[redacted]

FIGURE 25

PLT 700A RUN 72 · Co,Ru,Mn,Zr on MgO

6531-134 w/7.45% Co via aq. impreg 2:1 H_2:CO in feed

13g Active in 160g SiO_2 sand

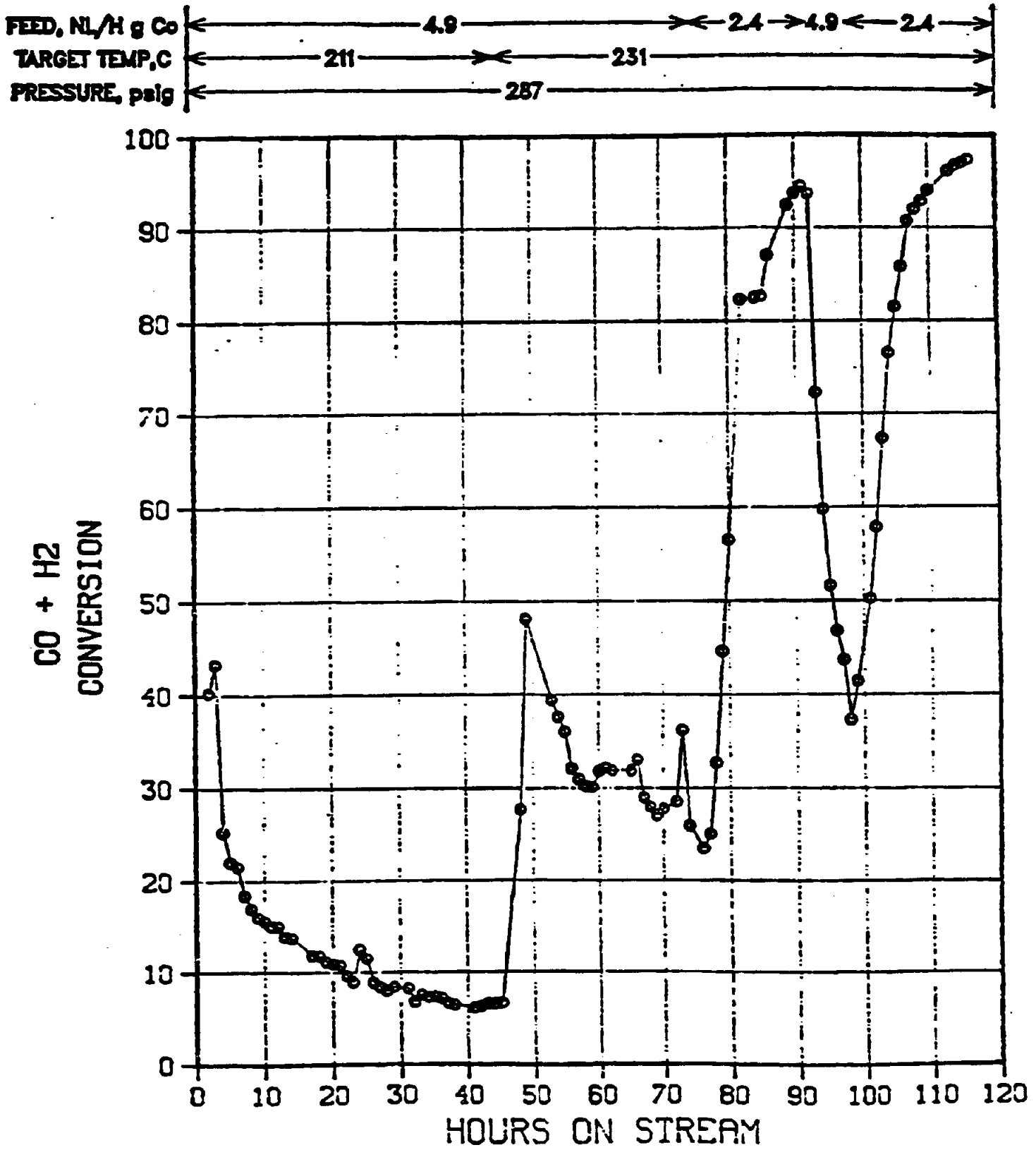


FIGURE 26

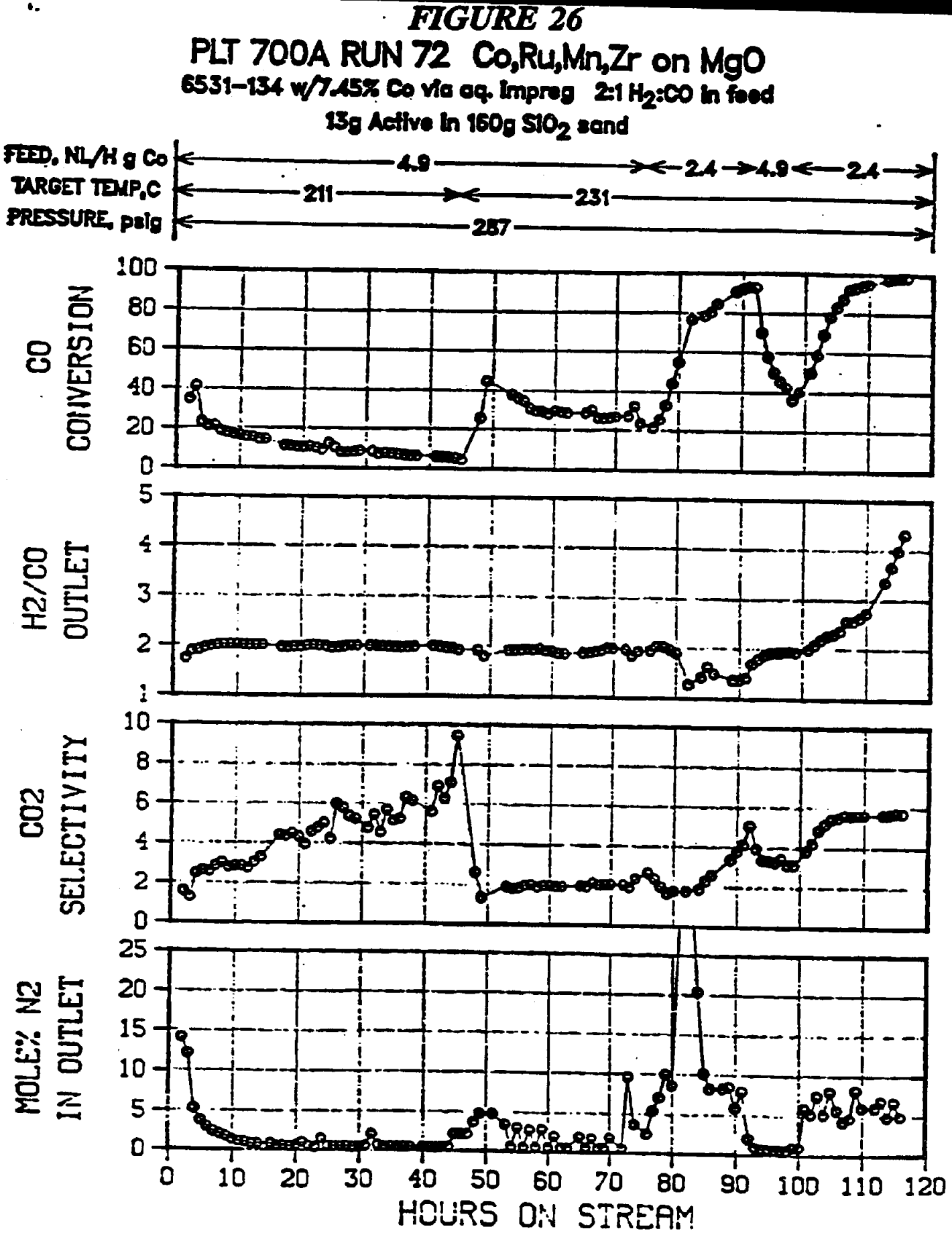
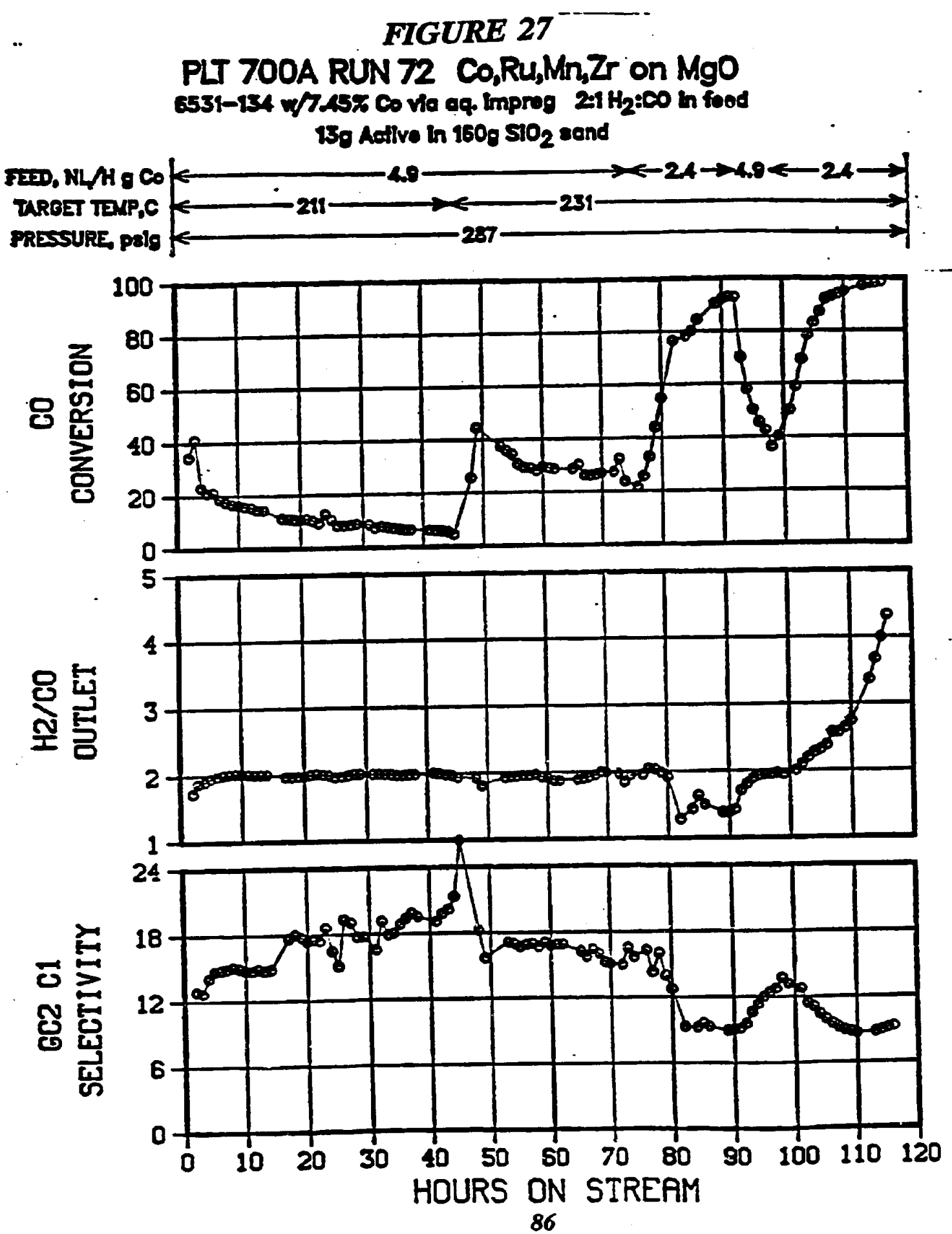

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO
6531-134 w/7.45% Co via aq. impreg 2:1 H2:CO in feed
13g Active in 160g SiO2 sand
FEED, NL/H g Co
TARGET TEMP,C
PRESSURE, psig
4.9
2.4
4.9
2.4
211
231
287
CO CONVERSION
H2/CO OUTLET
CO2 SELECTIVITY
MOLE% N2 IN OUTLET
HOURS ON STREAM

FIGURE 27


PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO
6531-134 w/7.45% Co via aq. impreg 2:1 H2:CO in feed
13g Active in 160g SiO2 sand
FEED, NL/H g Co
TARGET TEMP,C
PRESSURE, psig
4.9
2.4
4.9
2.4
211
231
287
CO CONVERSION
H2/CO OUTLET
GC2 C1 SELECTIVITY
HOURS ON STREAM

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO

6531–134 w/7.45% Co via aq. impreg 2:1 H_2:CO in feed

13g Active in 160g SiO_2 sand

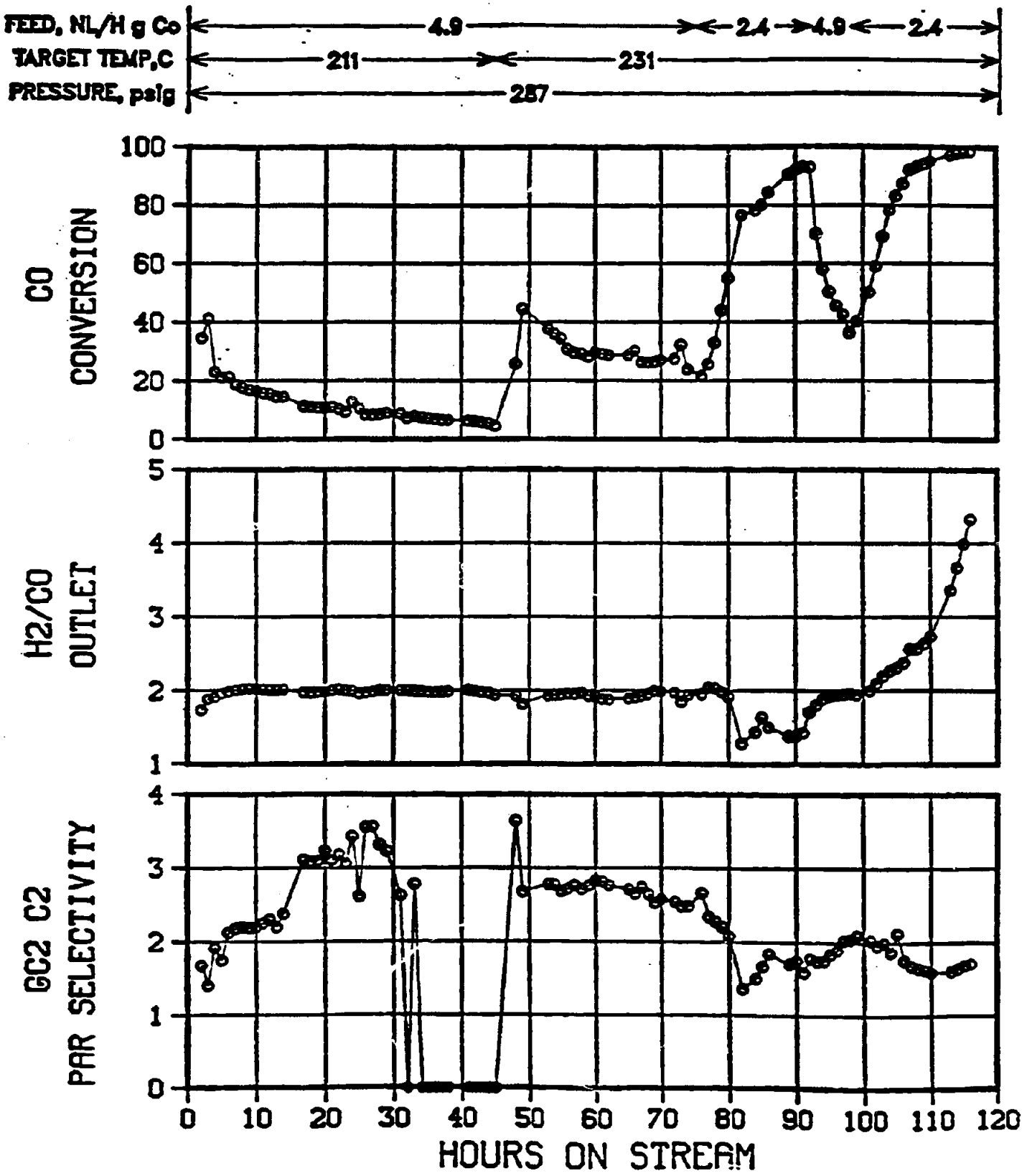


FIGURE 29

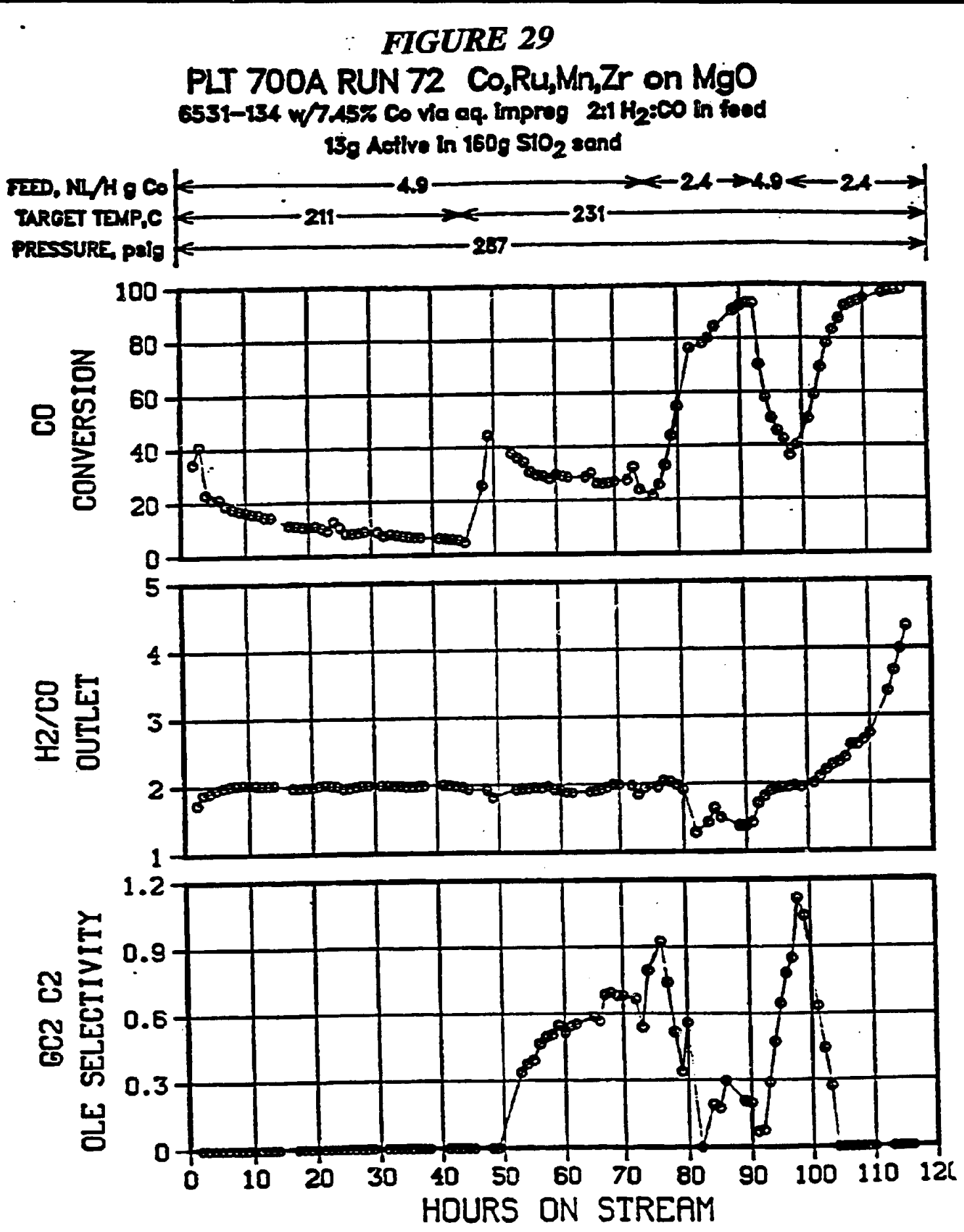

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO
6531-134 w/7.45% Co via aq. impreg 2:1 H2:CO in feed
13g Active in 160g SiO2 sand
FEED, NL/H g Co
4.9
2.4
4.9
2.4
TARGET TEMP,C
211
231
PRESSURE, psig
257
CO CONVERSION
100
80
60
40
20
0
H2/CO OUTLET
5
4
3
2
1
GC2 C2 OLE SELECTIVITY
1.2
0.9
0.6
0.3
0
0
10
20
30
40
50
60
70
80
90
100
110
120
HOURS ON STREAM

FIGURE 30

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO

6531–134 w/7.45% Co via aq. impreg 2:1 H_2:CO in feed

13g Active in 160g SiO_2 sand

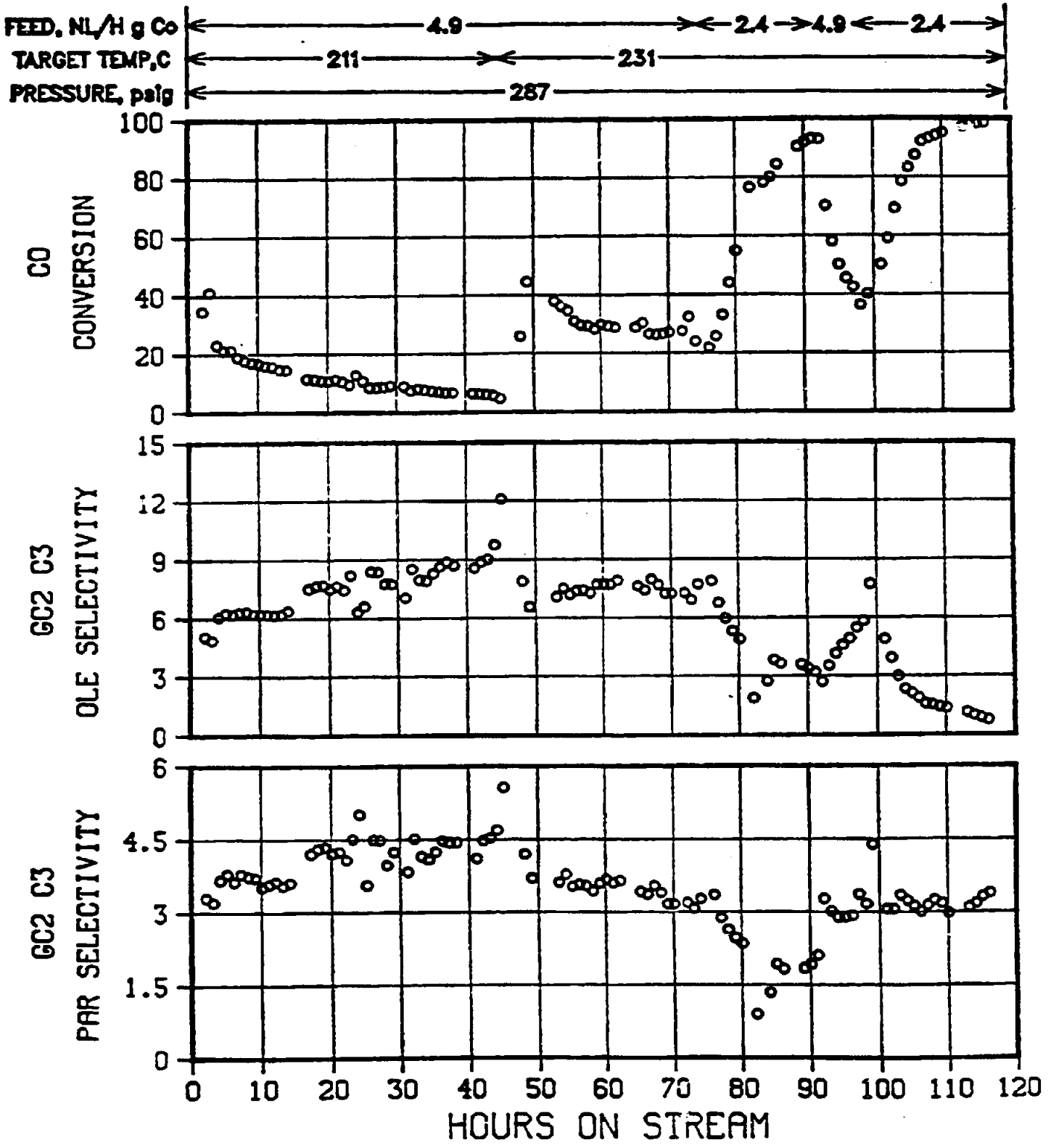


FIGURE 31

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO

6531-134 w/7.45% Co via aq. Impreg 2:1 H_2:CO in feed

13g Active in 160g SiO_2 sand

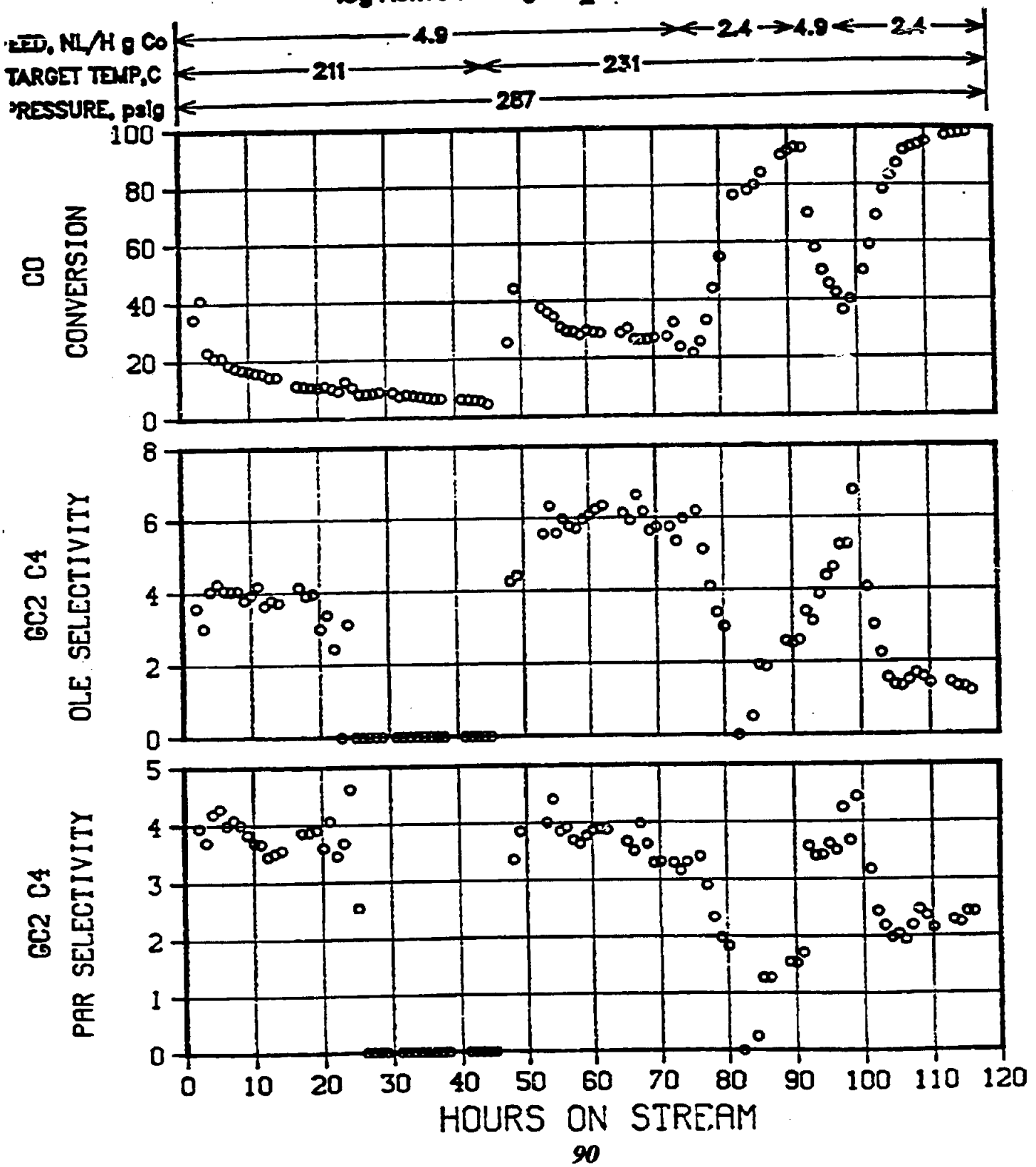
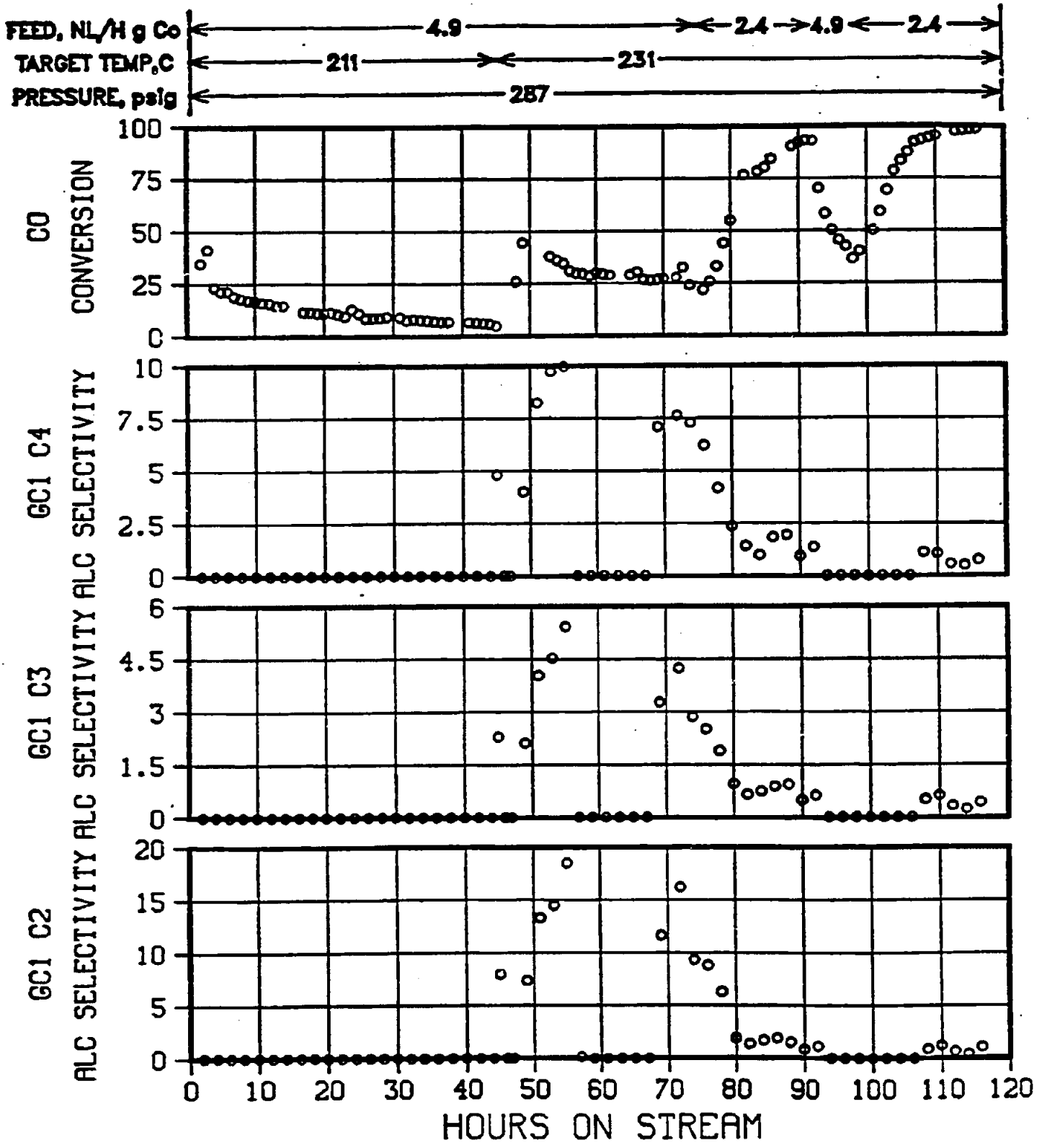


FIGURE 32

PLT 700A RUN 72 Co,Ru,Mn,Zr on MgO

6531–134 w/7.45% Co via aq. impreg 2:1 H_2:CO in feed

13g Active in 160g SiO_2 sand



COMPARISON OF CARBON-SUPPORTED CATALYSTS TO REFERENCE CATALYST

THREE-CONDITION SCREENING TEST SUMMARY

CATALYST SOURCE	SUPPORT	METALS, WT %	% CO CONV/% C-1 SELEC CONDITION 1	2	3
UNION CARBIDE	STEAMED, ACID-WASHED Y ZEOL.	Co, 8.3; Mn, 1.3 Zr, 1.0	58/6.0		
DES PLAINES (RUN 67)[1]	CARBOTRAP B	Co,5.8; Ru,1.0	25/22	50/20	60/18
DES PLAINES (RUN 77)[2]	CARBOTRAP B	Co,5.8; Ru,1.0	40/15	75/20	90/24

1. REVERSE MICELLE IMPREGNATION
2. AQUEOUS IMPREGNATION

FIGURE 33

FIGURE 34

BIMETALLIC Co/Ru CATALYST ON C SUPPORT

PLT 700A RUN 67 H_2:CO (MOLAR)= 2.0

5.8 Co : 1.0 Ru : 100 C (BY WT.)

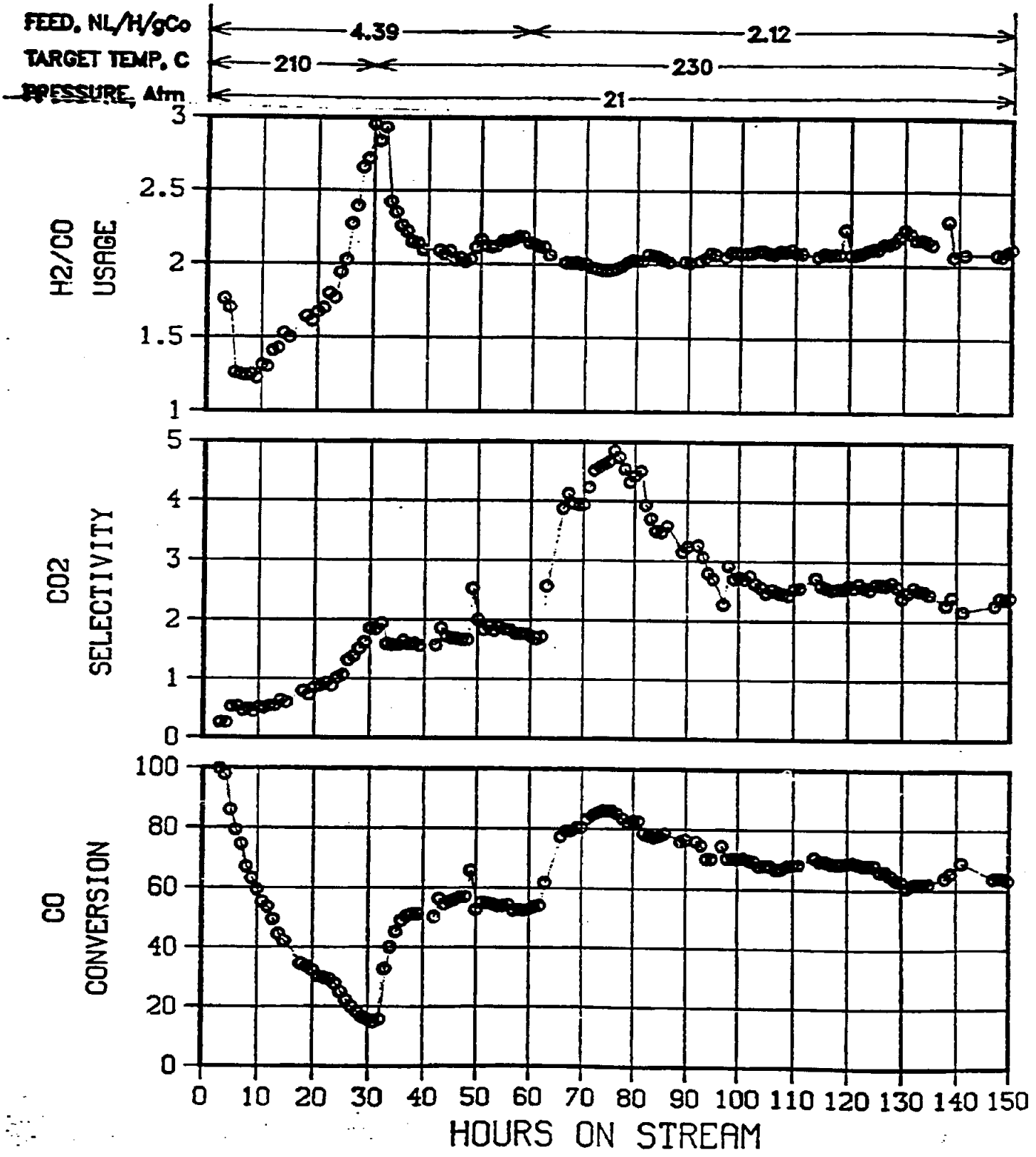


FIGURE 35

BIMETALLIC Co/Ru CATALYST ON C SUPPORT

PLT 700A RUN 67 H_2:CO (MOLAR)= 2.0

5.8 Co : 1.0 Ru : 100 C (BY WT.)

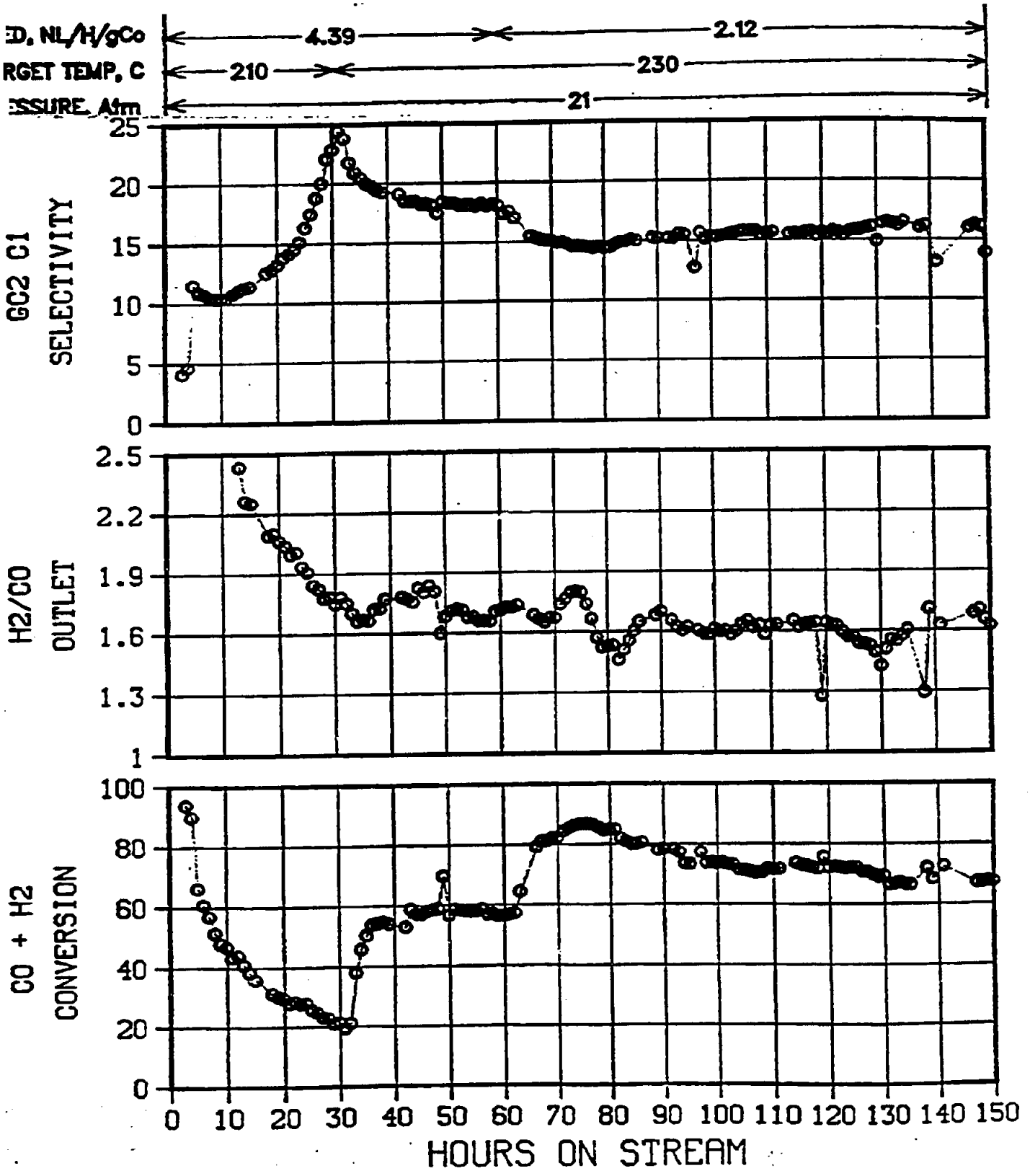


FIGURE 36

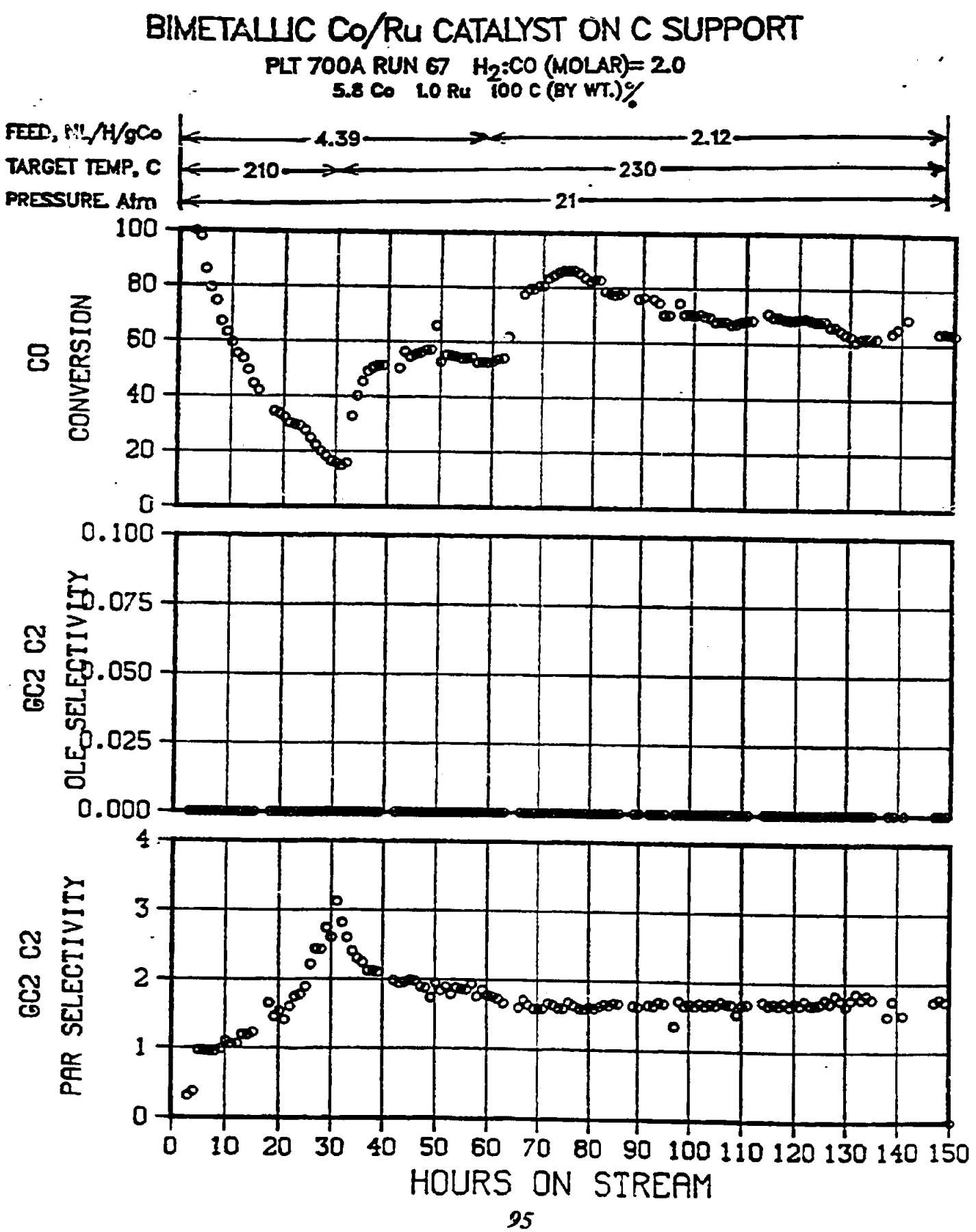

BIMETALLIC Co/Ru CATALYST ON C SUPPORT
PLT 700A RUN 67 H_2:CO (MOLAR)= 2.0
5.8 Co 1.0 Ru 100 C (BY WT.)%
FEED, NL/H/gCo
4.39
2.12
TARGET TEMP, C
210
230
PRESSURE, Atm
21
CO CONVERSION
100
80
60
40
20
0
GC2 C2 OLEFIN SELECTIVITY
0.100
0.075
0.050
0.025
0.000
GC2 C2 PAR SELECTIVITY
4
3
2
1
0
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
HOURS ON STREAM

FIGURE 37

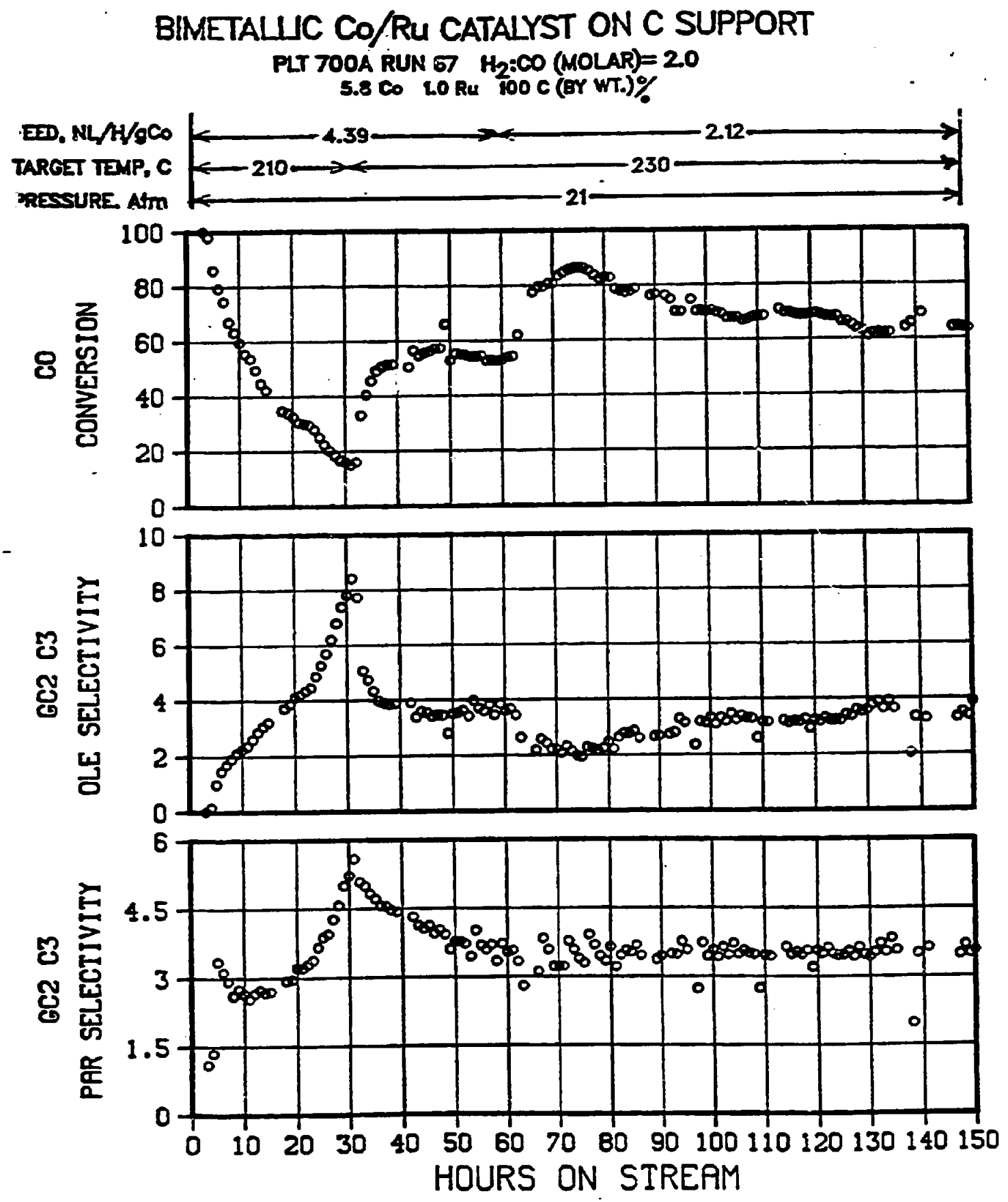

BIMETALLIC Co/Ru CATALYST ON C SUPPORT
PLT 700A RUN 67 H2:CO (MOLAR)= 2.0
5.8 Co 1.0 Ru 100 C (BY WT.)%
FEED, NL/H/gCo
TARGET TEMP, C
PRESSURE, Atm
4.39
2.12
210
230
21
CO CONVERSION
GC2 C3 OLE SELECTIVITY
GC2 C3 PAR SELECTIVITY
HOURS ON STREAM

FIGURE 38

BIMETALLIC Co/Ru CATALYST ON C SUPPORT

PLT 700A RUN 67 H_2:CO (MOLAR)= 2.0

5.6 Co 1.0 Ru 100 C (BY WT.)%

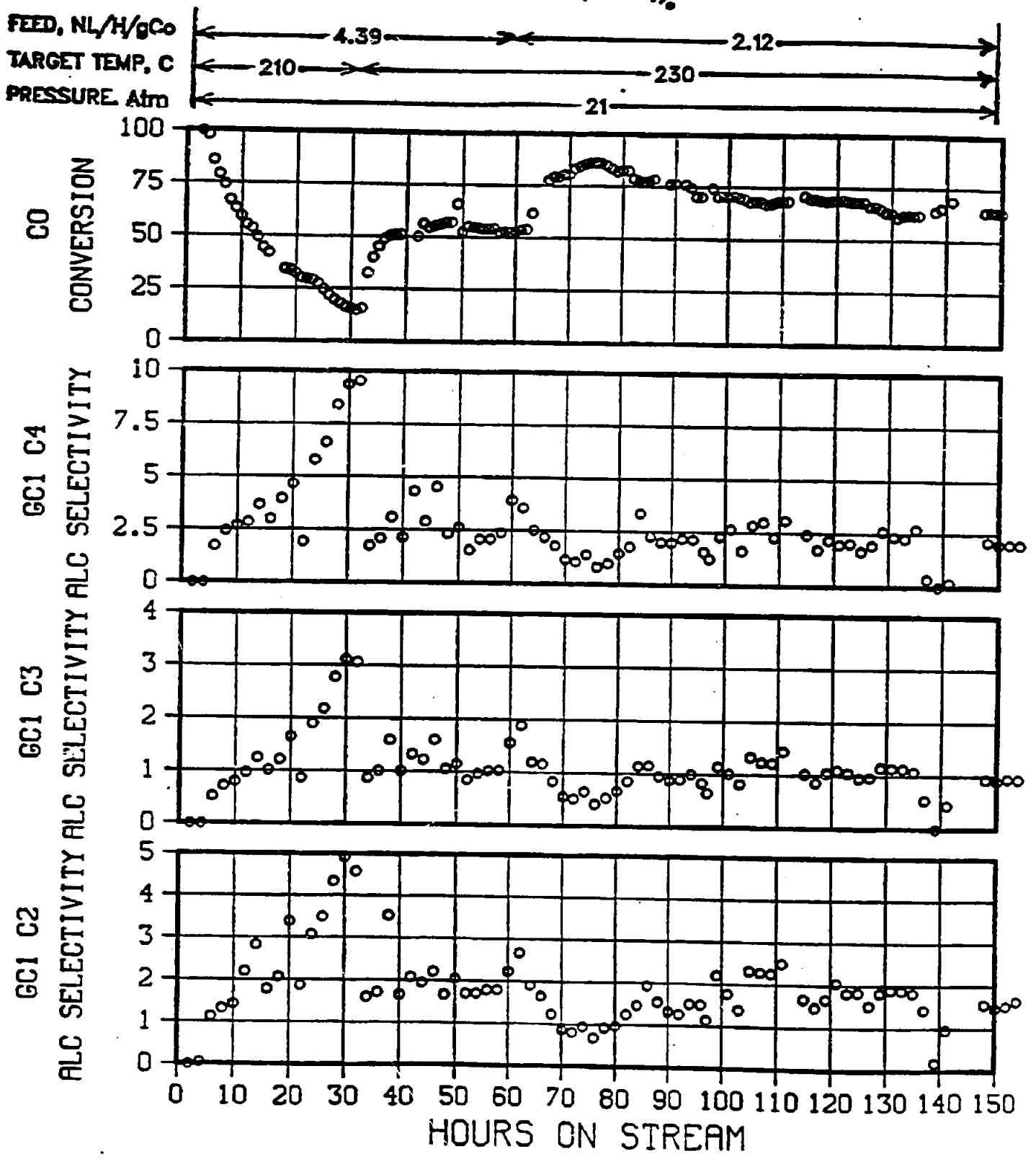


FIGURE 39

PLT 700A RUN 77 Co,Ru on Carbotrap B

6531–150 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand

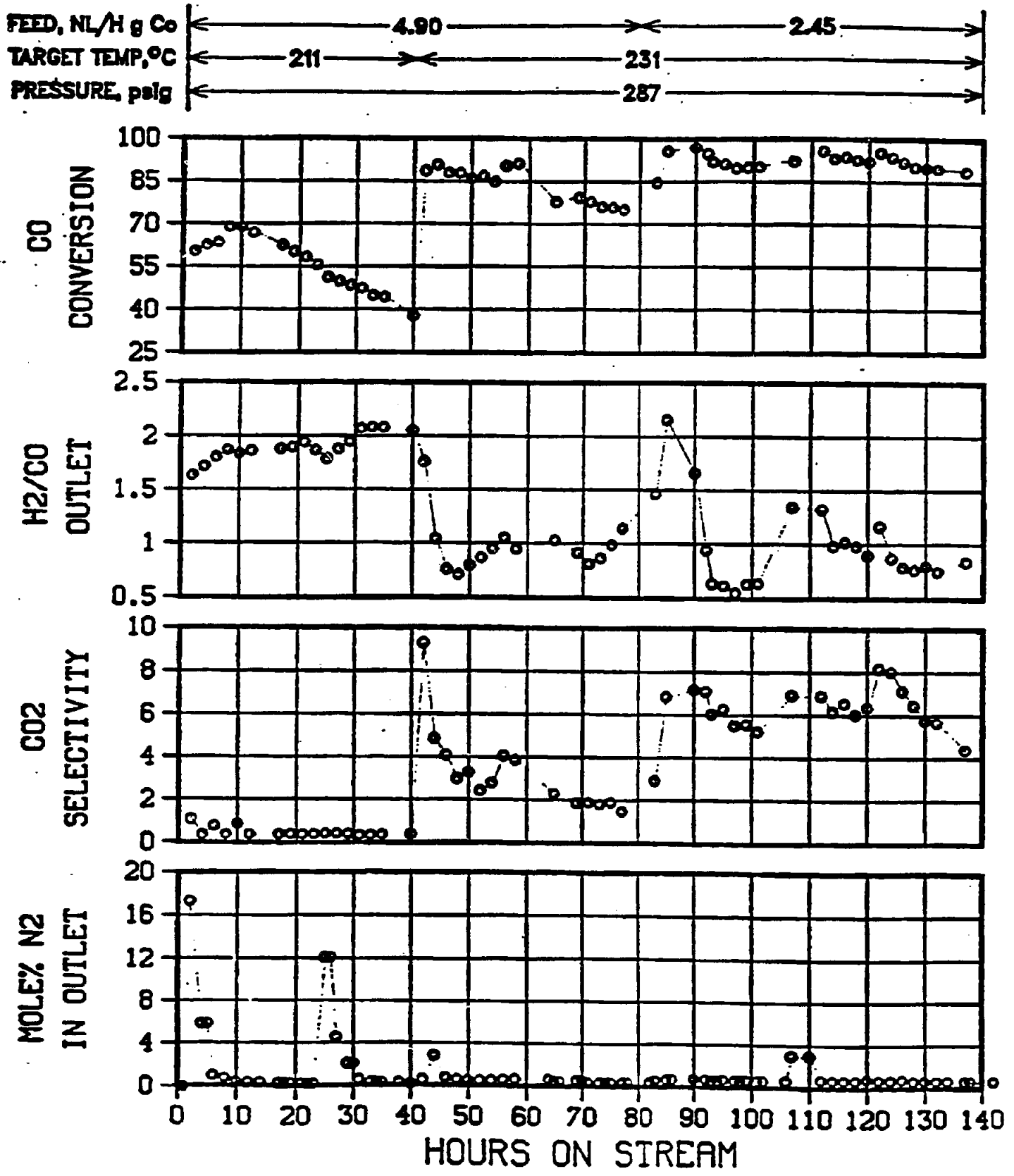


FIGURE 40

PLT 700A RUN 77 Co,Ru on Carbotrap B

6531–160 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand

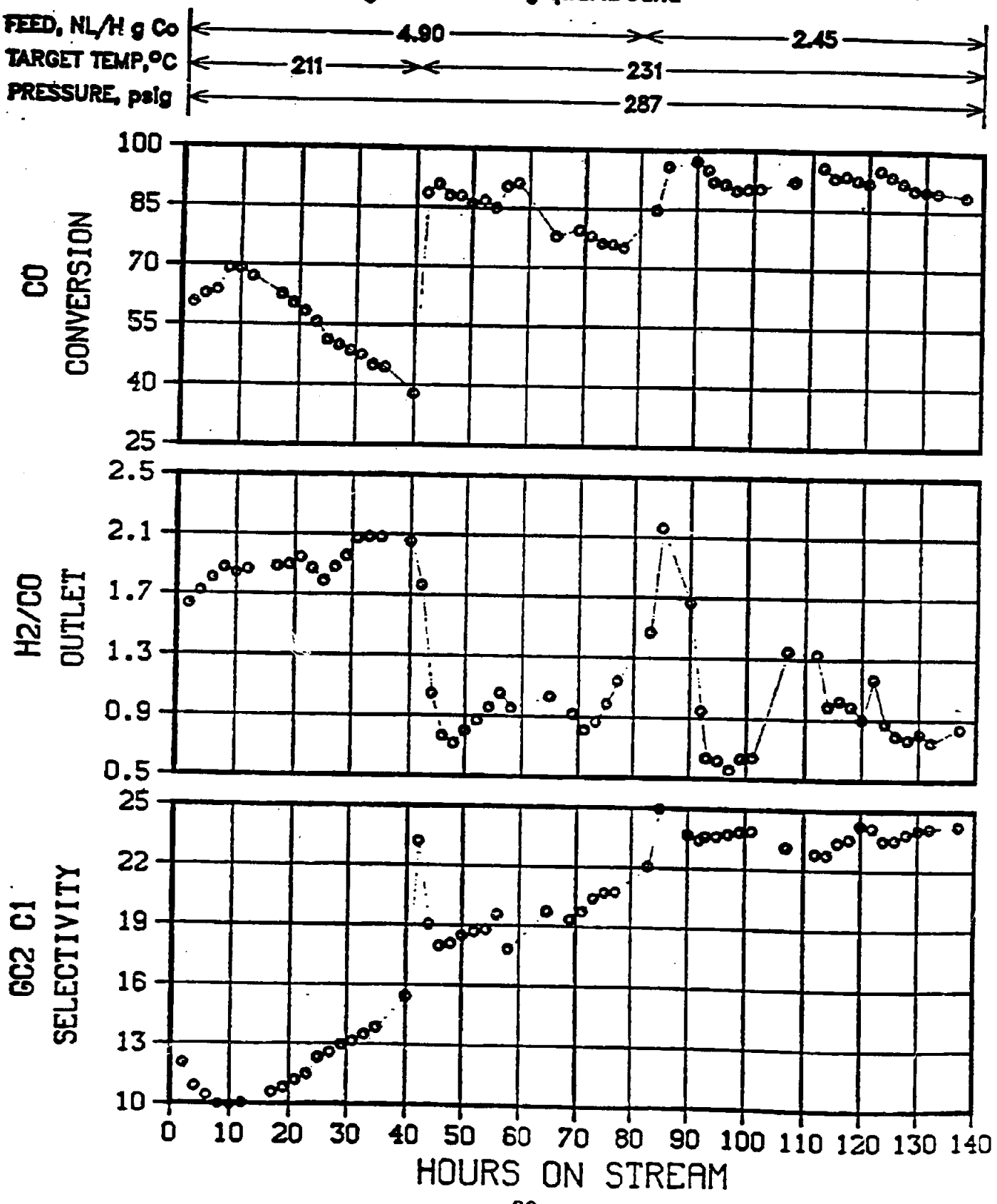


FIGURE 41

PLT 700A RUN 77 Co,Ru on Carbotrap B

6531–160 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand

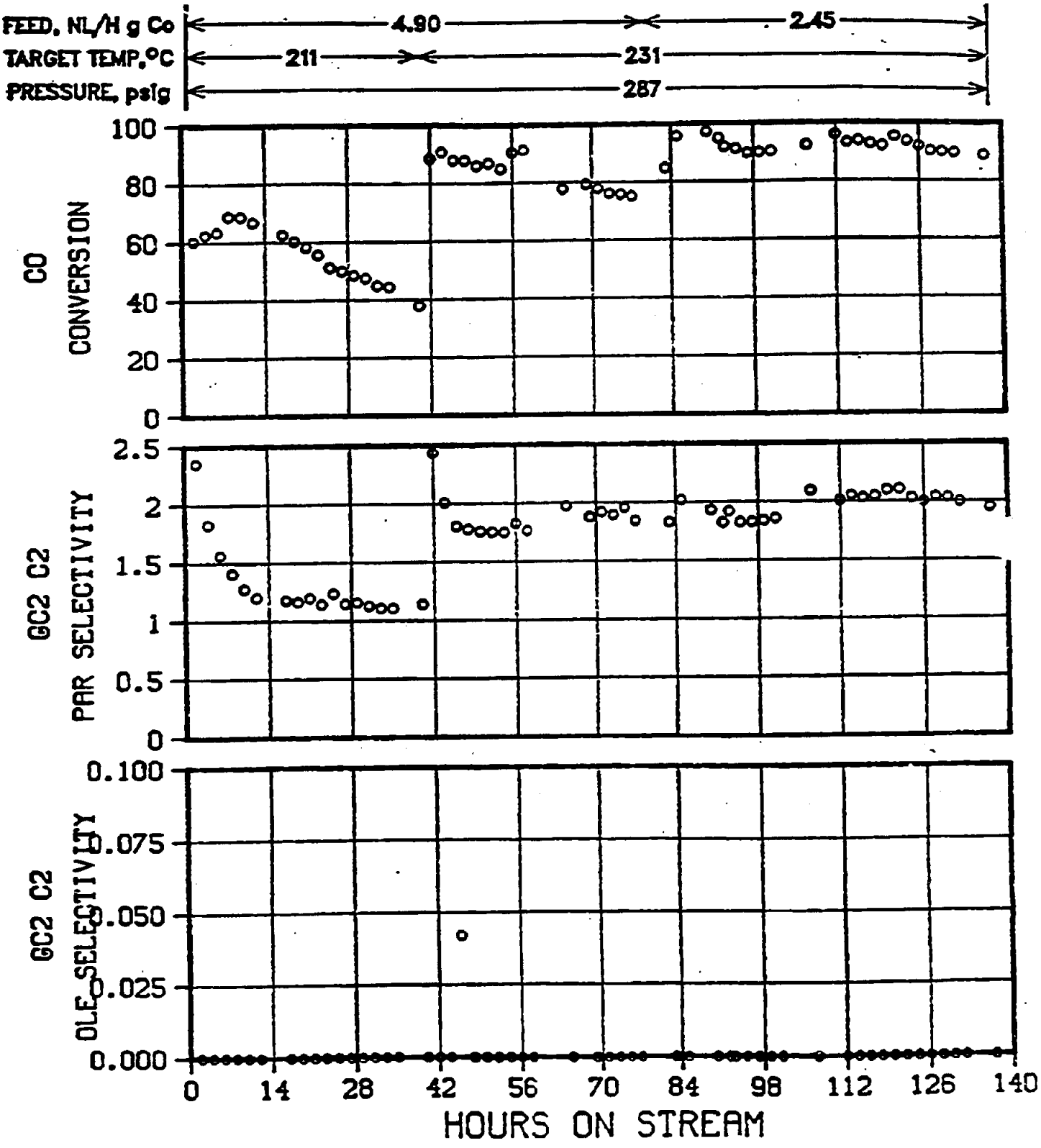


FIGURE 42

PLT 700A RUN 77 Co,Ru on Carbotrap B

5531–160 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand

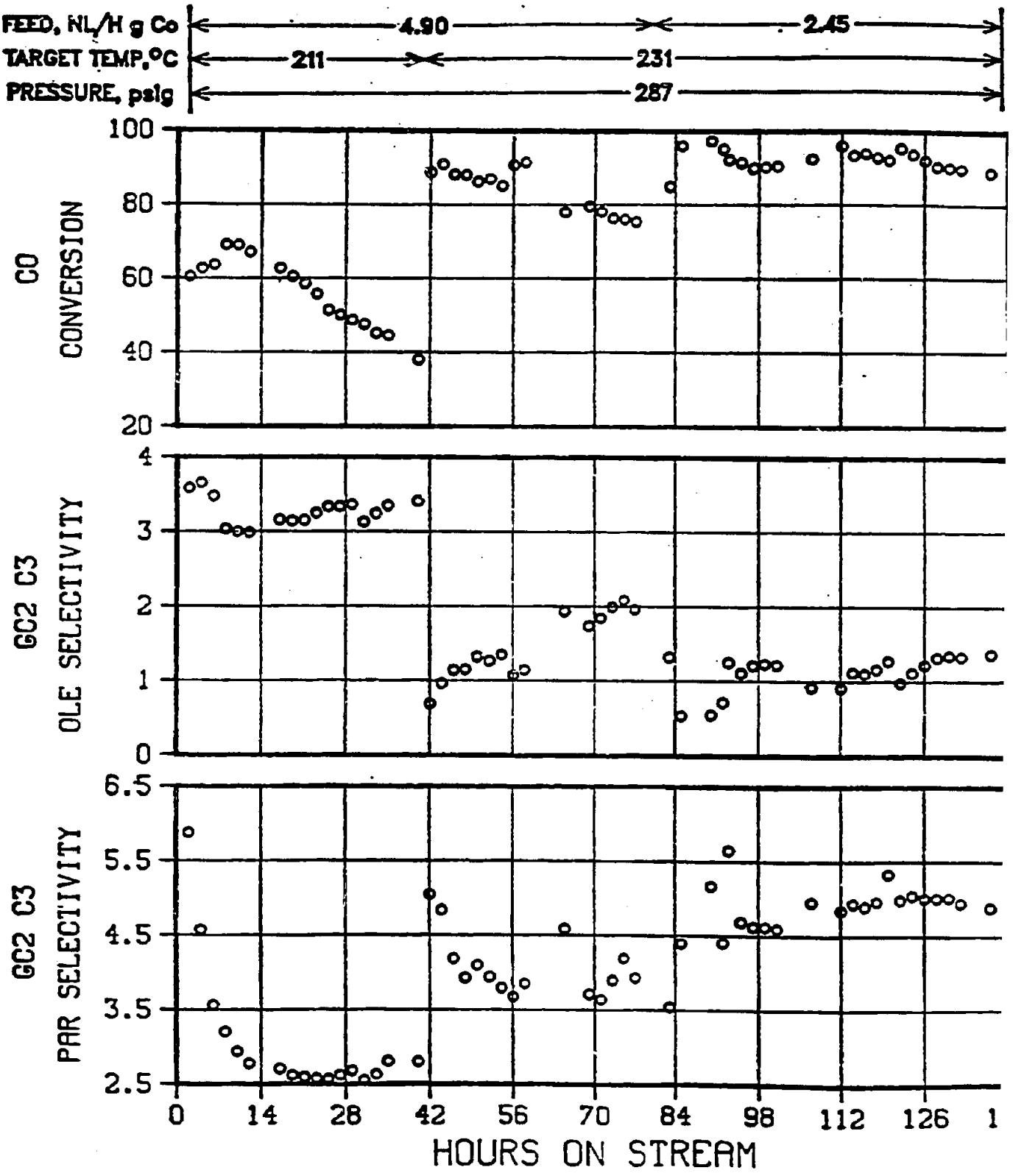


FIGURE 43

PLT 700A RUN 77 Co,Ru on Carbotrap B

6531-160 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand

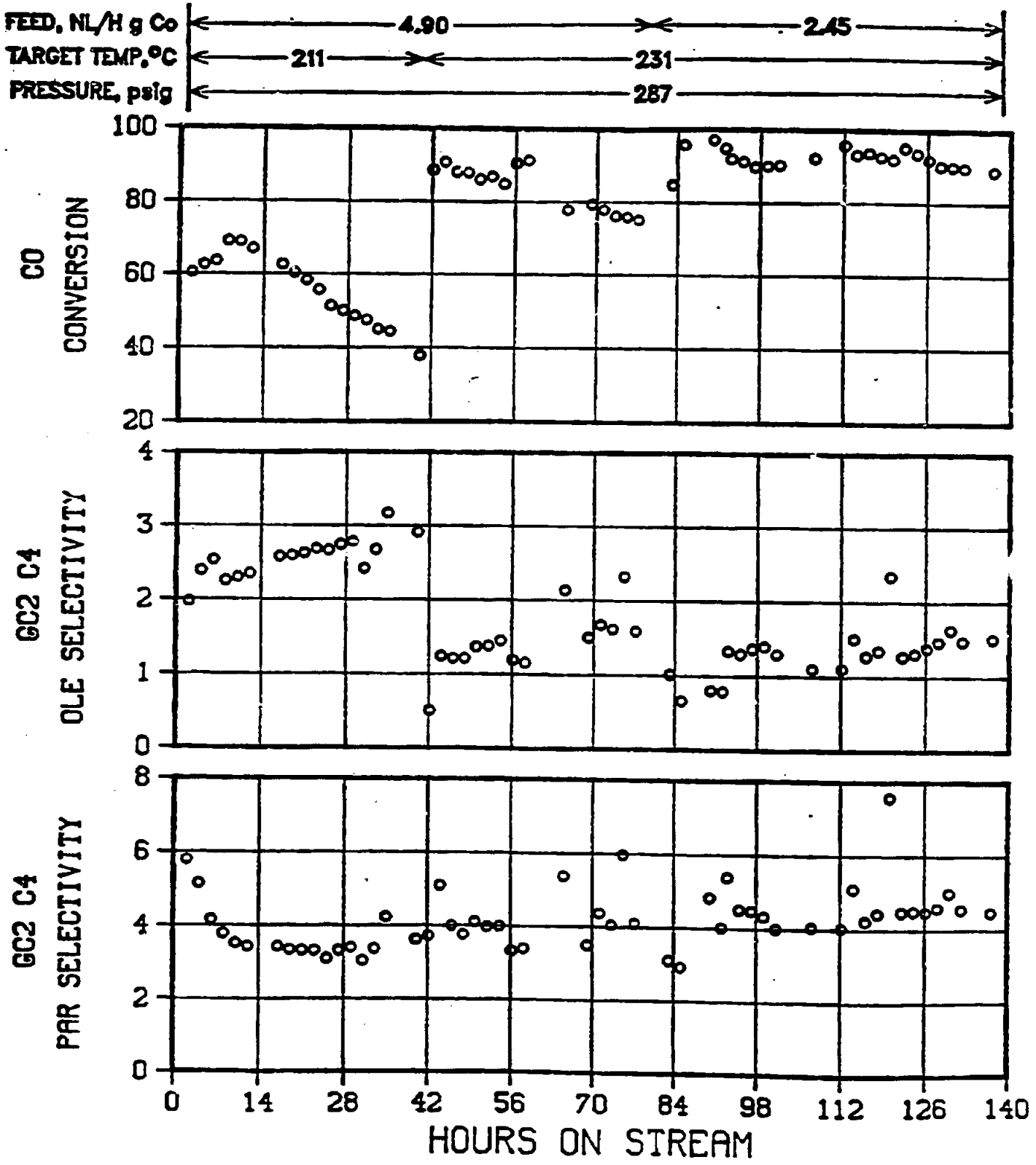
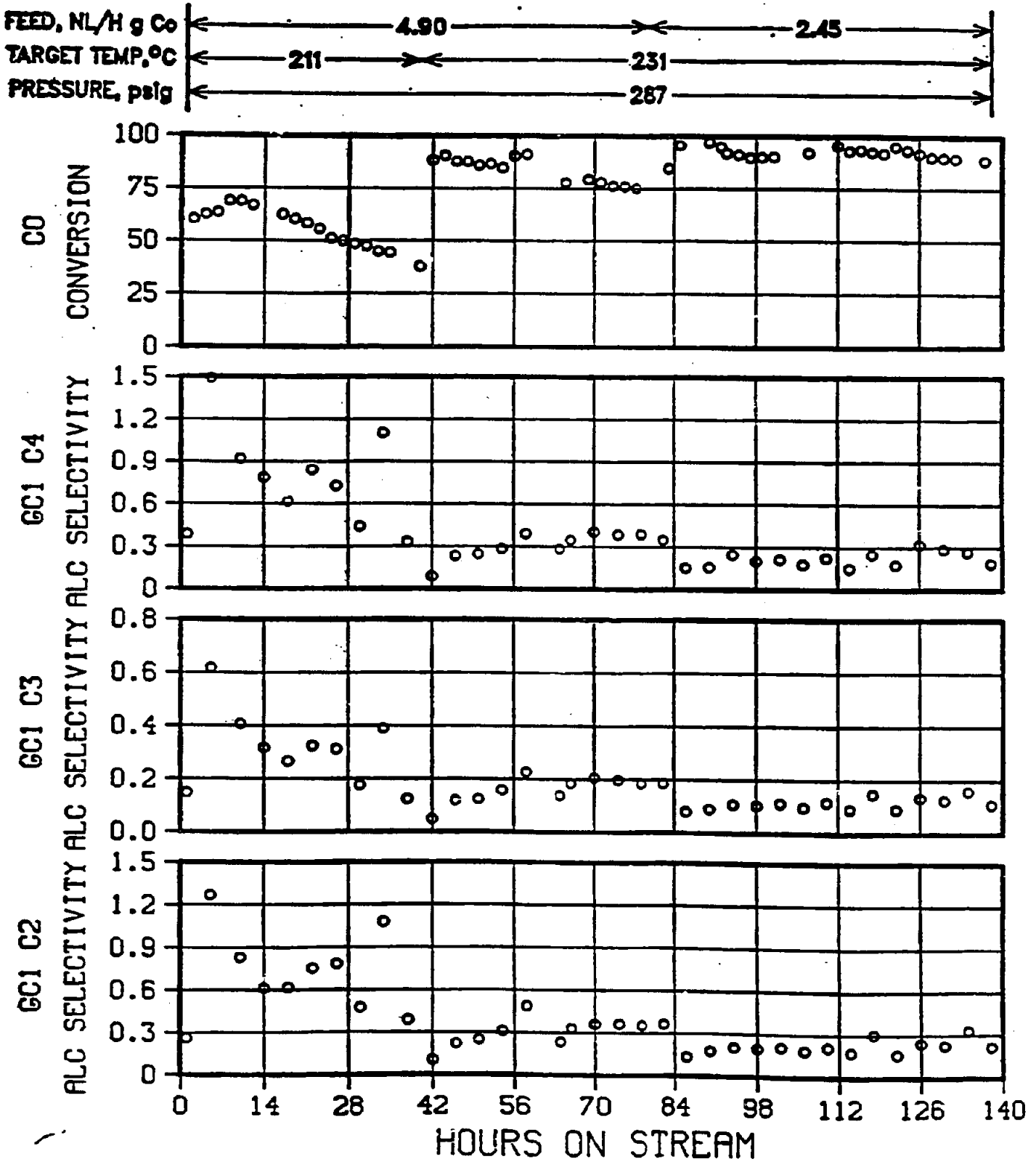


FIGURE 44

PLT 700A RUN 77 Co,Ru on Carbotrap B

8531-160 w/13.6 % Co via aq. impreg 2:1 H_2:CO in feed

13g active in 160g quartz sand



COMPARISON OF ALUMINA-TITANIA CATALYSTS TO REFERENCE CATALYST

THREE-CONDITION SCREENING TEST SUMMARY

CATALYST SOURCE	SUPPORT	METALS, WT %	% CO CONV/% C-1 SELEC CONDITION 1	2	3
UNION CARBIDE	STEAMED, ACID-WASHED Y ZEOL	Co, 8.3; Mn, 1.3 Zr, 1.0	58/6.0		
DES PLAINES (Run 68)[1]	50/50 Al_2O_3/TiO_3	Co, 2.7; Ru, 0.49	20/21	40/25	
DES PLAINES (Run 73)[2]	50/50 Al_2O_3/TiO_2	Co, 7.5; Ru, 0.29	25/45	50/75	100/37

1. REVERSE MICELLE IMPREGNATION
2. AQUEOUS IMPREGNATION

104

FIGURE 45

FIGURE 46

BIMETALLIC Co/Ru CATALYST ON Al_2O_3–TiO_2 SUPPORT

PLT 700A RUN 68 H_2:CO (MOLAR)= 2.0

2.65 % Co , 0.49 % Ru , 50:50 Al_2O_3–TiO_2

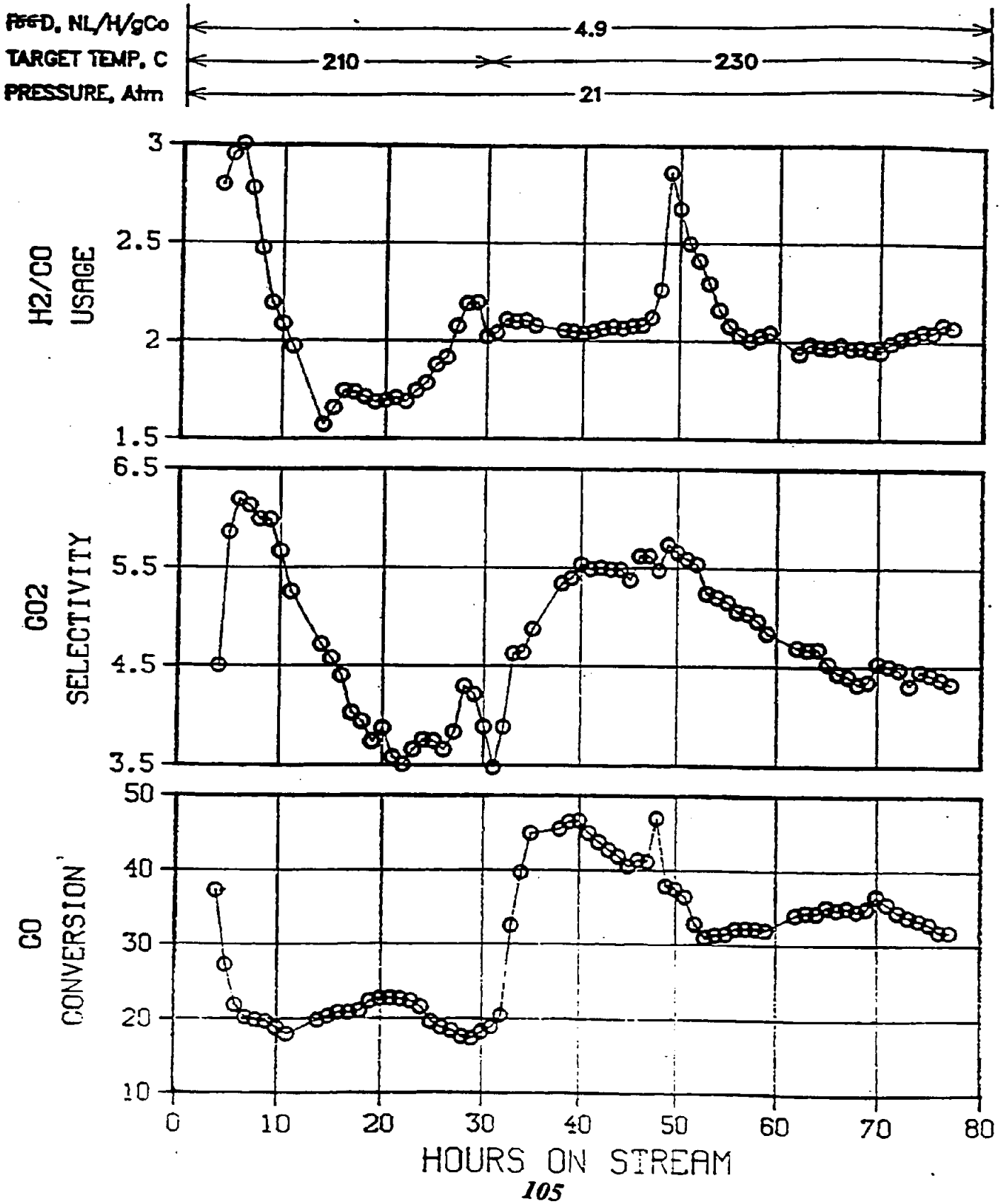


FIGURE 47

BIMETALLIC Co/Ru CATALYST ON Al_2O_3–TiO_2 SUPPORT

PLT 700A RUN 68 H_2:CO (MOLAR)= 2.0

2.65 % Co , 0.49 % Ru , 50:50 Al_2O_3–TiO_2

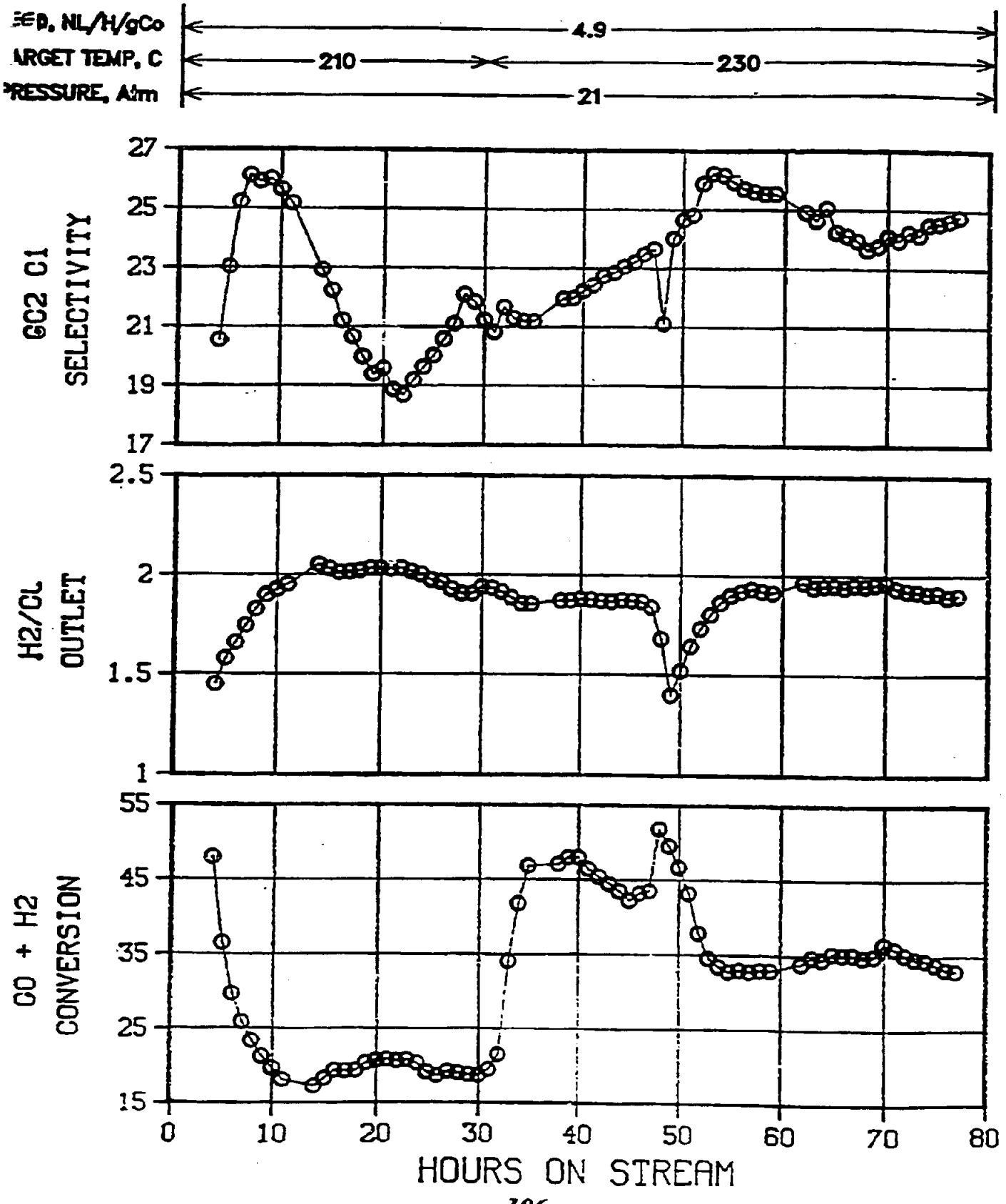


FIGURE 48

BIMETALLIC Co/Ru CATALYST ON Al_2O_3–TiO_2 SUPPORT

PLT 700A RUN 68 H_2:CO (MOLAR)= 2.0

2.65 % Co , 0.49 % Ru , 50:50 Al_2O_3–TiO_2

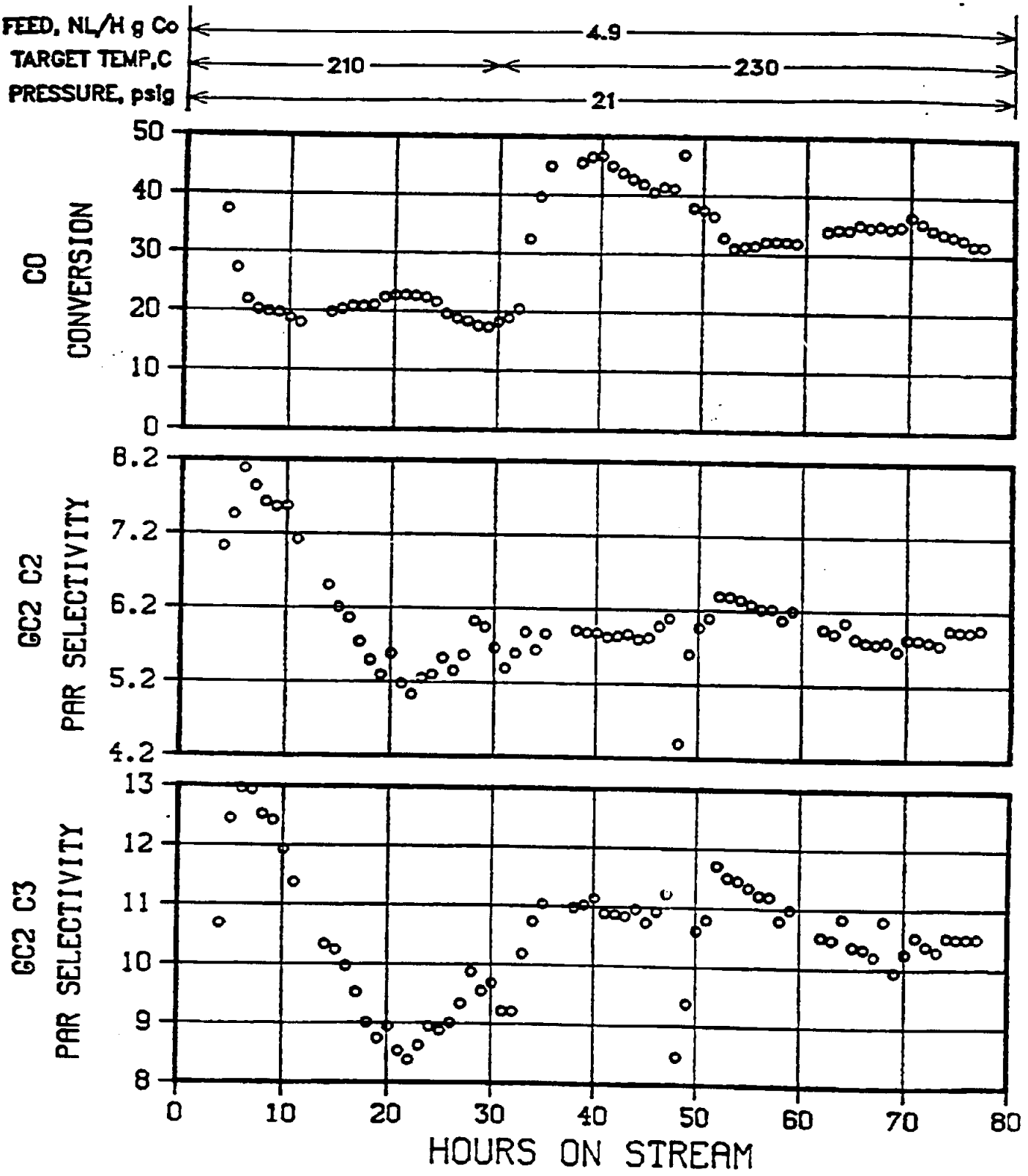


FIGURE 49

BIMETALLIC Co/Ru CATALYST ON Al_2O_3–TiO_2 SUPPORT

PLT 700A RUN 68 H_2:CO (MOLAR)= 2.0

2.65 % Co . 0.49 % Ru . 50:50 Al_2O_3–TiO_2