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APPENDIX A

CALCULATION OF CATALYST PREPARATION

A1 Cobalt ion exchange

Let the amount of Co into catalyst = 10 wt%

The catalyst use = X g

So that : from the equation

$Co / (X + Co) = 10/100$

$100 \times Co = 10 \times (X+Co)$

$(100-10) \times Co = 10 \times X$

thus $Co = (10 \times X)/(100-10)$ g

use $Co(NO_3)_2.6H_2O$ (molecular weight = 291.04, Co = 58.93 g)

Weight of $Co(NO_3)_2.6H_2O$ = $[10 \times X / (100-10)] \times [291.04 / 58.93]$

A2 Ruthenium ion exchange

Let the amount of Ru into catalyst = 15 wt%

The catalyst use = X g

So that : from the equation

$Ru / (X+Ru) = 15/100$

$100 \times Ru = 15 \times (X+Ru)$

$(100-15) \times Ru = 15 \times X$

thus $Ru = (15 \times X) / (100-15)$ g

use $RuCl_3.XH_2O$ (molecular weight = 207.43, Ru = 101.07 g)

Weight of $RuCl_3.XH_2O$ = $[(15 \times X) / (100-15)] / [207.43 / 101.07]$ g

A3 Platinum ion exchange

Let the amount of Pt into catalyst = 15 wt%

The catalyst use = X g

So that : from the equation

$Pt / (X+Pt) = 15/100$

$100 \times Pt = 15 \times (X+Pt)$

$(100-15) \times Pt = 15 \times X$

thus Ru = $(15 \times X) / (100-15)$ g

use $H_2PtCl_6.6H_2O$ (molecular weight = 517.92, Pt = 195.09 g)

Weight of $H_2PtCl_6.6H_2O$ = $[(15 \times X) / (100-15)] / [517.92 / 195.09]$ g

APPENDIX B

SAMPLE OF CALCULATIONS

B1 Calculation of metal active sites

The calculation of metal active sites of the catalyst measured by CO adsorption at room temperature has the following procedures :

Let the weight of catalyst used = w g

Area of CO peak after adsorption = A unit

Area of 40 µl standard CO peak = B unit

Amounts of CO adsorbed on catalyst = B-A unit

Volume of CO adsorbed on catalyst = [(B-A) / B](40) µl

Volume of gas 1 mole at 30 °C = 24.86×10^{6} µl

Mole of CO adsorbed on catalyst = $[(B-A) / B][40 / 24.86\times10^{6}]$ mole

Molecule of CO adsorbed on catalyst

$= 1.61\times10^{-6}[(B-A) / B](6.02\times10^{23})$ molecules

Metal active sites = $9.68\times10^{17}[(B-A) / B]$ / W molecules of CO / g.cat.

B2 Calculation of GHSV of methane

The catalyst used = 0.2 g.

packed catalyst into quartz reactor (inside diameter = 0.6 cm.)

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

$$\text{GHSV } (h^{-1}) = \frac{\text{Volumetric flow rate}^1 \text{ (cc/min)}}{\text{Volume of bed (cc-cat)}}$$

at STP condition :

$$\text{Volumetric flow rate} = \frac{\text{Volumetric flow rate}^1 \times (273.15 + T)}{273.15}$$

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

where T = room temperature, °C.

APPENDIX C

CALIBRATION CURVE

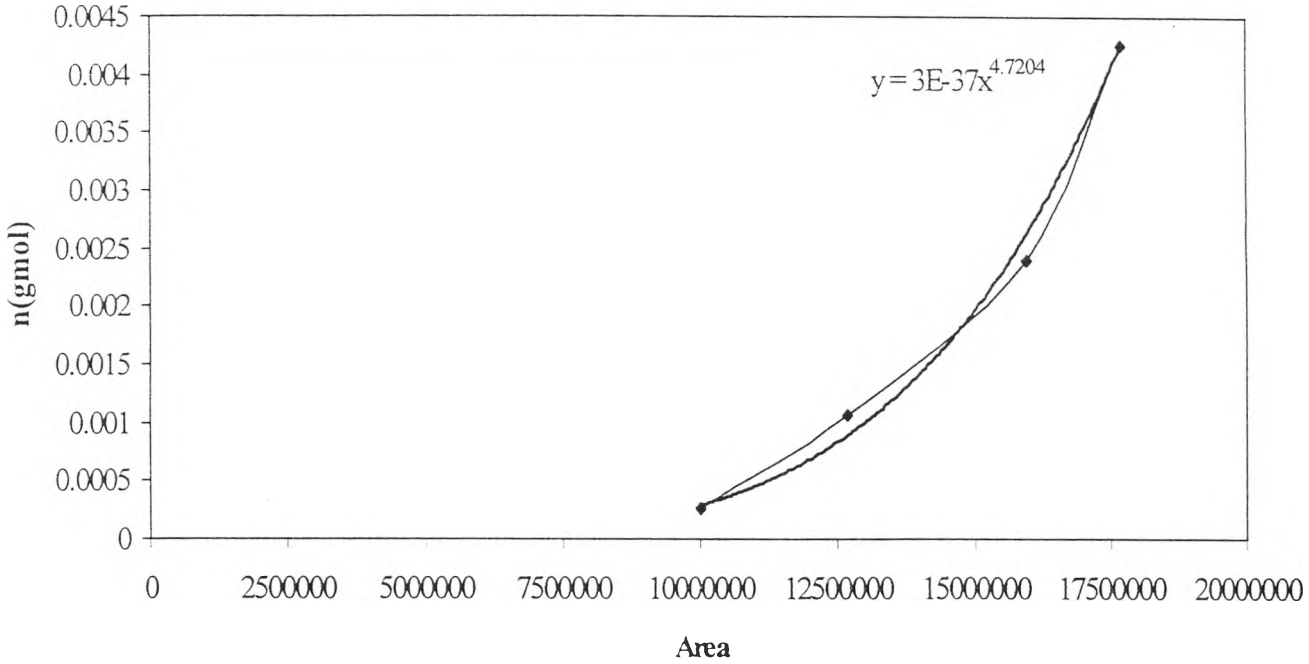

Figure C1 calibration curve of methane

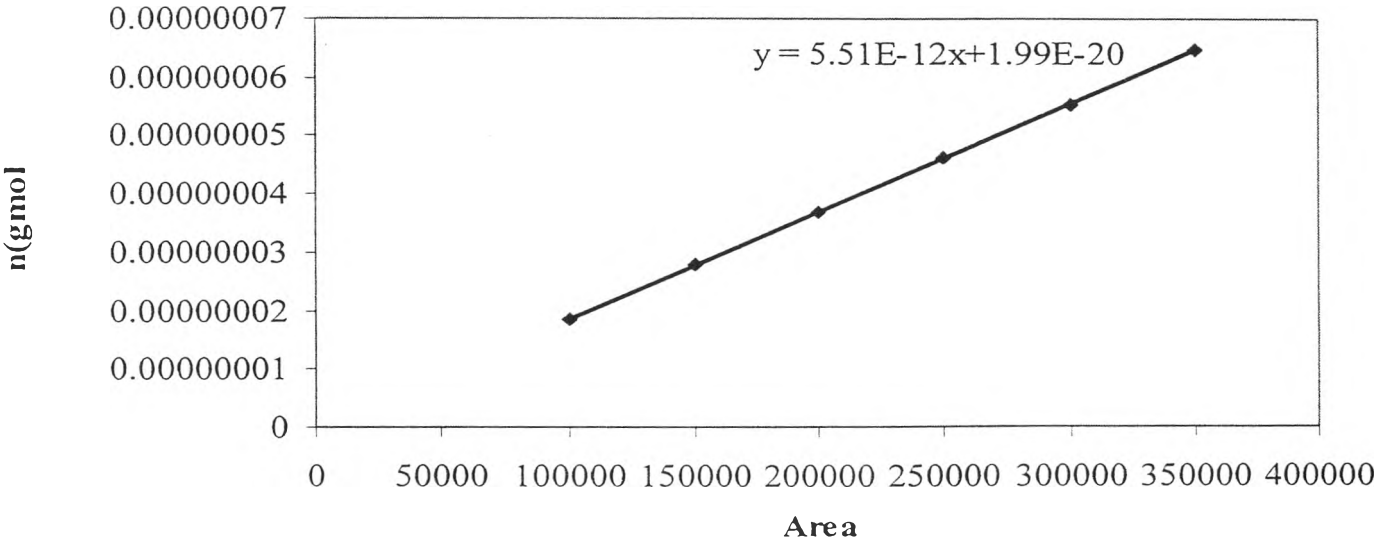

Figure C2 calibration curve of ethane

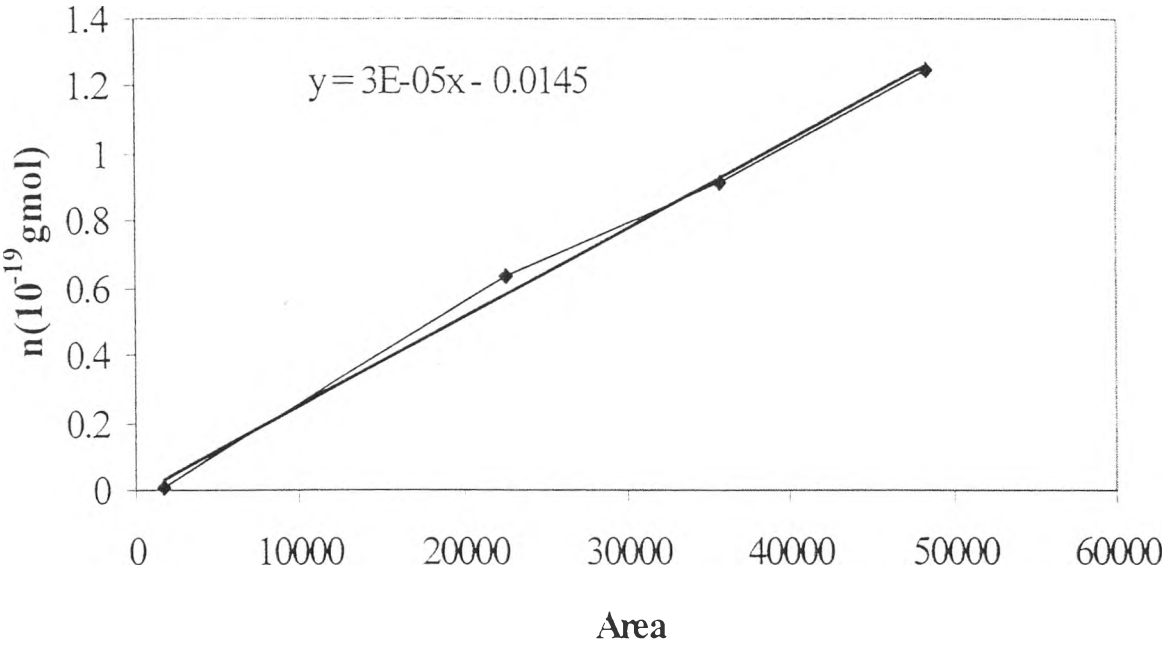

Figure C3 calibration curve of propane

APPENDIX D

METHANE ADSORBED CURVE

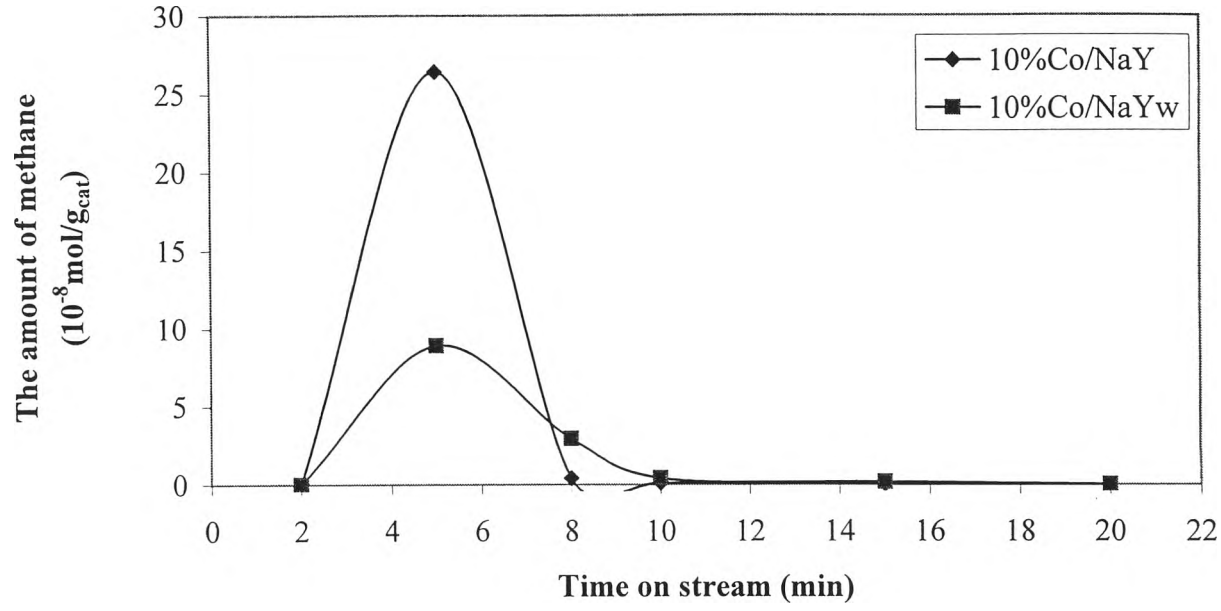

Figure D1 The amount of methane adsorbed on 10%Co/NaY and 10%Co/NaY_w as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}. Reaction temperature : 300 °C.

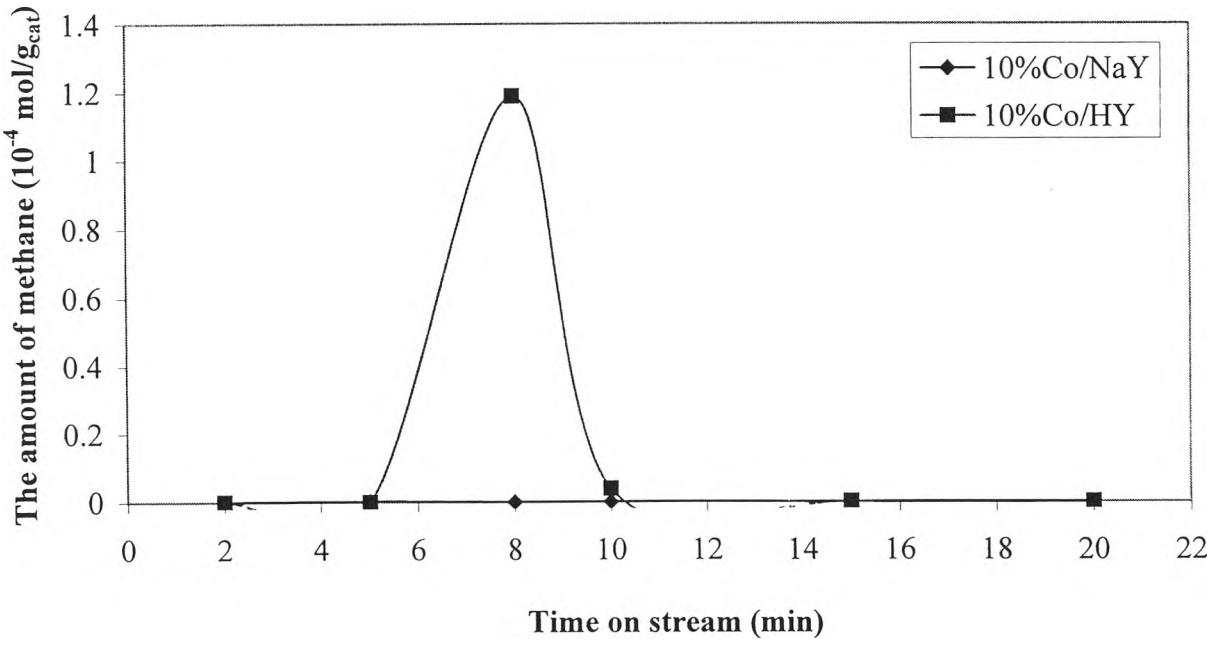

Figure D2 The amount of methane adsorbed on 10%Co/HY and 10%Co/NaY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}. Reaction temperature : 300 °C.

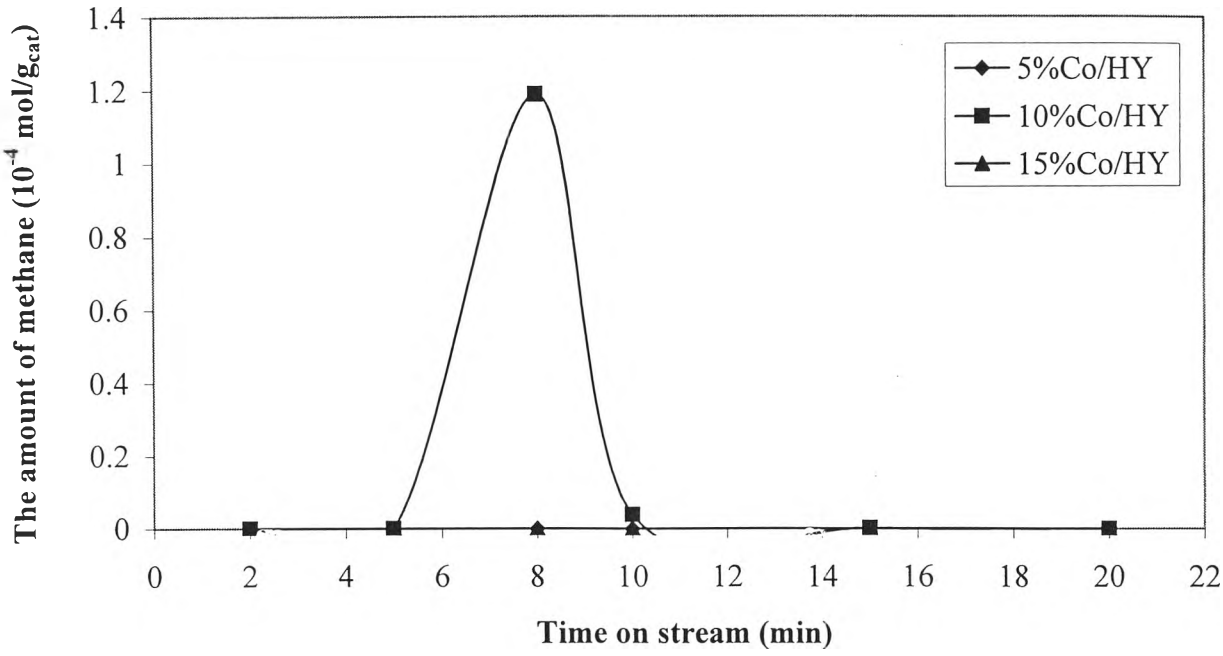

Figure D3 The amount of methane adsorbed on Co/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}. Reaction temperature : 300 °C.

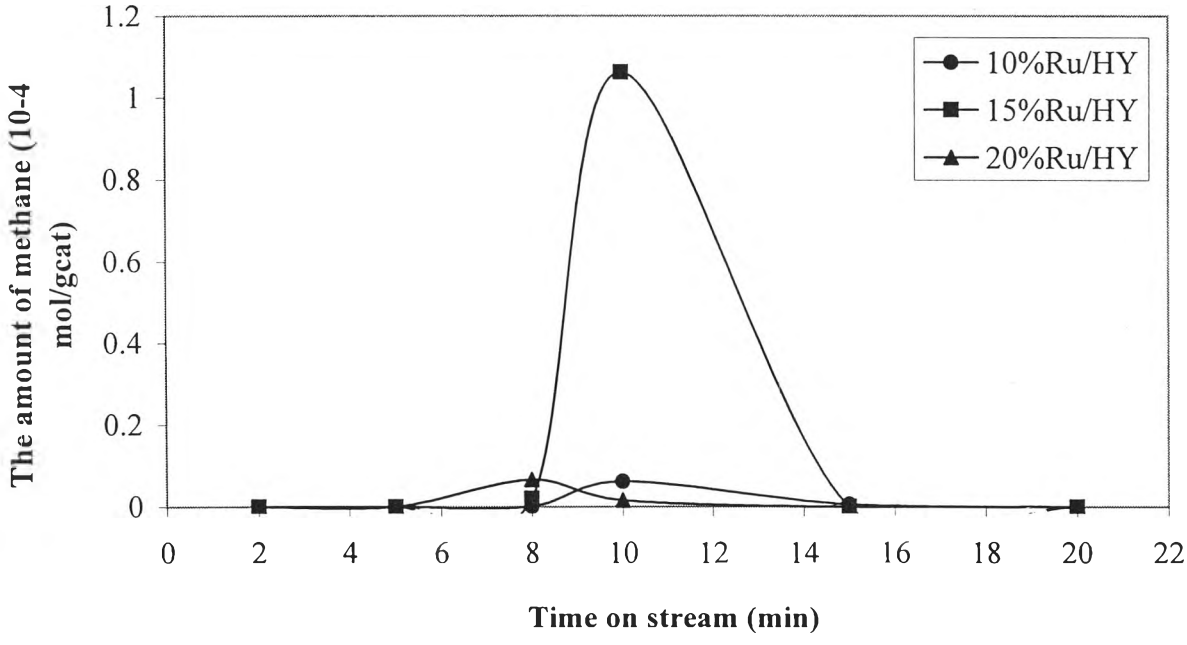

Figure D4 The amount of methane adsorbed on Ru/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}. Reaction temperature : 200 °C.

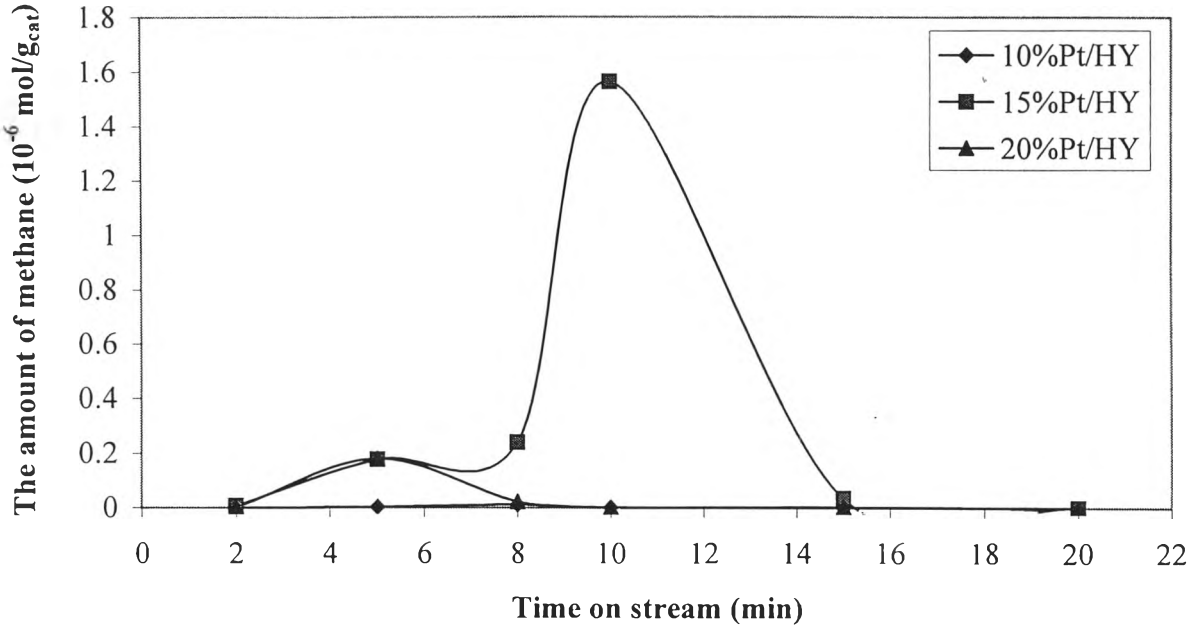

Figure D5 The amount of methane adsorbed on Pt/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}. Reaction temperature : 200 °C.

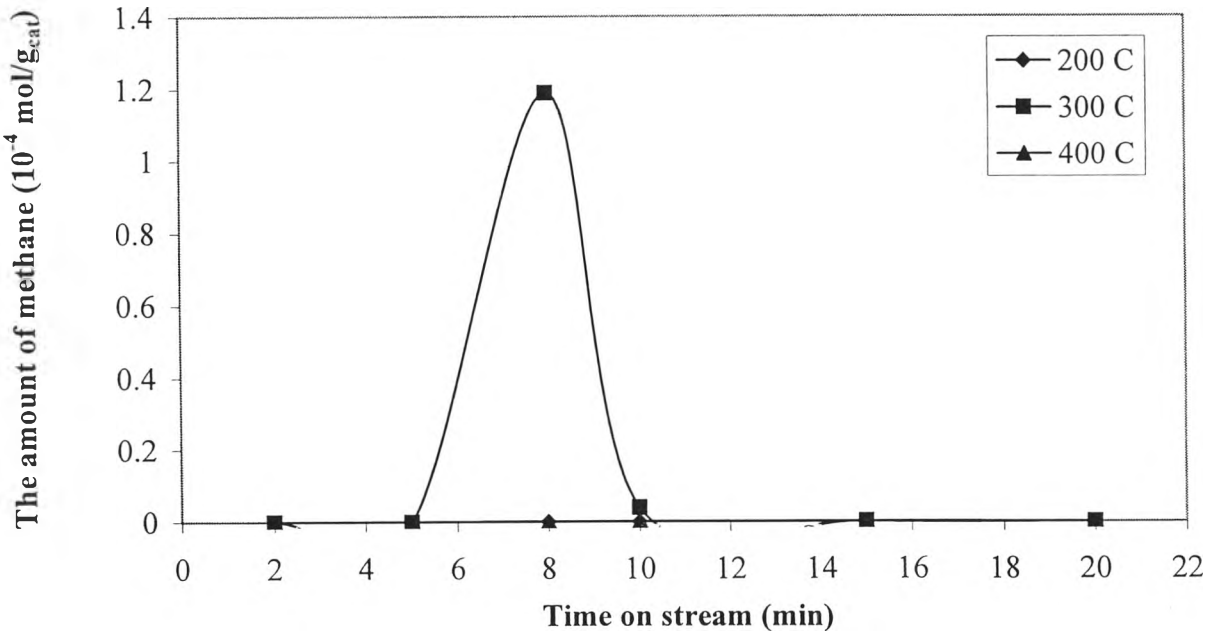

Figure D6 The amount of methane adsorbed on 10%Co/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}.

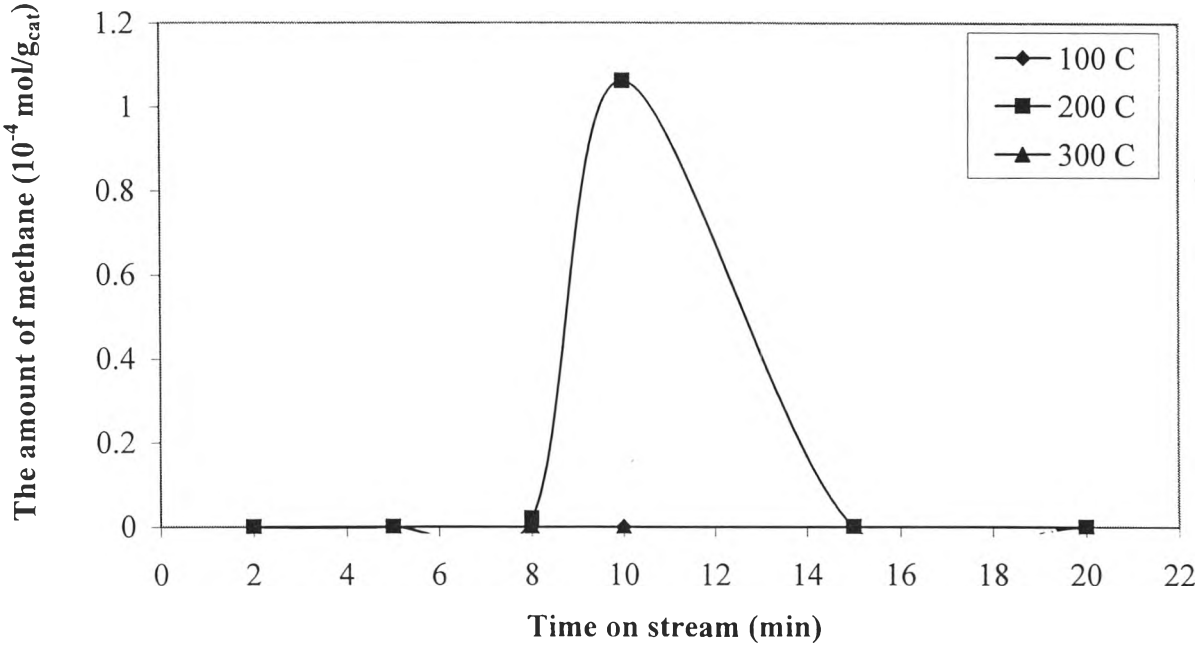

Figure D7 The amount of methane adsorbed on 15%Ru/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}.

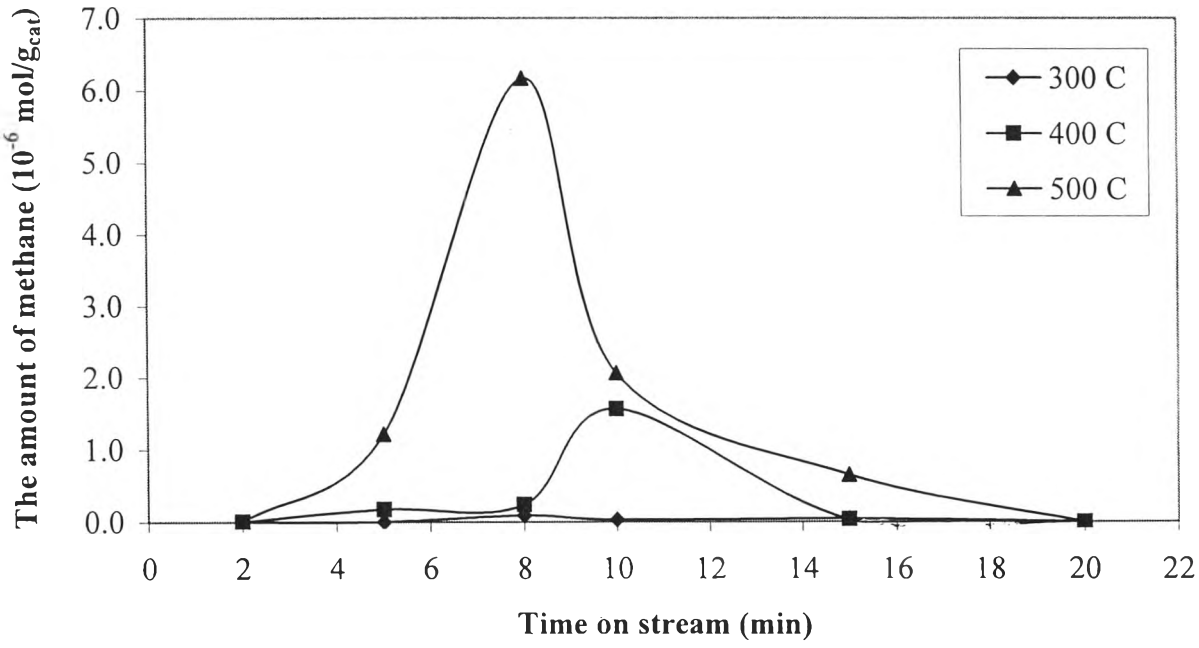

Figure D8 The amount of methane adsorbed on 15%Pt/HY as a function of time on stream. GHSV of CH_4 : 4960 h^{-1}. GHSV of H_2 : 4960 h^{-1}.

VITA

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