NO_3 exposure (NH_4NO_3=0.377 % v/v, P=1 atm, T=25 °C)

Functional groups	Wavenumber (cm^{-1})			References
	Before NH_4NO_3 exposure	NH_4NO_3 exposure	After NH_4NO_3 exposure	
Para-phenylene ring C-H out of plane bending	830±10 (820)	830±10 (835)	830±10 (835)	Peres *et al.*,(2006)
C-H out of plane bending	960±10 (985)	960±10 (964)	960±10 (964)	Peres *et al.*,(2006)
Vibrations of Si-O-Si linkages	1010±10 (1000)	1010±10 (1010)	1010±10 (1011)	Venkatathri N., (2006)
S=O symmetric stretching	1050±10 (1060)	1050±10 (1047)	1050±10 (1047)	Fernandes *et al.*,(2004)
Vibrations of Si-O-Si linkages	1200±10 (1130)	1200±10 (1220)	1200±10 (1219)	Venkatathri N., (2006)
Quinoid ring C=C stretching	1170±10 (1160)	1170±10 (1170)	1170±10 (1170)	Fernandes *et al.*,(2004)
S=O asymmetric stretching	1200±10 (1220)	1200±10 (1210)	1200±10 (1220)	Fernandes *et al.*,(2004)
NO_3^- strectching	-	1340±10 (1330)	-	Cziczo *et al.*,(1999)
C-C ring stretching	1517±10 (1517)	1517±10 (1520)	1517±10 (1514)	Peres *et al.*,(2006)
NH_4^+ vibration	-	1630±10 (1630)	-	Zecchina *et al.*,(1997)
CH_3 symmetric stretching	2872±10 (2840)	2872±10 (2882)	2872±10 (2873)	Çirpan *et al.*,(2002)
CH_3 asymmetric stretching	2960±10 (2980)	2960±10 (2950)	2960±10 (2962)	Çirpan *et al.*,(2002)
Trans vinylene C-H strectching	3022±10 (3010)	3022±10 (3023)	3022±10 (3018)	Peres *et al.*,(2006)
NH_4^+ strectching	-	3330±10 (3340)	-	Zecchina *et al.*,(1997)
Silanol group	3630±10 (3660)	-	3630±10 (3663)	Venkatathri N., (2006)

Appendix L Calibration curve of vapor concentration (Probe number 4, 6)

The flow rate of NH_4NO_3 was measured by the slope of calibration curve between volume of NH_4NO_3(L) and the elapsed time (min). The flow rate of N_2 from the flow controller was 5 L/min. N2 was flown through the chemical solution chamber to form a vapor. The vapor concentration was calculated from volume flow rate of NH_4NO_3 (L/min) divided by total volume flow rate ($V_{N2}+V_{NH4NO3}+V_{H20}$, L/min) as :

$$\% \text{ Vapor concentration} = \left(\frac{V_{NH4NO3}}{V_{N2}+V_{NH4NO3}+V_{H20}} \right) \times 100 \qquad (L.1)$$

Where V_{NH4NO3} = Volume flow rate of NH_4NO_3 (L/min)

V_{N2} = Volume flow rate of N_2 (L/min)

V_{H20} = Volume flow rate of H_20 (L/min)

Table L1 Weight loss of Ammonium nitrate vapor

Time (sec)	Weight loss (g)	Volume of NH4NO3 (L)
0	0	0
5	0.25	$1.28x10^{-2}$
10	0.41	$2.09x10^{-3}$
15	0.65	$3.32x10^{-3}$
20	0.74	$3.78x10^{-3}$
25	0.85	$4.34x10^{-3}$
30	1.03	$5.26x10^{-3}$
35	1.45	$7.40x10^{-3}$
40	1.53	$7.81x10^{-3}$
45	1.8	$9.18x10^{-3}$
50	2.16	$1.10x10^{-1}$
55	2.41	$1.23x10^{-1}$
60	2.5	$1.28x10^{-1}$

Slope of calibration curve = $2.20x10^{-3}$ L/min

$$\% \text{ Vapor concentration at 60 min} = \left(\frac{2.2x10^{-3} \text{ L/min}}{(5 \text{ L/min} + 5x(2.2x10^{-3} \text{ L/min})} \right) x\ 100$$

$$= 3.77x10^{-2} \ \% \text{ v/v}$$

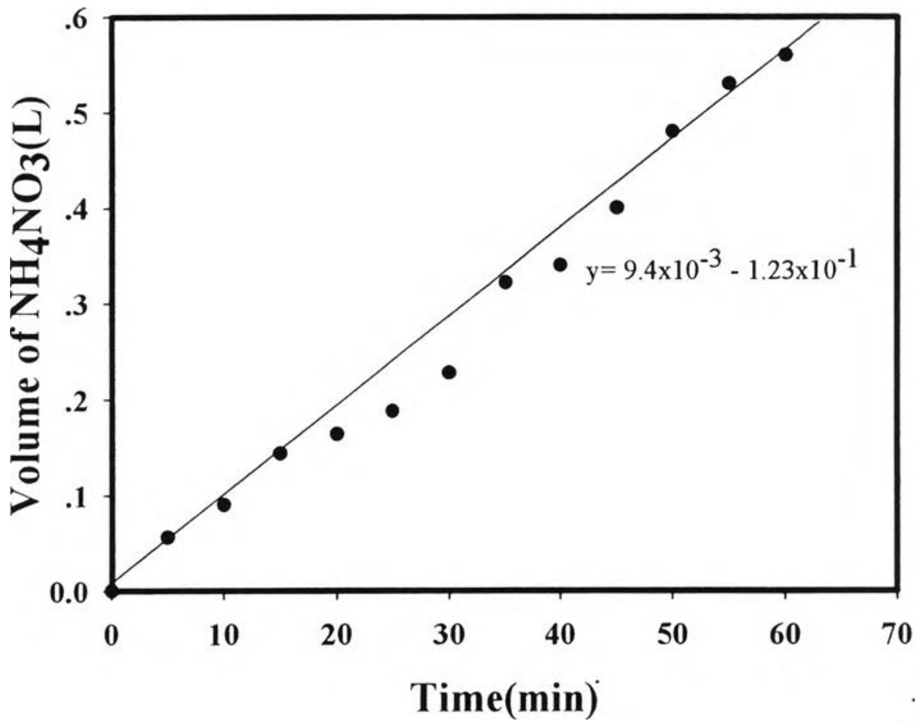


Figure L1 Calibration curve of NH_4NO_3.

Appendix M Sensitivity Measurement (Probe number 4, 6)

Sensitivity measurements of poly(*p*-phenylene vinylene) and $300H_2SO_4$: poly(*p*-phenylene vinylene)/zeolite pellets were carried out by using the two point probe at the 0.0377% v/v NH_4NO_3 vapor of 1 atm, 40-60% relative humidity and 28±2 °C. The electrical response of sample was calculated from the difference between the equilibrium conductivity of sample upon exposed to NH_4NO_3 vapor and the steady state of final conductivity of sample in N_2 (Densakulprasert *et al.*, 2003).

$$\Delta\sigma = \sigma_{NH4NO3} - \sigma_{N2\ final} \qquad (M.1)$$

However, an addition of zeolite into PPV results in the lowering of the conductivity of composite samples. The sensitivity is defined as the electrical response divided by the it's conductivity at the final N_2 (Densakulprasert *et al.*, 2003).

$$\text{Sensitivity} = \Delta\sigma / \sigma_{N2\ final} \qquad (M.2)$$

Table M1 The conductivity response of PPV, Doped PPV and Zeolite Y (Cation H^+) exposed to 0.0377%v/v NH_4NO_3

Sample	Si/Al ratio	Sensitivity		Average	STD
		Sample1 (probe 4)	Sample 2 (probe 6)		
PPV	0	$6.24x10^{-02}$	$4.85x10^{-02}$	$5.55x10^{-02}$	$9.84x10^{-03}$
dPPV	0	$9.85x10^{-01}$	$9.44x10^{-01}$	$9.65x10^{-01}$	$2.86x10^{-02}$
CVB400	5.1	$1.15x10^{-01}$	$1.42x10^{-01}$	$1.21x10^{-01}$	$1.87x10^{-02}$
CVB720	30	$1.86x10^{-01}$	$2.11x10^{-01}$	$1.98x10^{-01}$	$1.81x10^{-02}$
CVB760	60	$3.81x10^{-01}$	$3.85x10^{-01}$	$3.83x10^{-01}$	$2.55x10^{-03}$
CVB780	80	$4.79x10^{-01}$	$4.86x10^{-01}$	$4.64x10^{-01}$	$2.15x10^{-02}$

Table M2 The conductivity response of 10% v/v Doped PPV with 90% Zeolite Y (Cation H^+) exposed to 0.0377%v/v NH_4NO_3

Sample	Si/Al ratio	Sensitivity		Average	STD
		Sample1 (probe 4)	Sample 2 (probe 6)		
PPV	0	$6.24x10^{-02}$	$4.85x10^{-02}$	$5.55x10^{-02}$	$9.84x10^{-03}$
dPPV	0	$9.85x10^{-01}$	$9.44x10^{-01}$	$9.65x10^{-01}$	$2.86x10^{-02}$
dPPV/CVB400	5.1	$2.06x10^{-01}$	$9.66x10^{-01}$	$5.86x10^{-01}$	$5.37x10^{-01}$
dPPV/CVB720	30	1.37	1.60	1.48	$1.64x10^{-01}$
dPPV/CVB760	60	2.80	2.23	2.52	$4.06x10^{-01}$
dPPV/CVB780	80	3.18	4.40	3.79	$8.60x10^{-01}$

Table M3 Electrical Sensitivity and Temporal Response

Sample	Sensitivity ($\Delta\sigma/\sigma_{N2}$)	Induction time, t_i (min)	Recovery time, t_r (min)
PPV	$5.55x10^{-02}$	81	28
dPPV	$9.65x10^{-01}$	80	38
CVB400	$1.21x10^{-01}$	88	138
CVB720	$1.98x10^{-01}$	103	56
CVB760	$3.83x10^{-01}$	105	25
CVB780	$4.64x10^{-01}$	101	48
dPPV/CVB400	$5.86x10^{-01}$	41	23
dPPV/CVB720	1.48	34	47
dPPV/CVB760	2.52	91	38
dPPV/CVB780	3.79	118	20

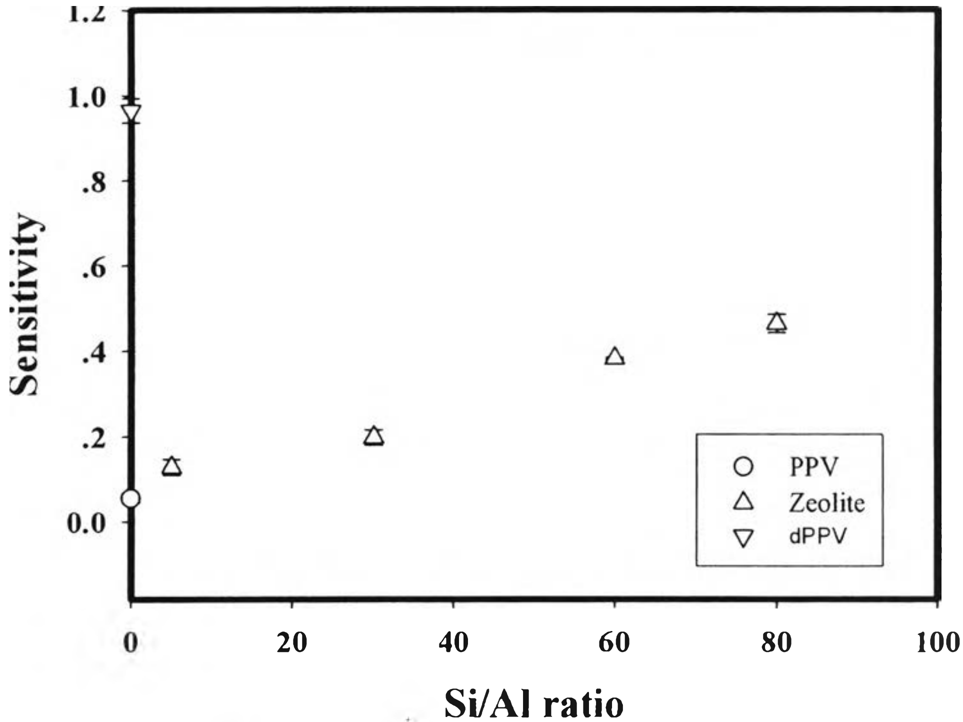


Figure M1 Sensitivity of PPV, dPPV and Zeolite.

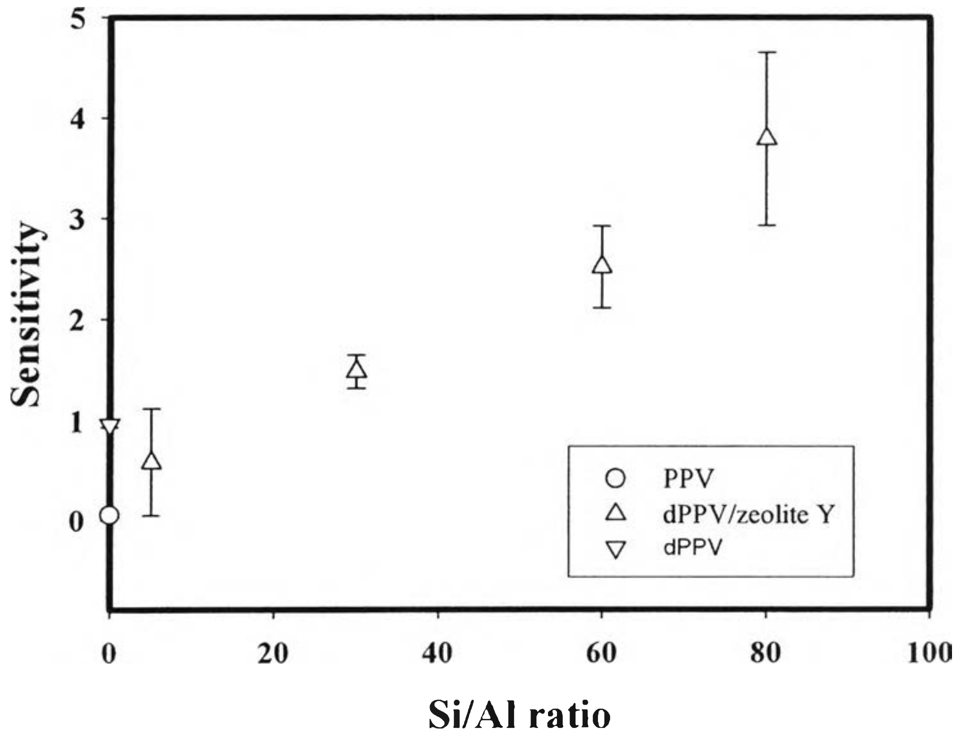


Figure M2 Sensitivity of PPV, dPPV and dPPV/zeolite Y.

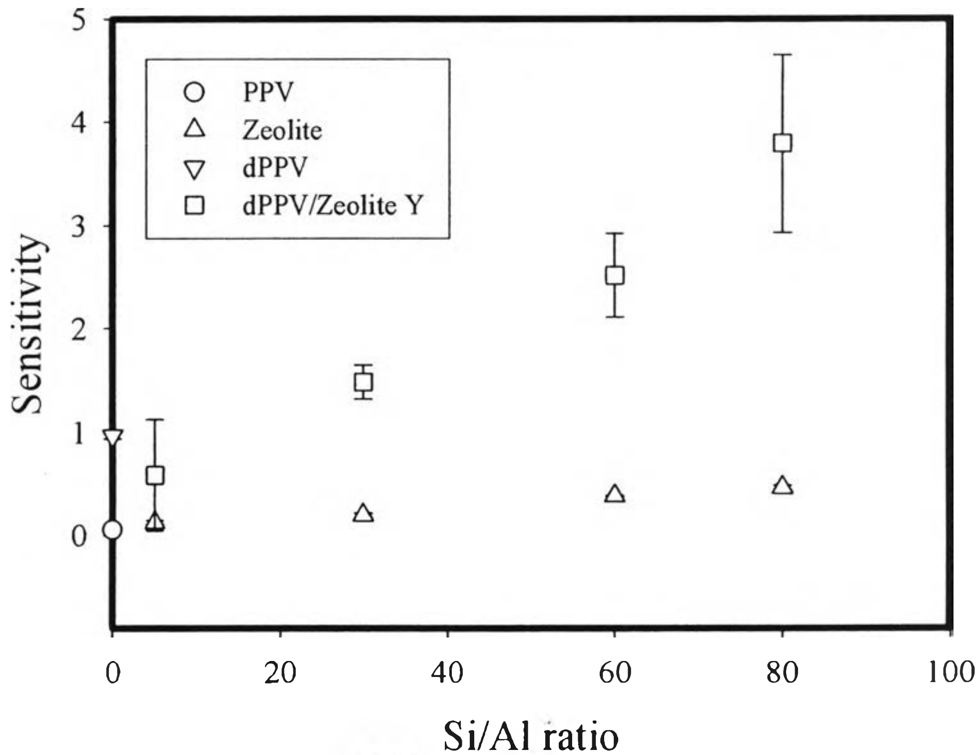


Figure M3 Sensitivity of PPV, dPPV, Zeolite Y and dPPV/zeolite Y.

Table M4 The conductivity response of PPV exposed to 0.0377%v/v NH_4NO_3

Sample name : PPV_1

Probe 4

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0706 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : $1.29x10^{-04}$

Sample name : PPV_2

Probe 6

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0384 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : $3.65x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{\ aferex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
PPV_1	$2.96x10^{-03}$	$8.83x10^{-05}$	$3.10x10^{-05}$	$3.30x10^{-05}$	$3.35x10^{-05}$	$6.24x10^{-06}$	$1.50x10^{-05}$	$6.24x10^{-02}$	54	15
PPV_2	$8.12x10^{-03}$	$1.21x10^{-05}$	$4.24x10^{-05}$	$4.45x10^{-05}$	$1.03x10^{-05}$	$2.06x10^{-06}$	$9.85x10^{-04}$	$4.85x10^{-02}$	108	42
AVG	$5.54x10^{-03}$	$5.02x10^{-05}$	$3.67x10^{-05}$	$3.87x10^{-05}$	$4.52x10^{-05}$	$2.00x10^{-06}$	$5.02x10^{-04}$	$5.55x10^{-02}$	81	28
STD	$3.65x10^{-03}$	$5.39x10^{-05}$	$8.06x10^{-06}$	$8.15x10^{-06}$	$3.88x10^{-06}$	$8.63x10^{-08}$	$6.88x10^{-04}$	$9.84x10^{-03}$	38	19

Table M5 The conductivity response of dPPV exposed to 0.0377%v/v NH_4NO_3

Sample name : dPPV_1

Probe 4

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0420 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : 4.31×10^{-04}

Sample name : dPPV_2

Probe 6

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0289 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : 7.49×10^{-04}

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{aferex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
dPPV_1	7.61×10^{-02}	4.51×10^{-05}	1.69×10^{-02}	3.36×10^{-02}	3.94×10^{-03}	1.67×10^{-02}	2.97×10^{-02}	9.85×10^{-01}	61	20
dPPV_2	9.53×10^{-02}	2.90×10^{-05}	6.49×10^{-05}	1.26×10^{-04}	2.90×10^{-05}	6.13×10^{-05}	9.73×10^{-05}	9.44×10^{-01}	100	56
AVG	8.57×10^{-02}	3.70×10^{-05}	8.50×10^{-03}	1.69×10^{-02}	1.98×10^{-03}	8.37×10^{-03}	1.49×10^{-02}	9.65×10^{-01}	80	38
STD	1.36×10^{-02}	1.14×10^{-05}	1.19×10^{-02}	2.37×10^{-02}	2.76×10^{-03}	1.18×10^{-02}	2.09×10^{-02}	2.86×10^{-02}	27	25

Table M6 The conductivity response of CVB400 exposed to 0.0377% v/v NH_4NO_3

Sample name : CVB400_1

Probe 4	Si/Al ratio 5.1	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.194 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $1.29x10^{-04}$

Sample name : CVB400_2

Probe 6	Si/Al ratio 5.1	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.0380 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $7.55x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
CVB400_1	$2.87x10^{-05}$	$5.66x10^{-06}$	$1.36x10^{-05}$	$1.51x10^{-05}$	$8.49x10^{-06}$	$1.57x10^{-06}$	$6.66x10^{-06}$	$1.15x10^{-01}$	68	111
CVB400_2	$3.86x10^{-05}$	$6.12x10^{-06}$	$1.15x10^{-05}$	$1.31x10^{-05}$	$1.08x10^{-05}$	$1.63x10^{-06}$	$1.43x10^{-05}$	$1.26x10^{-01}$	109	165
AVG	$3.37x10^{-05}$	$5.89x10^{-06}$	$1.25x10^{-05}$	$1.41x10^{-05}$	$9.64x10^{-06}$	$1.60x10^{-06}$	$1.05x10^{-05}$	$1.21x10^{-01}$	88	138
STD	$7.01x10^{-06}$	$3.23x10^{-07}$	$1.46x10^{-06}$	$1.42x10^{-06}$	$1.63x10^{-06}$	$4.71x10^{-08}$	$5.41x10^{-06}$	$7.88x10^{-03}$	29	38

Table M7 The conductivity response of CVB720 exposed to 0.0377% v/v NH_4NO_3

Sample name : CVB720_1

Probe 4 | Si/Al ratio 30 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0263 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $1.29x10^{-04}$

Sample name : CVB720_2

Probe 6 | Si/Al ratio 30 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0678 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $7.55x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
CVB720_1	$6.64x10^{-04}$	$1.26x10^{-05}$	$1.26x10^{-05}$	$1.49x10^{-05}$	$1.51x10^{-05}$	$2.34x10^{-06}$	$1.06x10^{-07}$	$1.86x10^{-01}$	66	41
CVB720_2	$4.25x10^{-03}$	$1.28x10^{-05}$	$1.68x10^{-05}$	$2.03x10^{-05}$	$1.29x10^{-05}$	$3.54x10^{-06}$	$7.39x10^{-06}$	$2.11x10^{-01}$	140	71
AVG	$2.46x10^{-03}$	$1.27x10^{-05}$	$1.47x10^{-05}$	$1.76x10^{-05}$	$1.46x10^{-05}$	$2.94x10^{-06}$	$3.75x10^{-06}$	$1.98x10^{-01}$	103	56
STD	$2.54x10^{-03}$	$1.31x10^{-07}$	$2.95x10^{-06}$	$3.80x10^{-06}$	$1.54x10^{-06}$	$8.50x10^{-07}$	$5.15x10^{-06}$	$1.81x10^{-02}$	53	21

Table M8 The conductivity response of CVB760 exposed to 0.0377% v/v NH_4NO_3

Sample name : CVB760_1

Probe 4 | Si/Al ratio 60 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0577 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $1.29x10^{-04}$

Sample name : CVB760_2

Probe 6 | Si/Al ratio 60 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0360 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $7.55x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{\ afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
CVB760_1	$1.50x10^{-03}$	$1.14x10^{-05}$	$1.60x10^{-05}$	$9.92x10^{-06}$	$1.10x10^{-05}$	$6.11x10^{-06}$	$1.04x10^{-06}$	$3.81x10^{-01}$	126	28
CVB760_2	$6.22x10^{-03}$	$9.00x10^{-06}$	$1.29x10^{-05}$	$7.94x10^{-06}$	$1.18x10^{-05}$	$4.96x10^{-06}$	$3.85x10^{-06}$	$3.85x10^{-01}$	85	23
AVG	$3.86x10^{-03}$	$1.02x10^{-05}$	$1.45x10^{-05}$	$8.93x10^{-06}$	$1.14x10^{-05}$	$5.54x10^{-06}$	$2.44x10^{-06}$	$3.83x10^{-01}$	105	25
STD	$3.33x10^{-03}$	$1.68x10^{-06}$	$2.22x10^{-06}$	$1.41x10^{-06}$	$5.86x10^{-07}$	$8.13x10^{-07}$	$1.99x10^{-06}$	$2.55x10^{-03}$	28	4

Table M9 The conductivity response of CVB780 exposed to 0.0377% v/v NH_4NO_3

Sample name : CVB780_1

Probe 4 | Si/Al ratio 80 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0264 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $4.31x10^{-04}$

Sample name : CVB780_2

Probe 6 | Si/Al ratio 80 | Cation H^+

Room Temperature : 25°C | Humidity : 48 % | Thickness : 0.0240 cm.

Chamber Temperature : 26°C | Applied Voltage : 20 V | K : $7.49x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{\ afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
CVB780_1	$1.49x10^{-03}$	$1.01x10^{-05}$	$3.02x10^{-05}$	$4.17x10^{-05}$	$1.48x10^{-05}$	$1.35x10^{-05}$	$2.69x10^{-05}$	$4.79x10^{-01}$	87	42
CVB780_2	$4.56x10^{-03}$	$1.63x10^{-05}$	$2.12x10^{-05}$	$3.07x10^{-05}$	$1.73x10^{-05}$	$9.50x10^{-06}$	$1.34x10^{-05}$	$4.49x10^{-01}$	116	53
AVG	$2.97x10^{-03}$	$1.32x10^{-05}$	$2.82x10^{-05}$	$3.62x10^{-05}$	$1.60x10^{-05}$	$1.15x10^{-05}$	$2.02x10^{-05}$	$4.64x10^{-01}$	101	48
STD	$2.24x10^{-03}$	$4.41x10^{-06}$	$6.37x10^{-06}$	$7.76x10^{-06}$	$1.78x10^{-06}$	$2.82x10^{-06}$	$9.55x10^{-06}$	$2.15x10^{-02}$	21	8

Table M10 The conductivity response of dPPV/CVB400 exposed to 0.0377%v/v NH_4NO_3

Sample name : dPPV/CVB400_1

Probe 4	Si/Al ratio 5.1	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.0286 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : 1.29×10^{-04}

Sample name : dPPV/CVB400_2

Probe 6	Si/Al ratio 5.1	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.0206 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : 3.65×10^{-04}

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
dPPV/CVB400_1	1.44×10^{-2}	9.04×10^{-5}	3.48×10^{-4}	4.19×10^{-4}	1.95×10^{-4}	7.15×10^{-5}	2.25×10^{-4}	2.06×10^{-1}	30	15
dPPV/CVB400_2	3.97×10^{-2}	2.72×10^{-5}	5.31×10^{-3}	1.82×10^{-4}	3.12×10^{-5}	5.13×10^{-3}	1.50×10^{-4}	9.66×10^{-1}	52	30
AVG	2.71×10^{-2}	5.88×10^{-5}	2.83×10^{-3}	3.01×10^{-4}	1.13×10^{-4}	2.60×10^{-3}	1.88×10^{-4}	5.86×10^{-1}	41	23
STD	1.79×10^{-2}	4.47×10^{-5}	3.51×10^{-3}	1.68×10^{-4}	1.16×10^{-4}	3.57×10^{-3}	5.24×10^{-5}	5.37×10^{-1}	11	8

Table M11 The conductivity response of dPPV/CVB720 exposed to 0.0377%v/v NH_4NO_3

Sample name : dPPV/CVB720_1

Probe 4	Si/Al ratio 30	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.0221 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $1.29x10^{-04}$

Sample name : dPPV/CVB720_2

Probe 6	Si/Al ratio 30	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.0277 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $3.65x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
dPPV/CVB720_1	$6.00x10^{-5}$	$9.32x10^{-5}$	$2.11x10^{-4}$	$5.00x10^{-4}$	$1.32x10^{-4}$	$2.89x10^{-4}$	$3.69x10^{-4}$	1.37	26	37
dPPV/CVB720_2	$6.31x10^{-2}$	$3.38x10^{-5}$	$3.57x10^{-5}$	$9.29x10^{-5}$	$4.86x10^{-5}$	$5.72x10^{-5}$	$4.44x10^{-5}$	1.60	41	57
AVG	$6.15x10^{-2}$	$6.35x10^{-5}$	$1.23x10^{-4}$	$2.97x10^{-4}$	$9.00x10^{-5}$	$1.73x10^{-4}$	$2.07x10^{-4}$	1.48	34	47
STD	$2.19x10^{-3}$	$4.20x10^{-5}$	$1.24x10^{-4}$	$2.88x10^{-4}$	$5.87x10^{-5}$	$1.64x10^{-4}$	$2.29x10^{-4}$	$1.64x10^{-1}$	11	14

Table M12 The conductivity response of dPPV/CVB760 exposed to 0.0377%v/v NH_4NO_3

Sample name : dPPV/CVB760_1

Probe 4	Si/Al ratio 60	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.042 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $1.29x10^{-04}$

Sample name : dPPV/CVB760_2

Probe 6	Si/Al ratio 60	Cation H^+
Room Temperature : 25°C	Humidity : 48 %	Thickness : 0.036 cm.
Chamber Temperature : 26°C	Applied Voltage : 20 V	K : $3.65x10^{-04}$

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{\ afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
dPPV/CVB760_1	$1.32x10^{-2}$	$4.07x10^{-5}$	$1.13x10^{-3}$	$4.29x10^{-3}$	$2.47x10^{-4}$	$3.16x10^{-3}$	$4.05x10^{-3}$	2.80	75	42
dPPV/CVB760_2	$1.61x10^{-2}$	$7.33x10^{-6}$	$2.22x10^{-5}$	$7.10x10^{-5}$	$8.32x10^{-6}$	$4.95x10^{-5}$	$6.34x10^{-5}$	2.23	107	34
AVG	$1.47x10^{-2}$	$2.40x10^{-5}$	$5.76x10^{-4}$	$2.18x10^{-3}$	$1.28x10^{-4}$	$1.61x10^{-3}$	$2.06x10^{-3}$	2.52	91	38
STD	$2.04x10^{-3}$	$2.36x10^{-5}$	$7.83x10^{-4}$	$2.99x10^{-3}$	$1.69x10^{-4}$	$2.20x10^{-3}$	$2.82x10^{-3}$	$4.06x10^{-1}$	23	6

Table M13 The conductivity response of dPPV/CVB780 exposed to 0.0377 %v/v NH_4NO_3

Sample name : dPPV/CVB780_1

Probe 4 Si/Al ratio 80 Cation H^+

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0270 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : 4.31×10^{-04}

Sample name : dPPV/CVB780_2

Probe 6 Si/Al ratio 80 Cation H^+

Room Temperature : 25°C Humidity : 48 % Thickness : 0.0248 cm.

Chamber Temperature : 26°C Applied Voltage : 20 V K : 7.49×10^{-04}

Sample	σ_{air} (S/cm)	σ_{vac} (S/cm)	$\sigma_{N2\ final}$ (S/cm)	σ_{NH4NO3} (S/cm)	$\sigma_{N2\ afterex}$ (S/cm)	$\Delta\sigma$ (S/cm)	$\Delta\sigma_{\ afterex}$ (S/cm)	$\Delta\sigma/\sigma_{N2}$	Induction time, t_i (min)	Recovery time, t_r (min)
dPPV/CVB780_1	1.91×10^{-2}	3.11×10^{-5}	3.50×10^{-5}	1.47×10^{-4}	7.03×10^{-5}	1.12×10^{-4}	7.63×10^{-5}	3.18	144	13
dPPV/CVB780_2	1.21×10^{-2}	1.53×10^{-5}	1.89×10^{-5}	1.02×10^{-4}	1.00×10^{-4}	8.30×10^{-5}	1.66×10^{-6}	4.40	91	26
AVG	1.56×10^{-2}	2.32×10^{-5}	2.70×10^{-5}	1.24×10^{-4}	8.53×10^{-5}	9.73×10^{-5}	3.90×10^{-5}	3.79	118	20
STD	4.98×10^{-3}	1.12×10^{-5}	1.14×10^{-5}	3.16×10^{-5}	2.12×10^{-5}	2.02×10^{-5}	5.28×10^{-5}	8.60×10^{-1}	38	10

CURRICULUM VITAE

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Proceedings:

1. Kamonsawas, J., Sirivat, A. (2008, April, June) Electrical Conductivity of Poly(phenylene vinylene)/Zeolite Composites and Synergetics Interaction with NH_4NO_3. Conference at CIMTEC'2008, Acireale, Sicily, Italy.
2. Kamonsawas, J., Sirivat, A., Hormnirun, P., Prissanaroon, W., (2008, April 23) Conductivity Response of Poly(phenylene vinylene)/Zeolite Composites Exposed to Ammonium Nitrate. Proceedings of the 14th PPC Symposium on Petroleum, Petrochemicals, and Polymers 2008, Bangkok, Thailand.

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1. Kamonsawas, J., Sirivat, A., Hormnirun, P., Prissanaroon, W., (2008, April 23) Electrical Conductivity Response of Poly(phenylene vinylene)/Zeolite Composites Exposed to Ammonium Nitrate. Poster presented at the 14th PPC Symposium on Petroleum, Petrochemicals, and Polymers 2008, Bangkok, Thailand.
2. Kamonsawas, J., Sirivat, A., Hormnirun, P., Prissanaroon, W., (2008, April 23) Poly(phenylene vinylene)/Zeolite Composites Response toward NH_4NO_3. Poster presented at Smartmat'08 and IWOFM-2, Chiangmai, Thailand.