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APPENDIX A

Surface Area of Catalyst from BET

Gastype : Nitrogen

Cross-sectional area : 16.2 A^{02}

Molecgular Weight : 28.0134 g/mole

Nonideality corr factor : 6.580E-05 / torr

Sample : 1% Pd on Alumina

Multipoint BET

P/Po	VOLUME (cc/g)	1/(W(Po/P-1))
0.1054	26.521	3.555E+00
0.1565	29.071	5.106E+00
0.2067	31.440	6.631E+00
0.2565	33.792	8.168E+00
0.3057	36.223	9.725E+00

Area = **1.121E+02** sq m/g

Slope = 3.07693E+01

Intercept = 2.93741E-01

Corr. = 1.0000 C = 1.057E+02

Sample : Blank Alumina

Multipoint BET

P/Po	VOLUME (cc/g)	1/(W(Po/P-1))
0.1035	40.460	2.283E+00
0.1544	44.818	3.260E+00
0.2043	48.994	4.193E+00
0.2537	53.208	5.112E+00
0.3023	57.663	6.012E+00

Area = **1.824E+02** sq m/g

Slope = 1.87378E+01

Intercept = 3.56206E-01

Corr. = 1.0000 C = 5.360E+01

APPENDIX B

The activation energy calculation

An air fuel ratio = 100.00 and temperture varies from 598-673 K.

The rate of reaction and temperature data is showed in Table B.1

Table B.1 The rate of reaction and temperature for methane combustion reaction over 1.0 % Pd on alumina catalyst .

Temperature (Kelvin)	Rate of reaction (cc of CH_4 converted/min/g. of Pd)
598.00	39.56
623.00	151.08
648.00	144.95
653.00	192.08
658.00	195.71
666.00	223.33
673.00	234.11

From this data, we followed Arrhenius equation by plotting ln(rate) and 1/temperature as shown in figure B.1.

The slope of graph is -8,655.1 .

The value of Ea = - (-8,655.1)/1.987

= 43,537 cal/g-mol

When R = 1.987 cal/g-mol.K

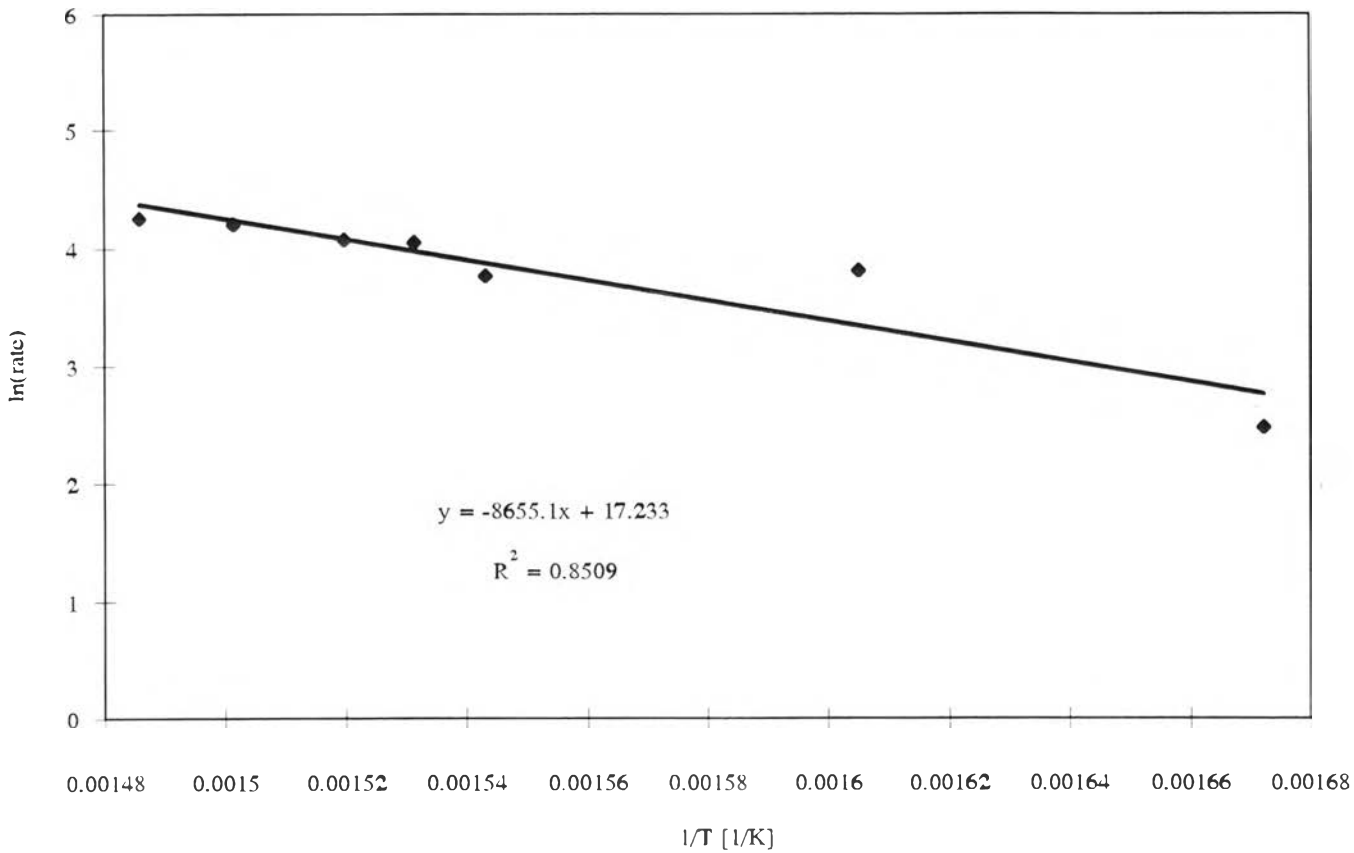

Figure B.1 ln(rate) with 1/T from Table B.1 over 0.3 gram of 1% Pd on alumina, air fuel ratio = 100 and 598-673 K.

APPENDIX C

The activation energy calculation (recalculated from the rate of reaction and temperature data of Najat Mouaddib,1992)

For the case that O_2:CH_4 = 2 or air fuel ratio = 9.52

The rate of reaction and temperature data from Najat Mouaddib, 1992 is showed in Table C.1

Table C.1 The rate of reaction and temperature for methane combustion reaction over 1.93 % Pd on alumina catalyst .

Temperature (Kelvin)	Rate of reaction (Mole CH_4 converted/hr/g. of Pd)
553.00	1.00
613.00	3.00
663.00	15.00
713.00	43.00
743.00	55.00

From this data, we followed Arrhenius equation by plotting ln(rate) and 1/temperature as shown in Figure C.1.

The slope of graph is -9,225.5.

The value of Ea = - (-9,225.5)/1.987

= 46,429 cal/g-mol

When R = 1.987 cal/g-mol.K

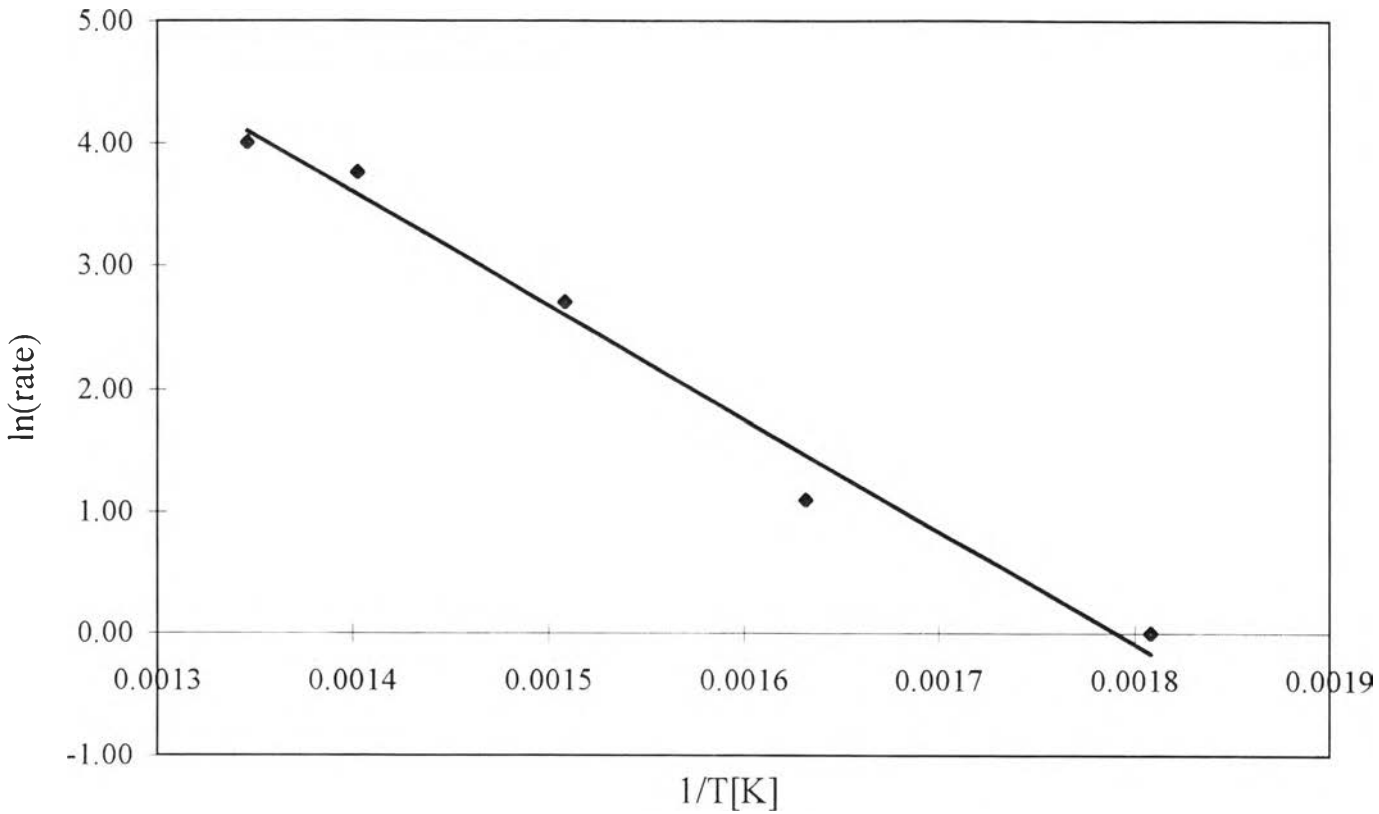

Figure C.1 ln(rate) with 1/T from data in Table C.1 over 0.2 gram of 1.93%Pd on alumina, O2/Ch4=2 and temperature between 553-743 K. (Najat Mouaddib, 1992)

For the case that O_2:CH_4 = 4 or air fuel ratio = 19.04

The rate of reaction and temperature data from Najat Mouaddib. 1992 is shown in Table C.2

Table C.2 The rate of reaction and temperature for methane combustion reaction over 1.93 % Pd on alumina catalyst .

Temperature (Kelvin)	**Rate of reaction (Mole CH_4 converted/hr/g. of Pd)**
553.00	**0.20**
613.00	**0.80**
663.00	**4.00**
713.00	**17.00**
743.00	**55.00**

Follow the previous method , the plot of ln(rate) and temperature shown in Figure C.2.

The slope of graph is -12,028 .

The value of Ea = - (-12,028)/1.987

= 60,553.5 cal/g-mol

When R = 1.987 cal/g-mol.K

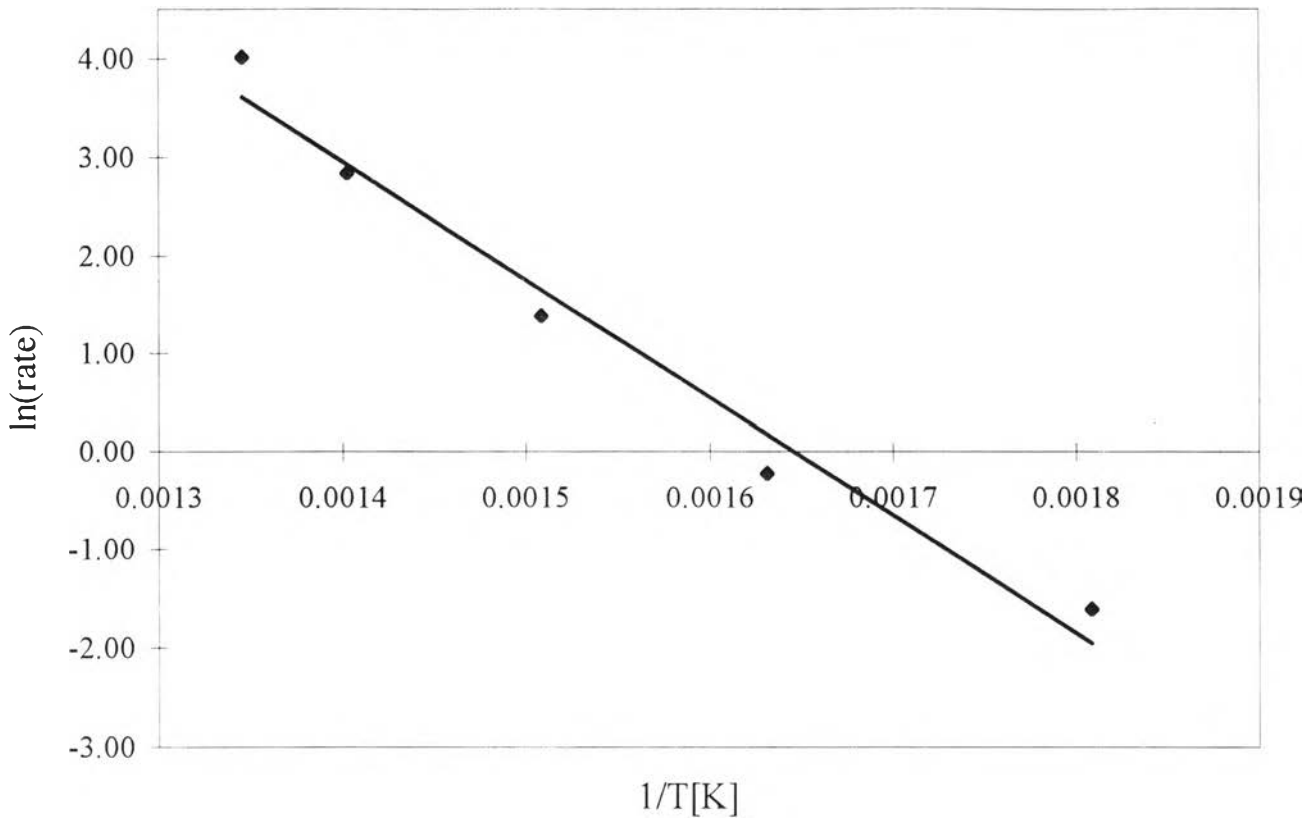

Figure C.2 ln(rate) with 1/T from data in Table C.2 over 0.2 gram of 1.93%Pd on alumina, O2/Ch4=2 and temperature between 553-743 K. (Najat Mouaddib, 1992)

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