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APPENDIX

APPENDIX A

SAMPLE OF CALCULATIONS

A-1 Calculation of the Crystallization Degree of NaY-Type Zeolite [52]

The degree of crystallization of synthesized NaY-type zeolite was expressed in terms of a relation degree of crystallization represent by the formula :

$$(I_1/I_2)*100(\%)$$

where I_1 = The total intensity of selected peaks of synthesized NaY-type zeolite sample

I_2 = The total intensity of selected peaks of standard commercial NaY-type zeolite "JRC-Z-Y"

For the example, the crystallization degree of synthesized NaY-type zeolite sample, as shown in Figure 5.14 was determined. From the Table A-1, the intensity of peaks of standard commercial NaY-type zeolite "JRC-Z-Y" and of synthesized NaY-type zeolite sample are revealed.

So that $I_1 = 3489$, $I_2 = 3590$

crystallization degree of NaY = (3489/3590)*100

= 97.19 %

Table A-1 the intensity of selected peaks

d-spacing	intensity	
	JRC-Z-Y	synthesized NaY sample
14.11	1491	1464
8.67	270	290
7.39	150	130
5.63	420	410
4.72	158	145
4.34	238	220
3.74	392	380
3.28	205	200
2.83	266	250
Total intensity	3590	3489

A-2 Calculation of H_2O/SiO_2 Ratio by Mole in the First Step of NaY-type Zeolite Preparation

Molecular weight of SiO_2 = 60.1

Molecular weight of H_2O = 18

Density of H_2O = 1 g/cm^3

Since the water glass contain 64% of H_2O, 27.45% of SiO_2, 8.55% of Na_2O , wherein percents are by weight. The water glass was used 218.6 g.

$$\text{Mole of } SiO_2 \text{ used} = \text{wt.} * \frac{(\%)}{100} * \frac{(1 \text{ mole})}{(\text{M.W of } SiO_2)} \quad \text{(A-2.1)}$$

$$= 218.6*(27.45/100)*(1/60.1)$$

$$= 1.0 \text{ mole}$$

$$\text{Mole of } H_2O \text{ in water glass used} = \text{wt.} * \frac{(\%)}{100} * \frac{(1 \text{ mole})}{(\text{M.W of } H_2O)} \quad \text{(A-2.2)}$$

$$= 218.6*(64/100)*(1/18)$$

$$= 7.8 \text{ mole}$$

$$\text{Mole of } H_2O \text{ in } NaAlO_2 \text{ solution} = \text{wt.} * \frac{(1 \text{ mole})}{(\text{M.W of } H_2O)} \quad \text{(A-2.3)}$$

$$= 158 *(1/18)$$

$$= 8.78 \text{ mole}$$

If used H_2O for preparation NaOH solution is 684 ml.

Mole of H_2O in NaOH solution = 684 *(1/18)

= 38 mole

Total H_2O in first step = 7.8 + 8.78 + 38

= 54.5 mole

So that H_2O/SiO_2 in the first step = 54.5/1

= 54.5 ratio by mole

Hence :

H_2O/SiO_2 ratio by mole	54.5	49	46.25	43.5	38	32.4
H_2O used in NaOH sol. (ml)	684	584	534	484	384	284

A-3 NH_3 Temperature programmed Desorption Calculation

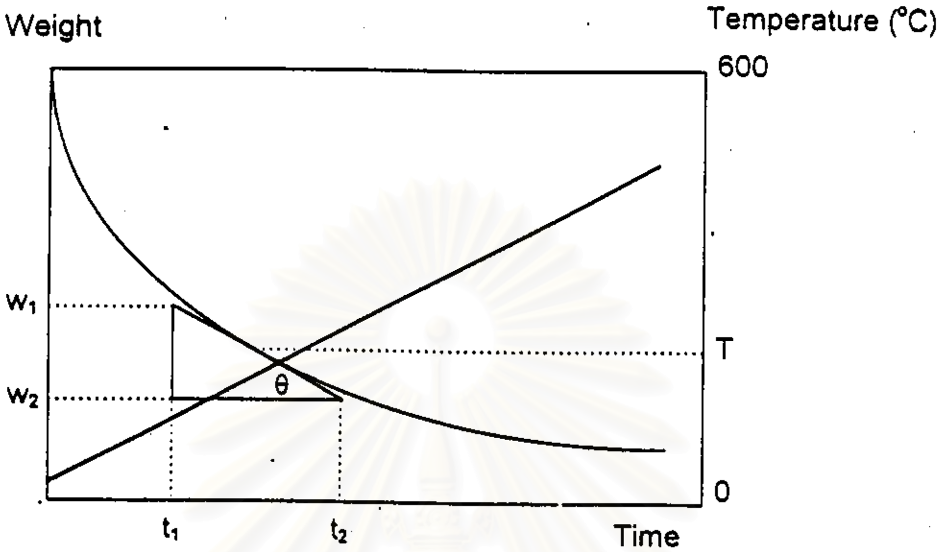

Figure A-3 Plot of weight loss and temperature versus time

Chart speed	=	0.25 cm/min	
Range	=	10 mg	
w	=	weight of catalyst	
w_w	=	weight of water	
w_d	=	weight of dry catalyst = $w-w_w$	
dw	=	10 mg * (a / 25 cm)	(A-2.1)
dt	=	60 sec * (b / 0.25 cm)	(A-2.2)
$\frac{(dw/dt)}{w_d}$	=	$\frac{(10 \text{ mg} * 0.25 \text{ cm} * a)/(60 \text{ sec} * 25 \text{ cm} * b)}{w_d}$	(A-2.3)

Plot $\frac{(dw/dt)}{w_d}$ versus temperature.

A-4 Calculation of Reaction Flow Rate

The catalyst used = 0.3000 g

packed catalyst into quart reactor (inside diameter = 0.6 cm)

determine the average high of catalyst bed = H cm. So that,

$$\text{Volume of bed} = \pi * (0.3)^2 * H * \text{ cc-cat.}$$

Used gas hourly space velocity (GHSV) = 2,000 hr^{-1}

$$GHSV = \frac{\text{Volumetric flow rate}^1}{\text{Volume of bed}}$$

$$\text{Volumetric flow rate}^1 = 2{,}000 * \text{Volume of bed}$$

$$= 2{,}000 * \pi * (0.3)^2 * H \quad \text{cc/hr}$$

$$= (2{,}000 * \pi * (0.3)^2 * H)/60 \quad \text{cc/min}$$

at STP condition :

Volumetric flow rate = Volumetric flow rate[1] * (273.15+T)/273.15

where T = room temperature °C

A-5 Calibration curves

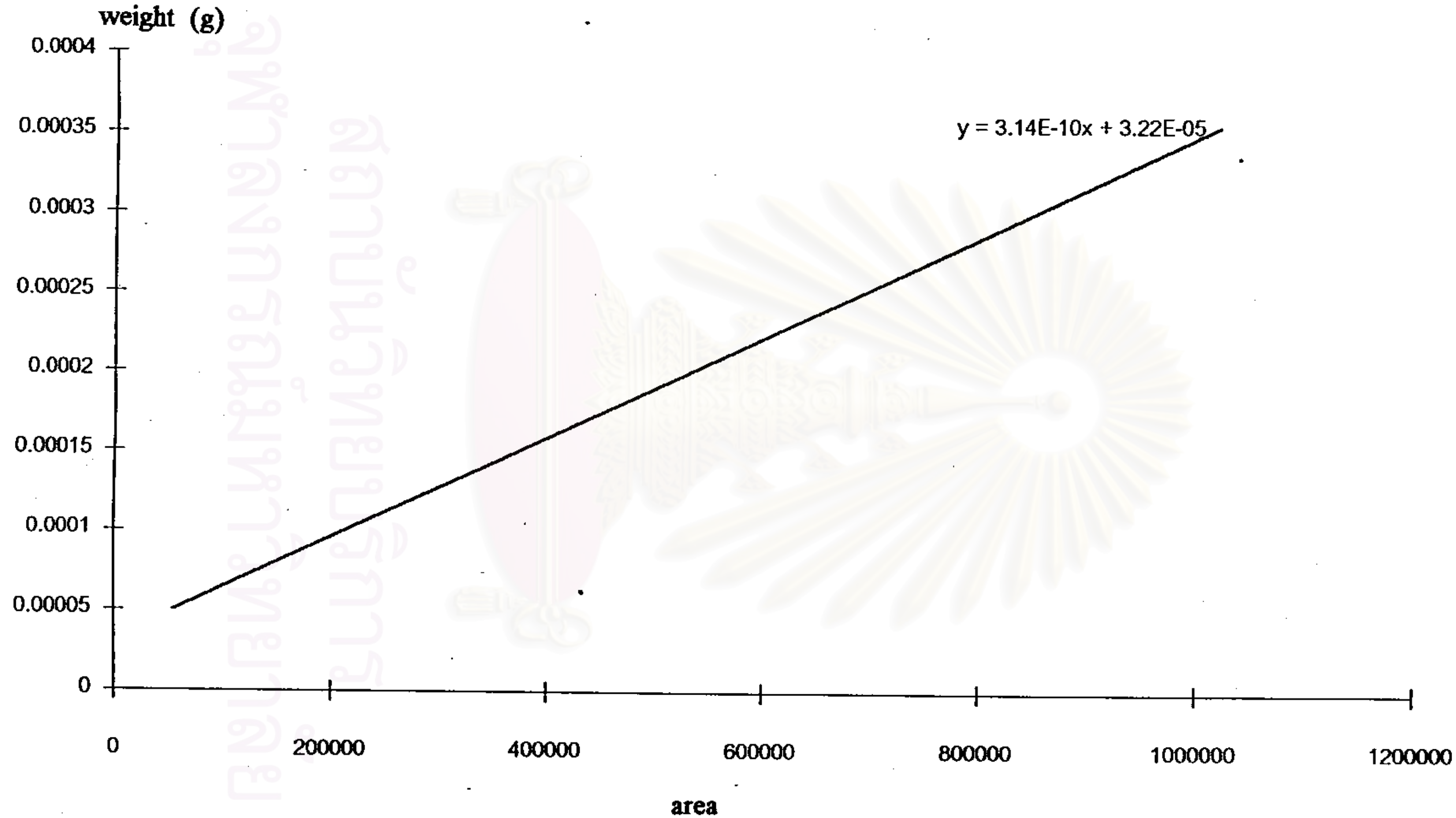

Figure A-5.1 calibration curve of n-octane, (OV-1 column)

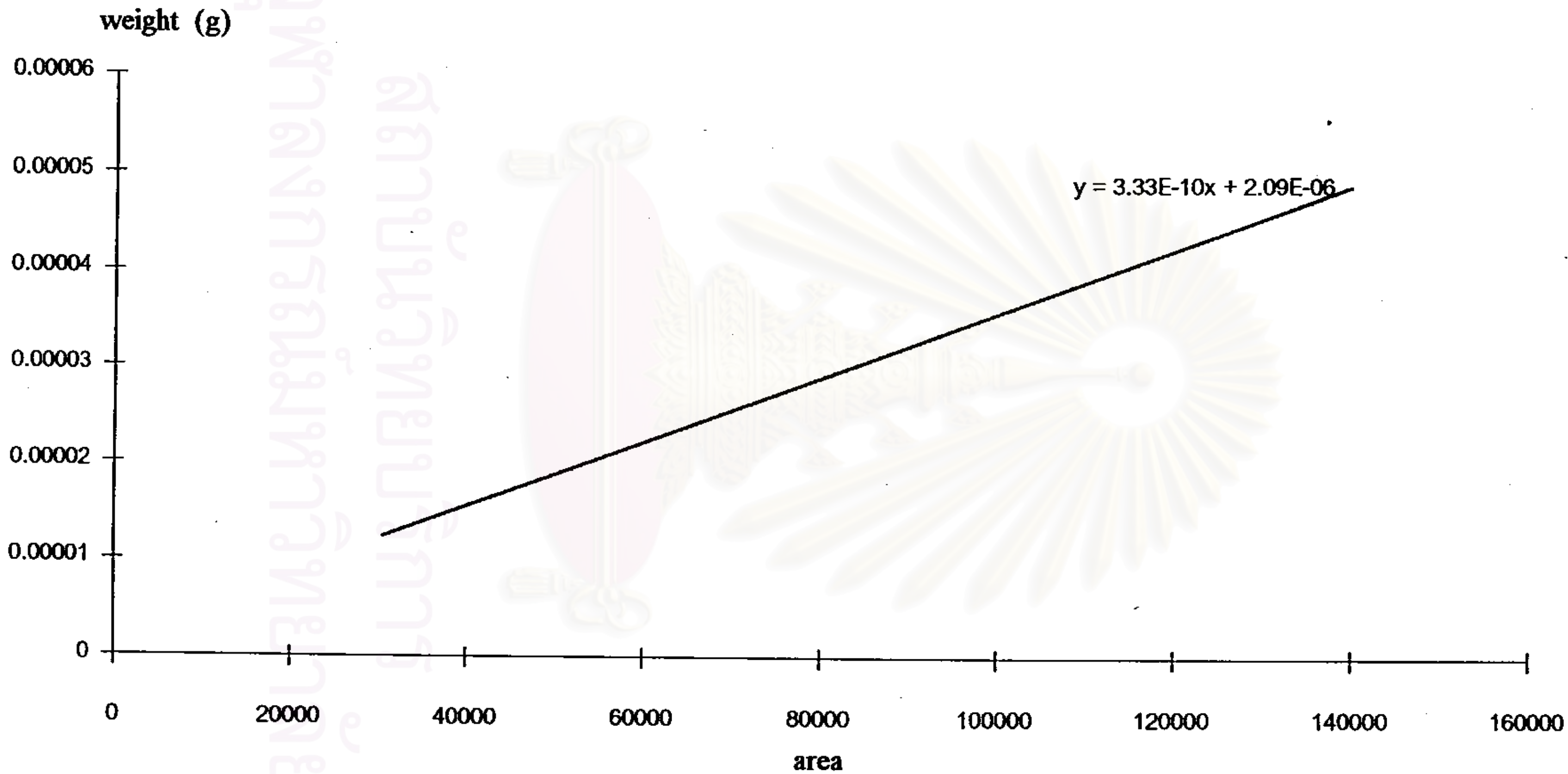

Figure A-5.2 calibration curve of benzene, (OV-1 column)

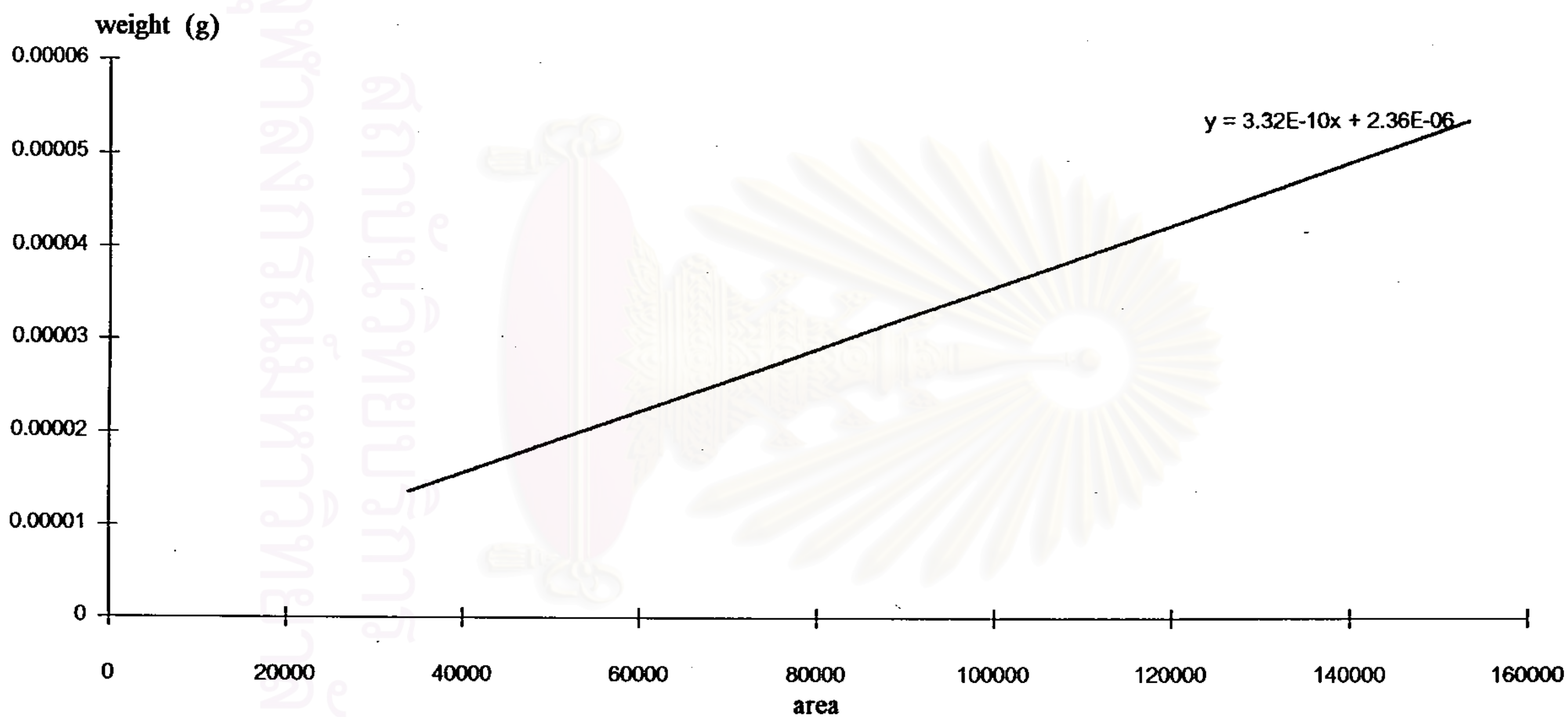

Figure A-5.3 calibration curve of tolulene, (OV-1 column)

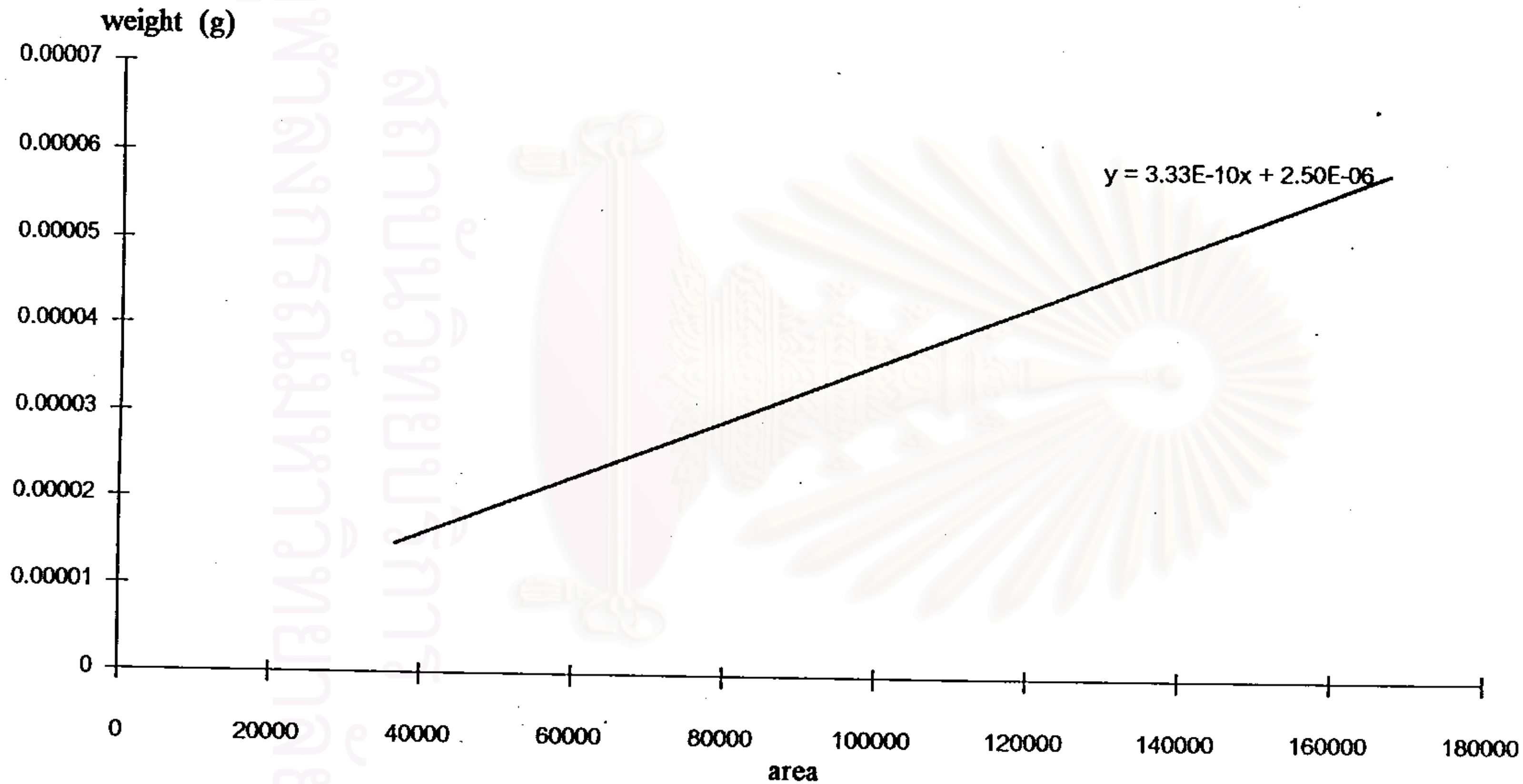

Figure A-5.4 calibration curve of ethylbenzene, (OV-1 column)

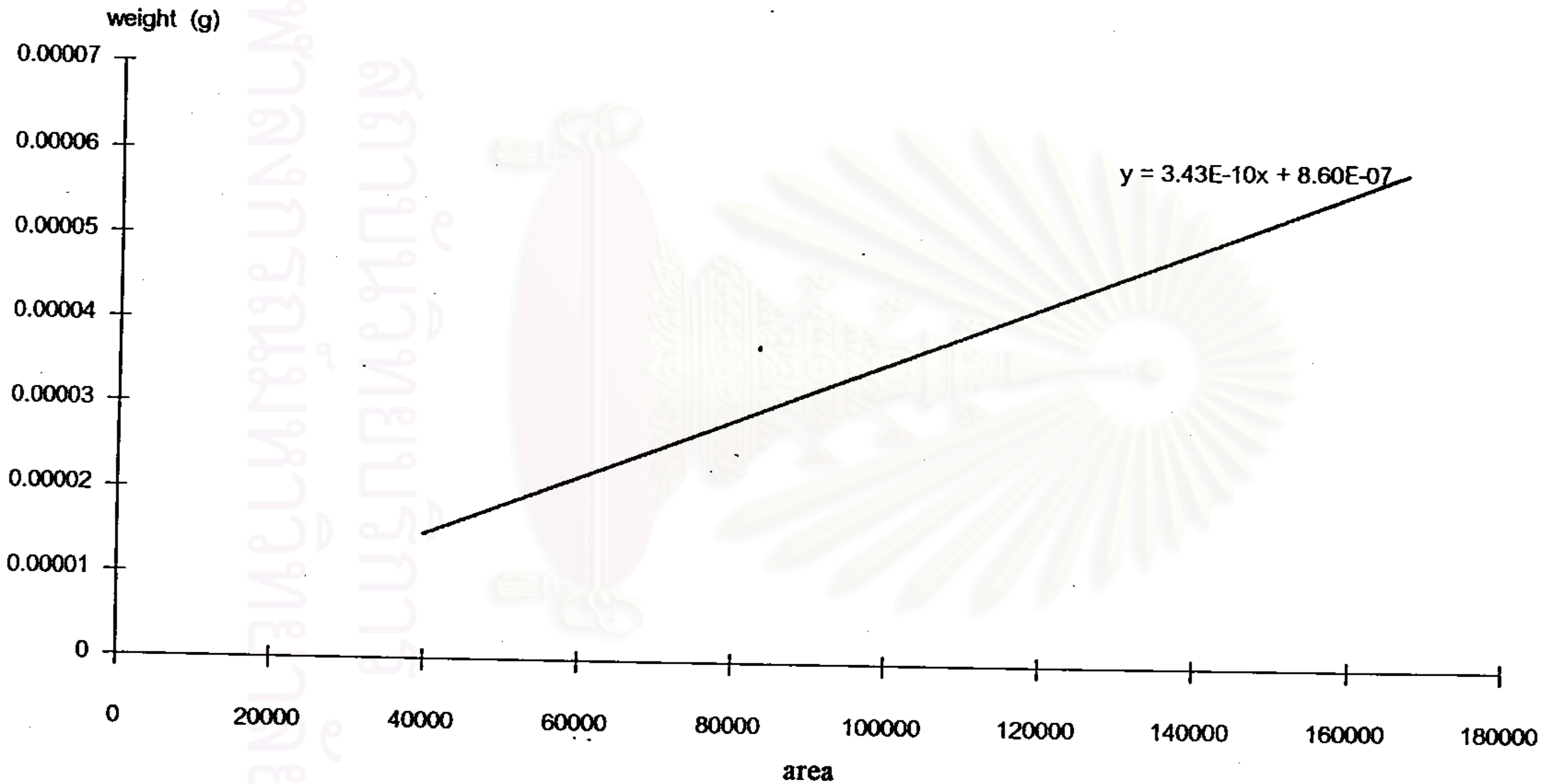

Figure A-5.5 calibration curve of m-xylene, (OV-1 column)

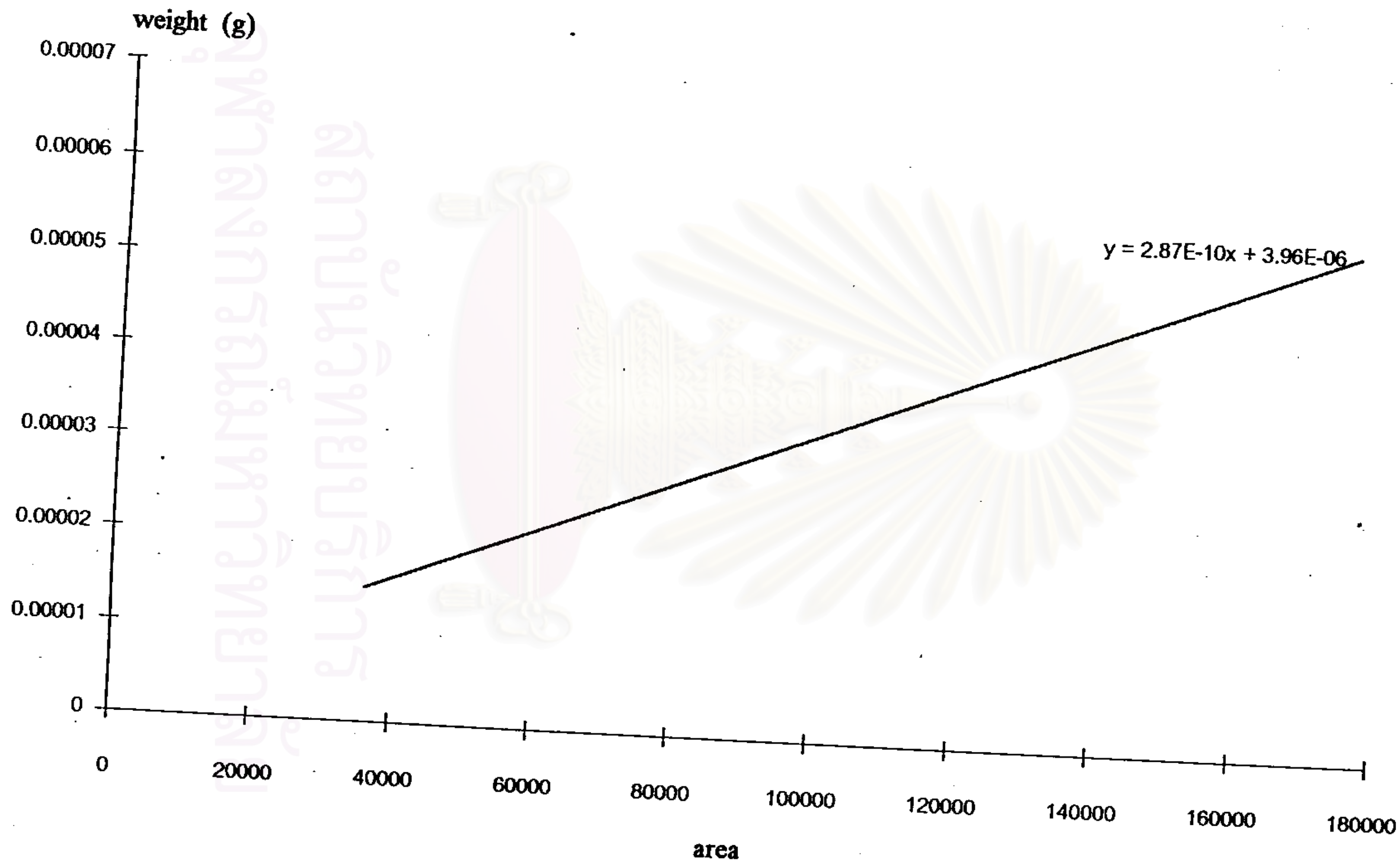

Figure A-5.6 calibration curve of o-xylene, (OV-1 column)

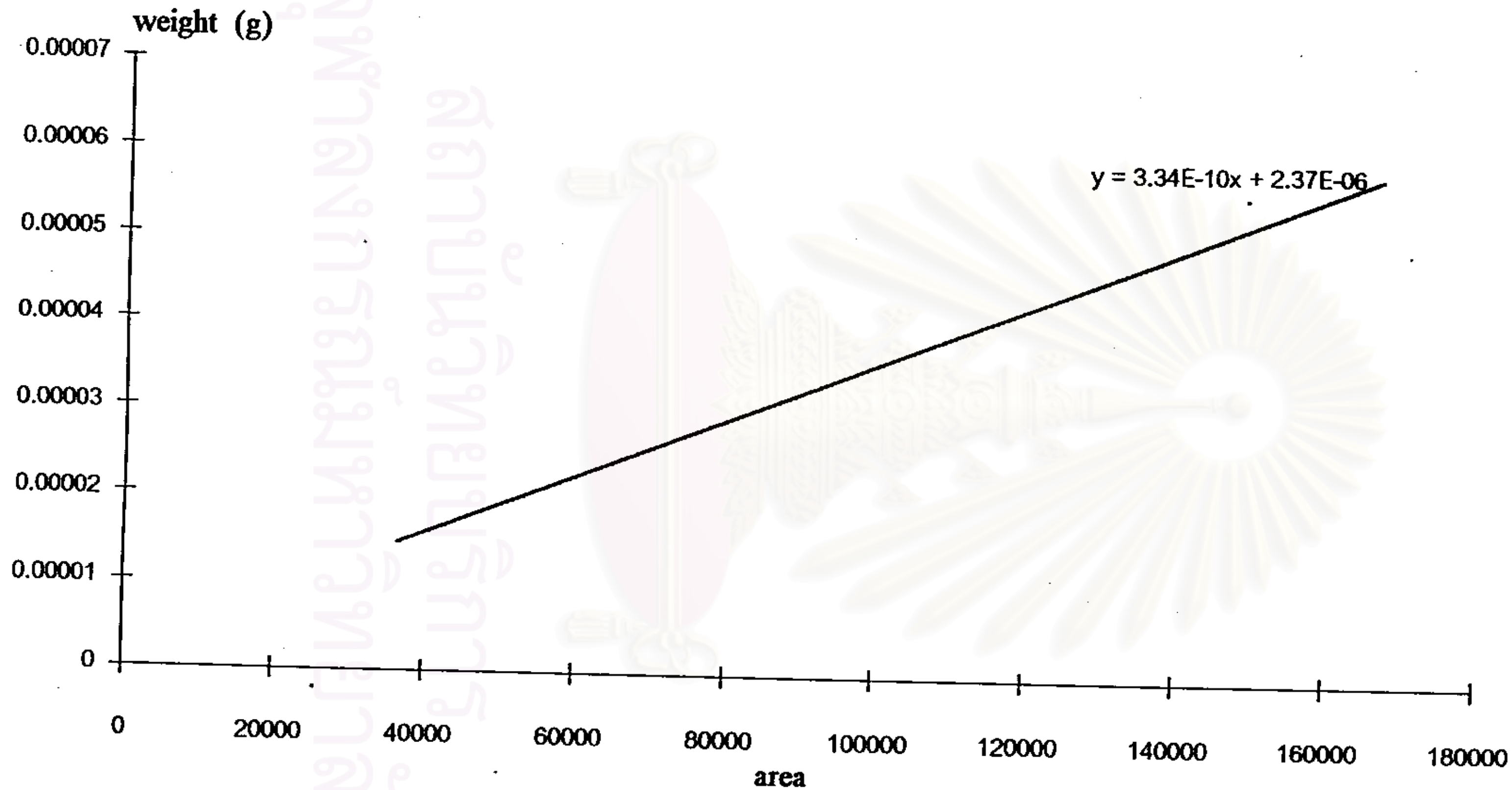

Figure A-5.7 calibration curve of p-xylene, (OV-1 column)

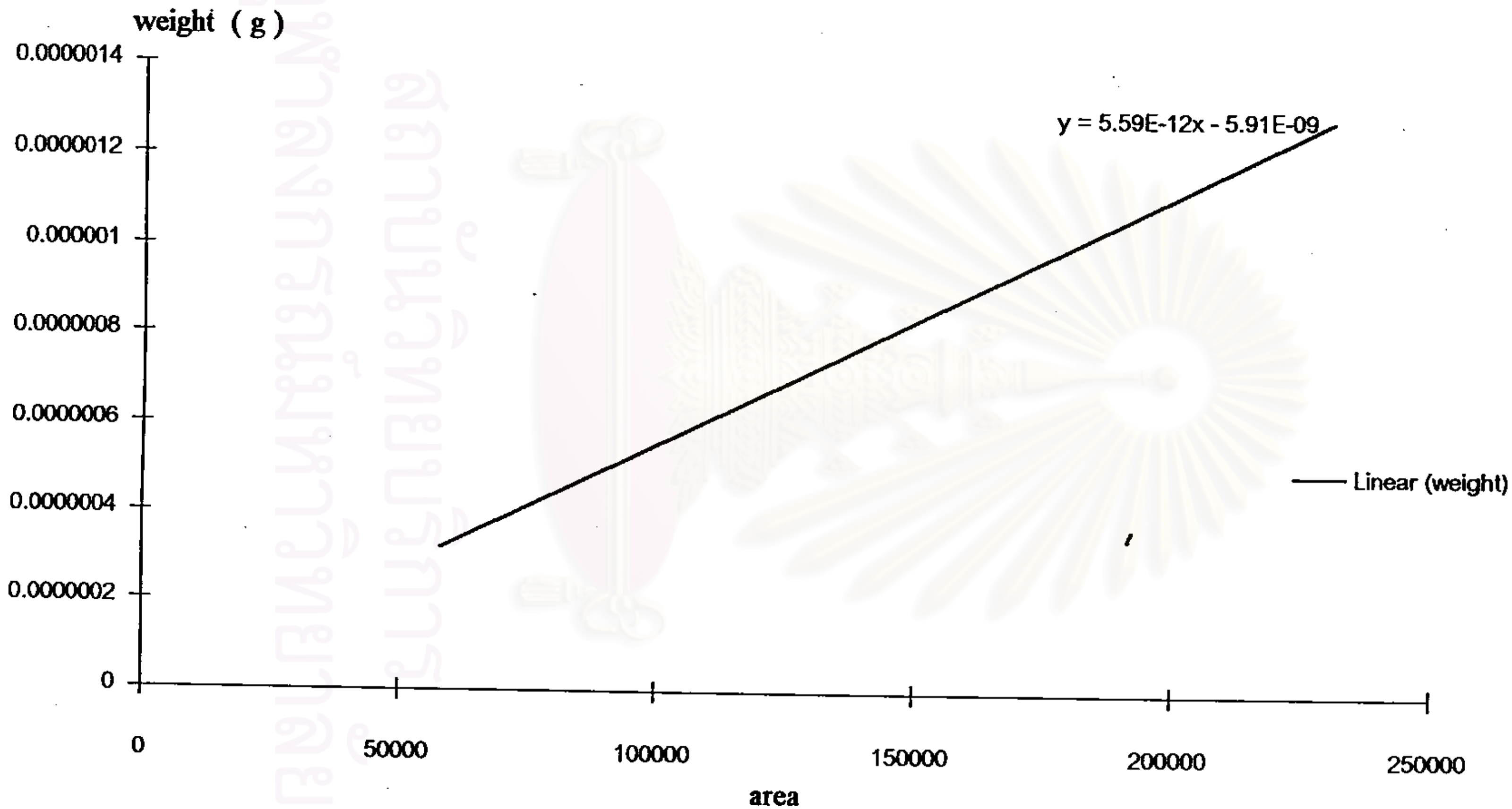

Figure A-5.8 calibration curve of methane (VZ-10 column)

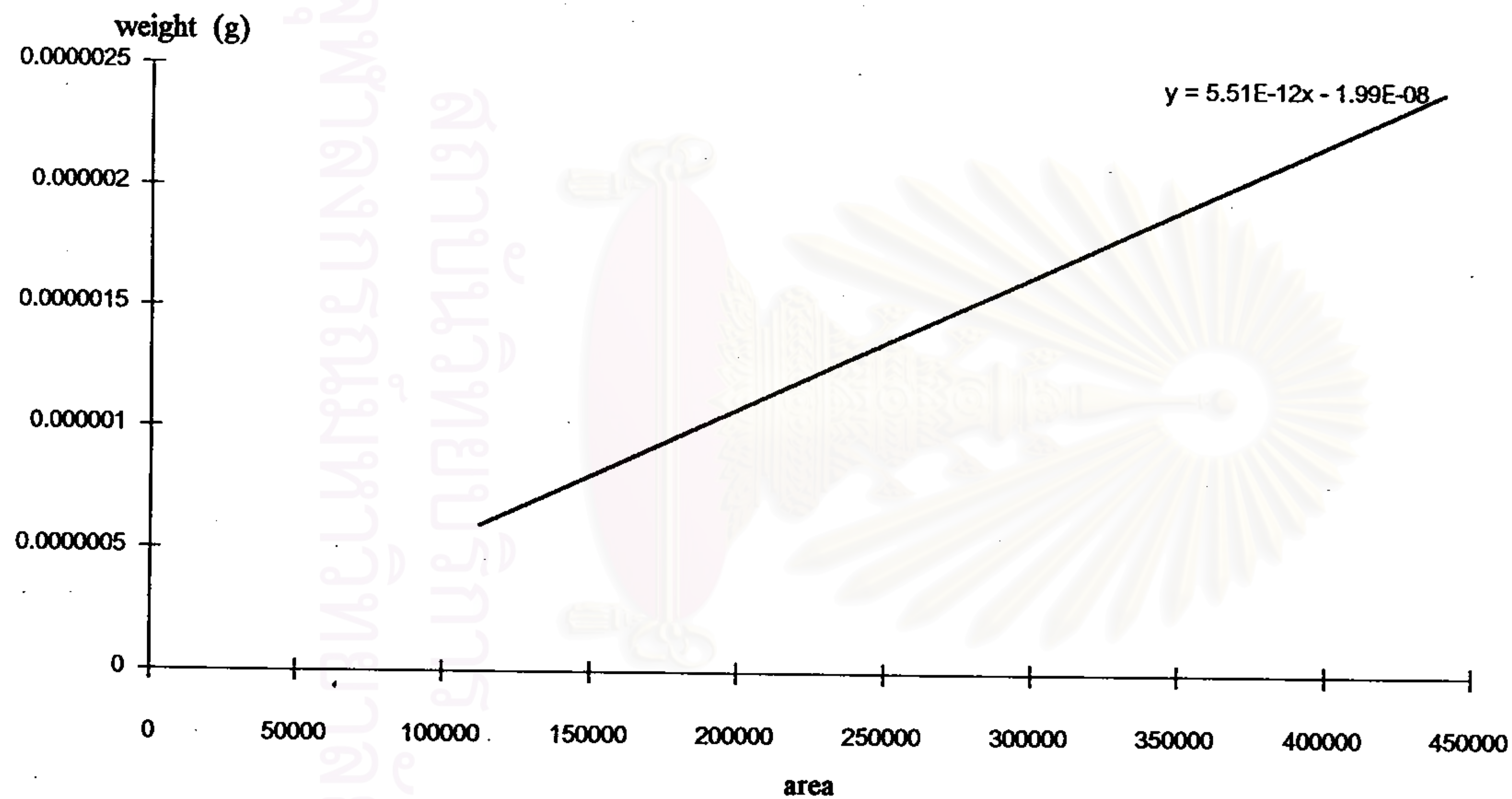

Figure A-5.9 calibration curve of ethane, (VZ-10 column)

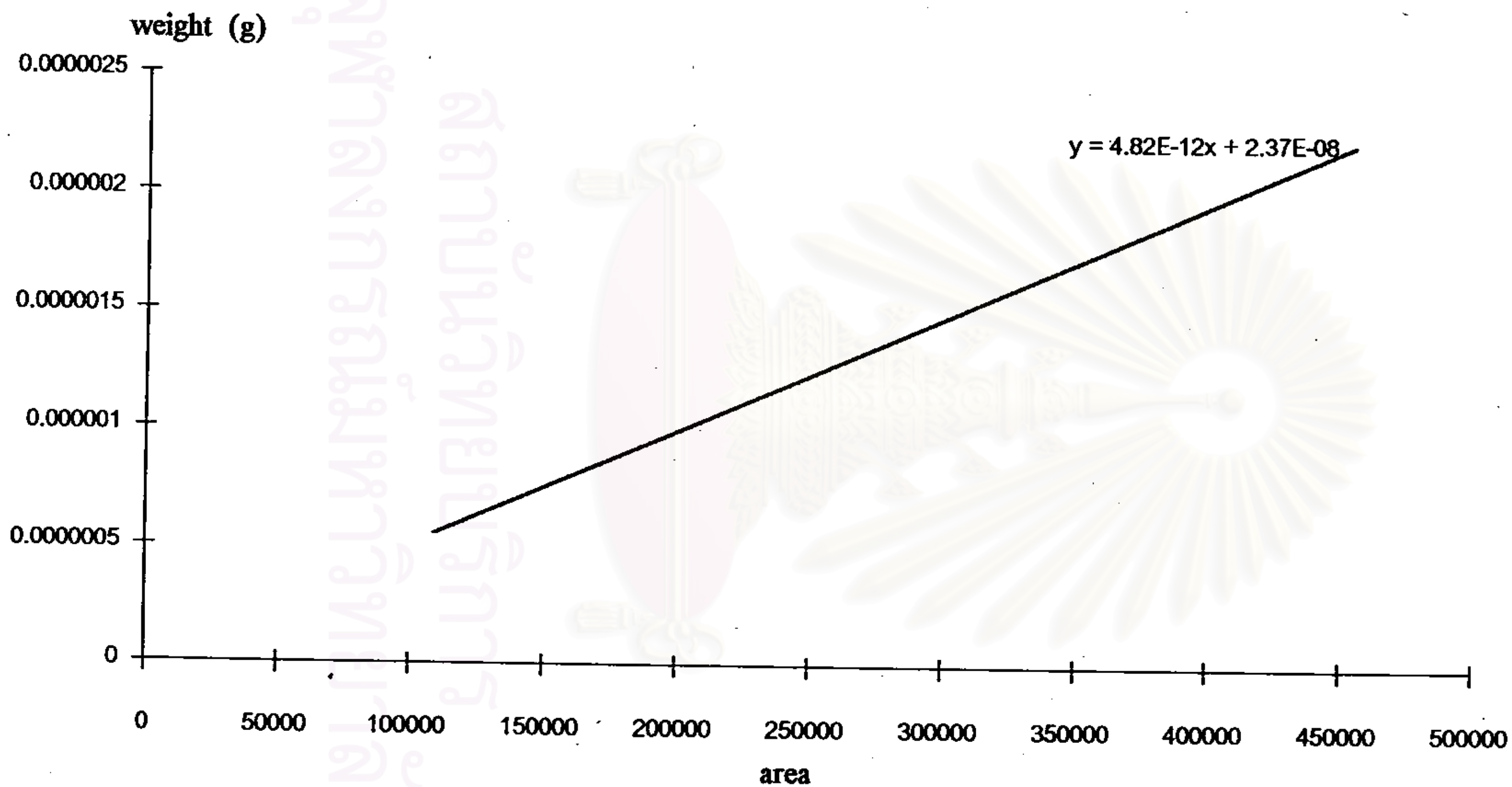

Figure A-5.10 calibration curve of ethylene, (VZ-10 column)

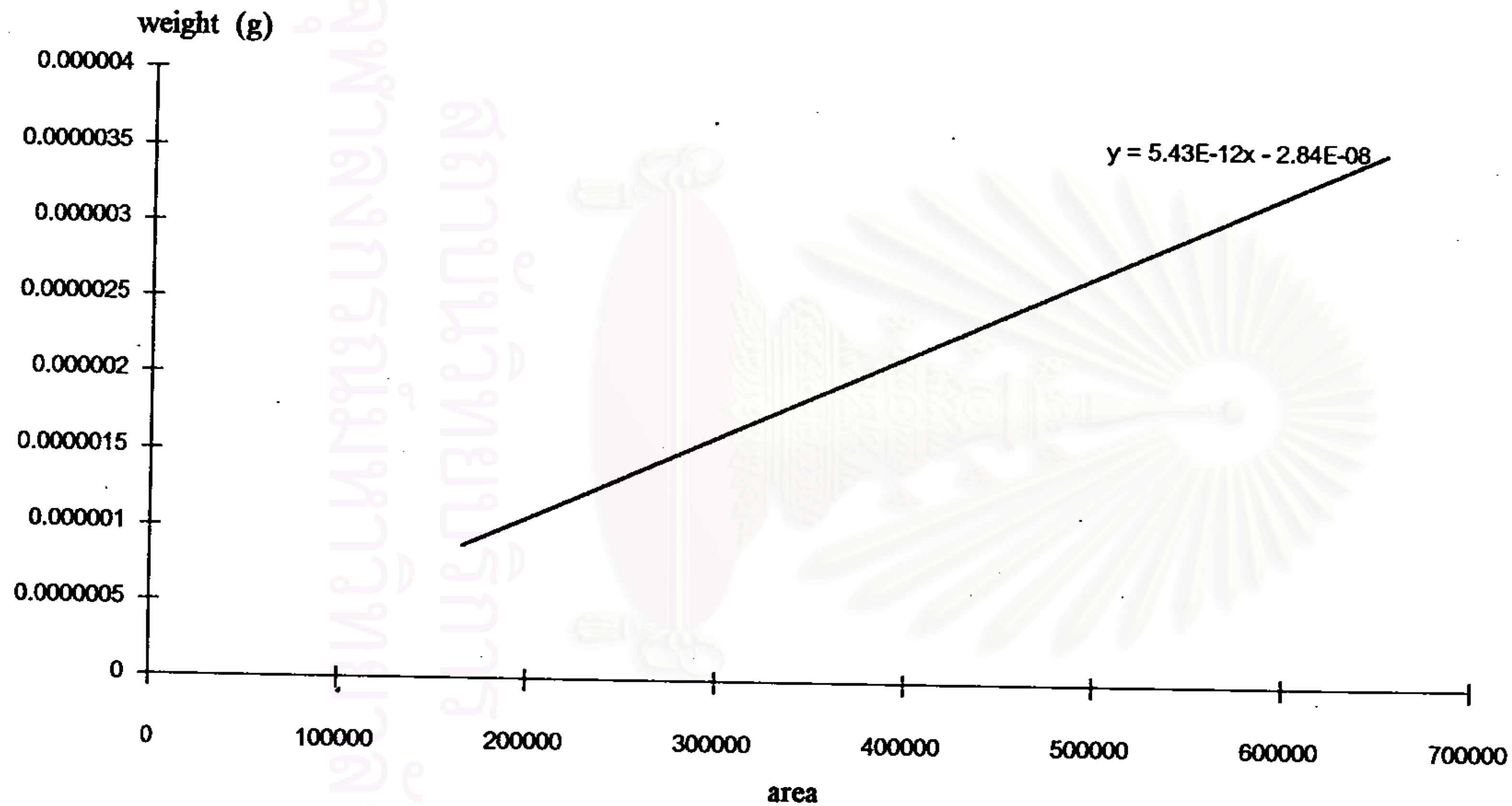

Figure A-5.11 calibration curve of propane, (VZ-10 column)

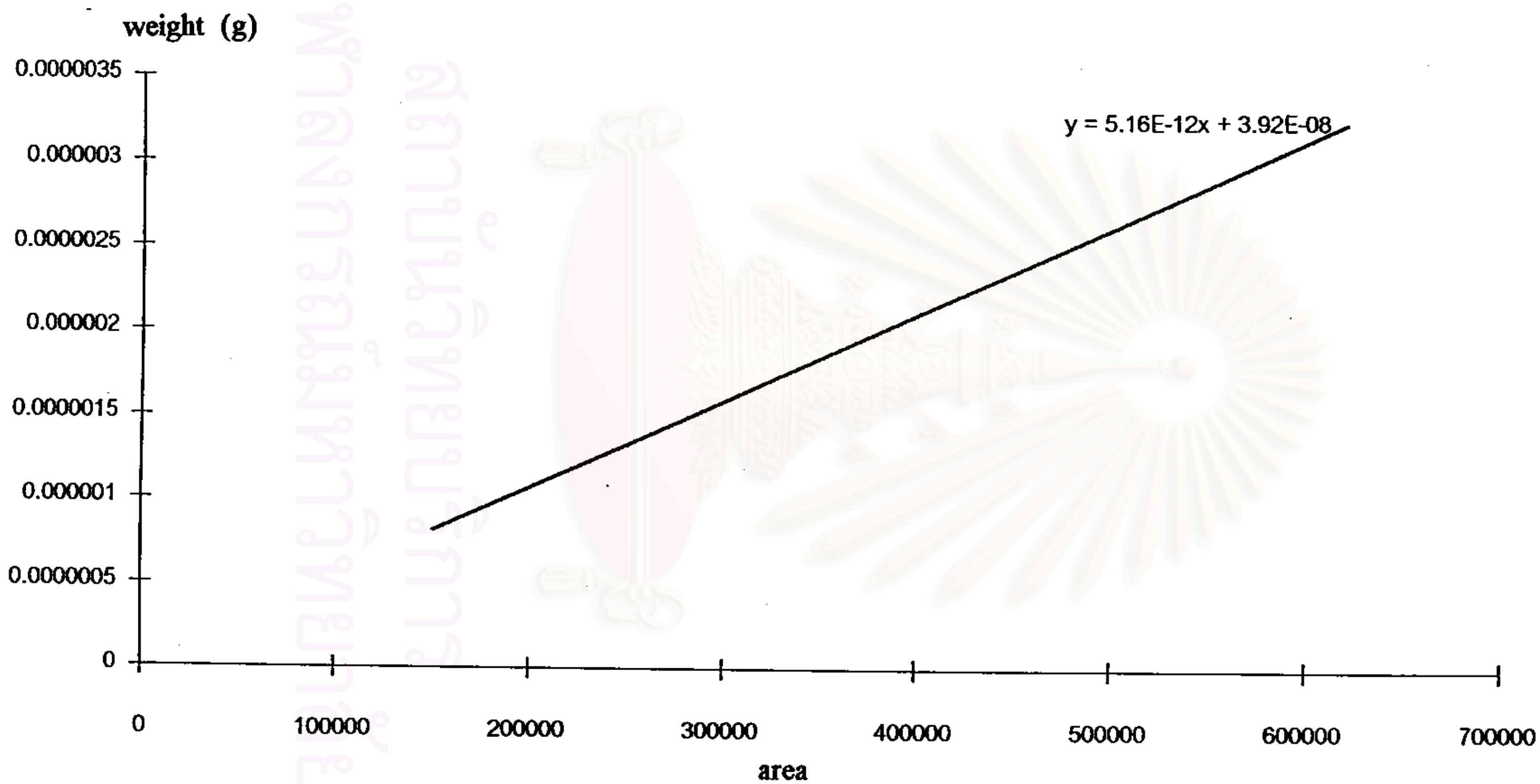

Figure A-5.12 calibration curve of propylene, (VZ-10 column)

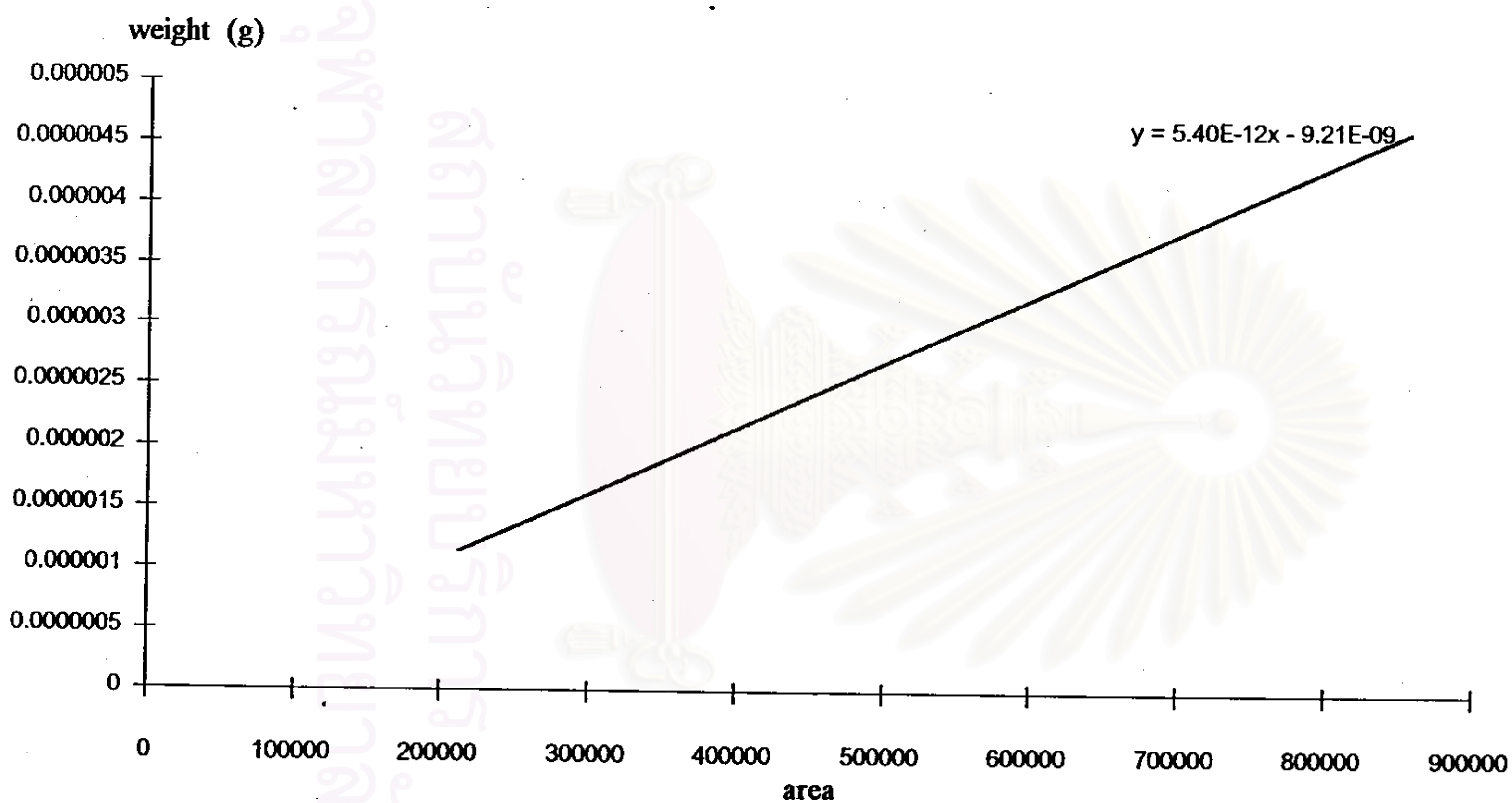

Figure A-5.13 calibration curve of butane, (VZ-10 column)

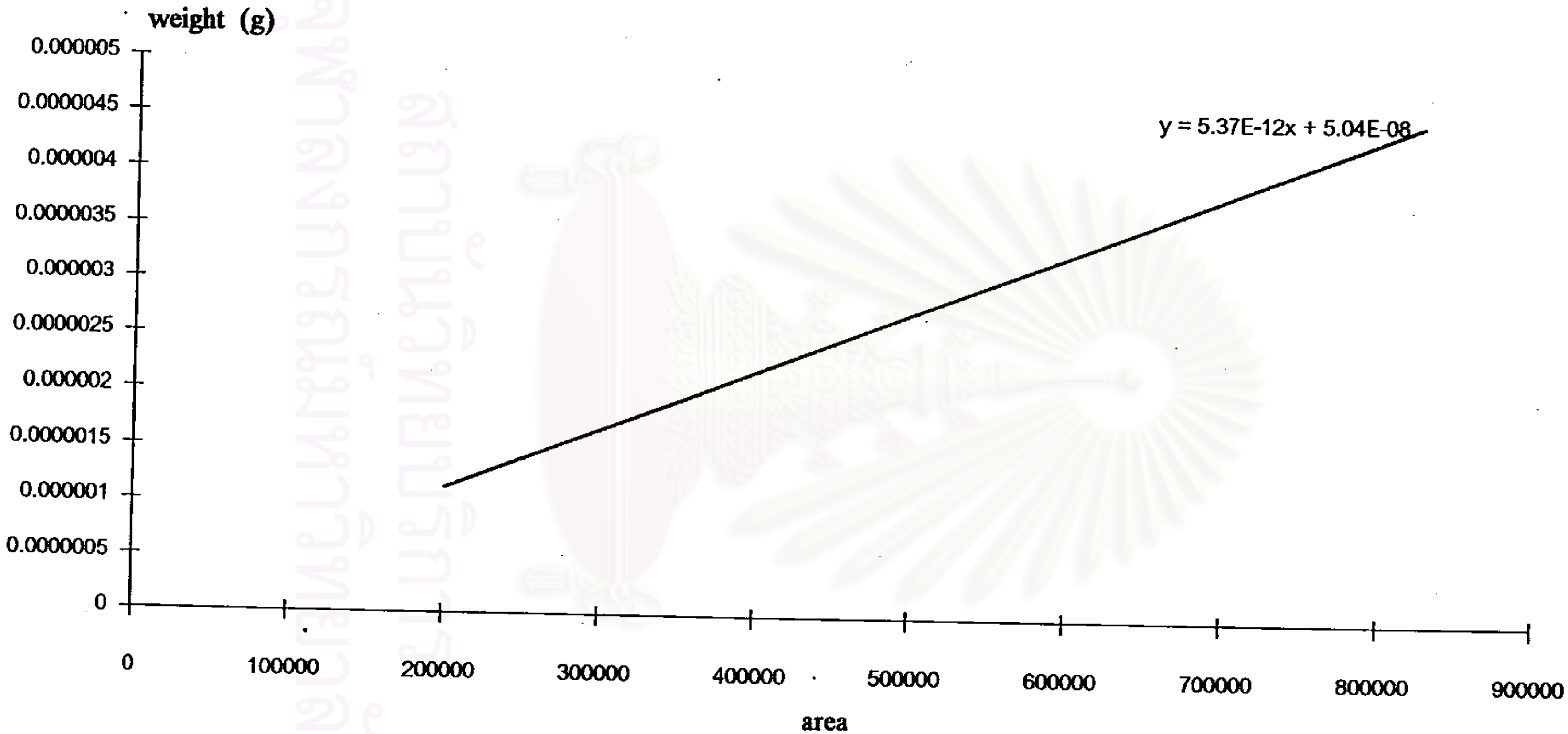

Figure A-5.14 calibration curve of butene, (VZ-10 column)

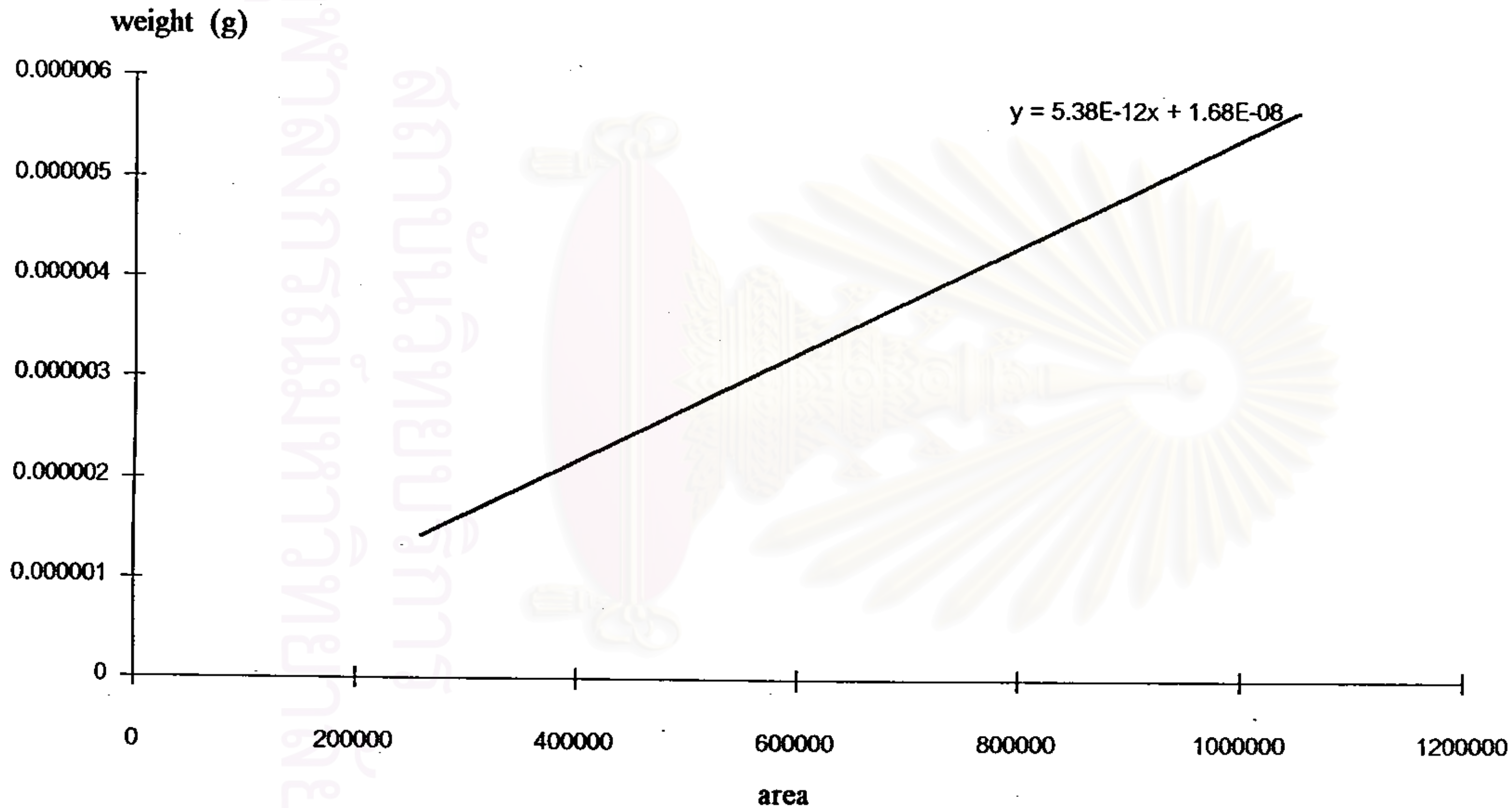

Figure A-5.15 calibration curve of pentane, (VZ-10 column)

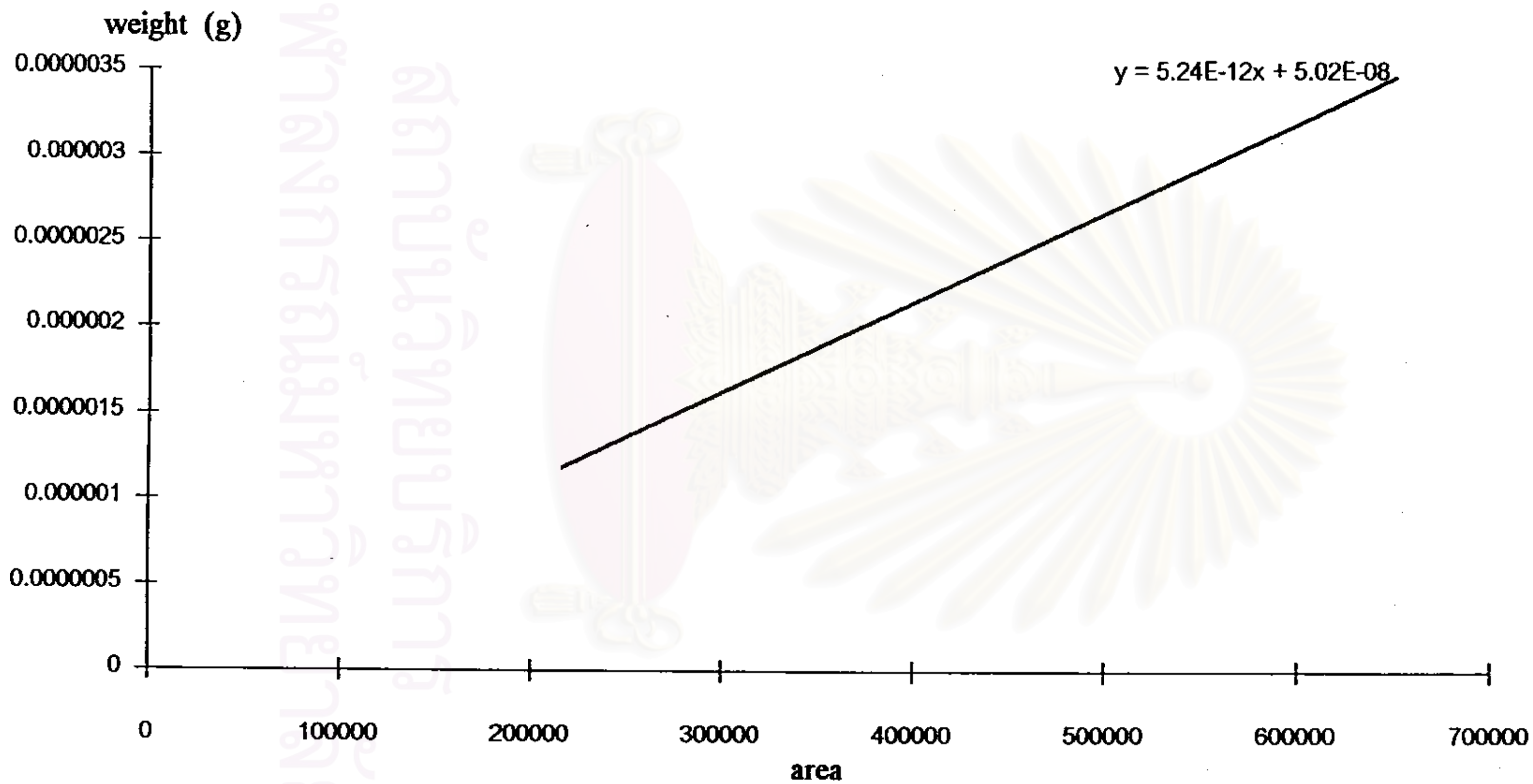

Figure A-5.16 calibration curve of isobutane, (VZ-10 column)

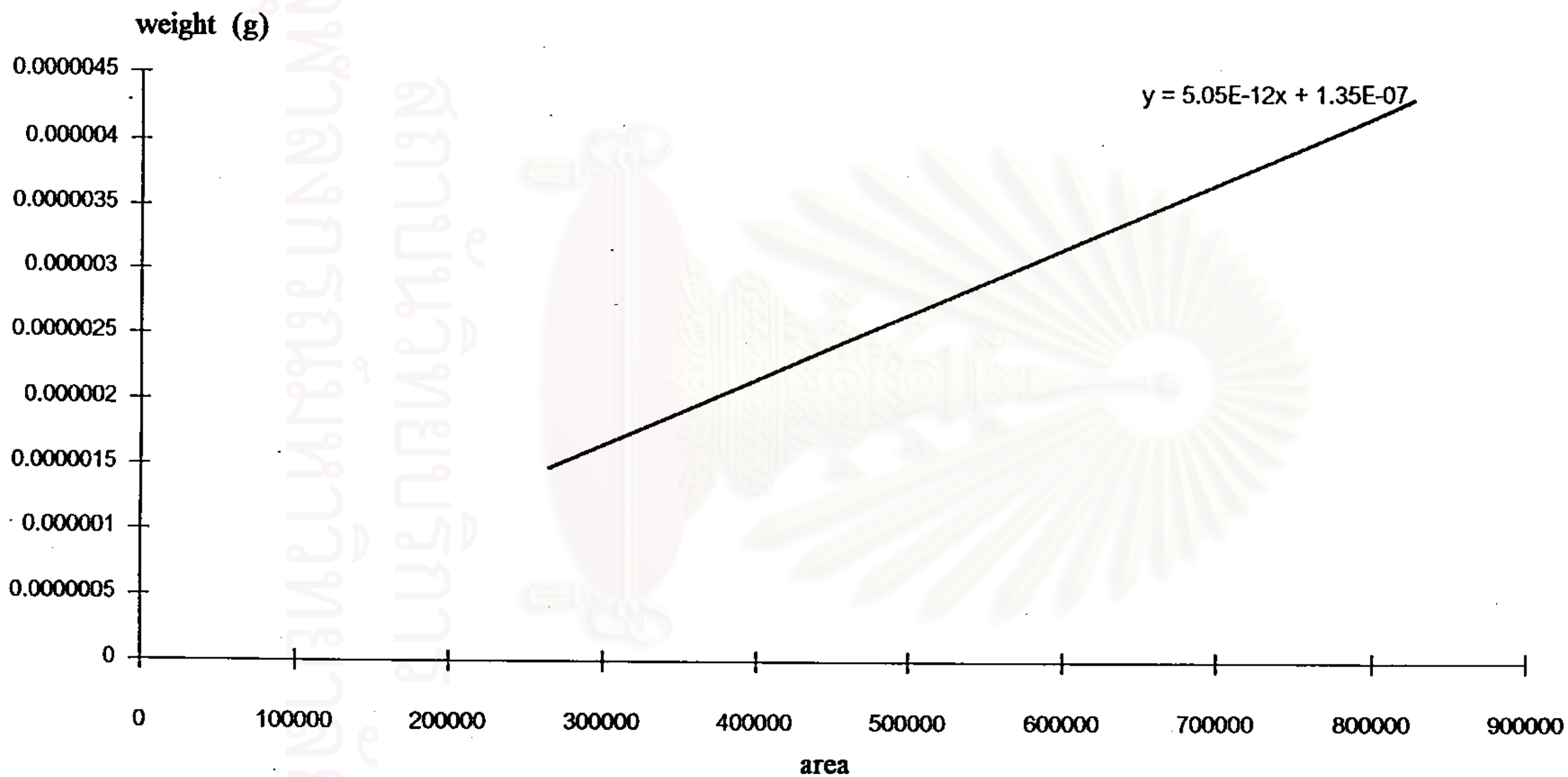

Figure A-5.17 calibration curve of isopentane, (VZ-10 column)

APPENDIX B

OCTANE NUMBER OF HYDROCARBONS

Table B-1 Octane number of hydrocarbons [15]

Hydrocarbon	Octane number	
	RON[a]	MON[b]
propene	93	91
iso-butane	93	92
n-butane	93	92
butene	96	94
iso-pentane	93.2	90.8
n-pentane	71.5	72.4
benzene	106	102.5
tolulene	115	103.5
n-octane	-	-17
ethylbenzene	107.5	98
m-xylene	-	100
o-xylene	-	100
p-xylene	-	100

a = Research octane number

b = Motor octane number

VITA

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