FIGURE 1

MAGNETIC PROPERTIES:

GROUP VIII METALS AND CARBIDES

MATERIAL	CURIE TEMP, °C	FISCHER-TROPSCH ACTIVITY
α-Fe	770	EXCELLENT
α-Co	1115	EXCELLENT
β-Co	1115	EXCELLENT
Ni	353	SOME, CH_4 GOOD
Ru	PARAMAGNETIC	EXCELLENT
Rh	PARAMAGNETIC	POOR
Pd	PARAMAGNETIC	POOR
Os	PARAMAGNETIC	POOR
Ir	PARAMAGNETIC	POOR
Pt	PARAMAGNETIC	POOR
Fe_3C	210	EXCELLENT
ε-Fe_2C	380	EXCELLENT
X-Fe_2C	247	EXCELLENT
FeC	250	EXCELLENT
Ni_3C (hcp)	PARAMAGNETIC	INERT
Ni_4C	220	SOME

FIGURE 2

Slurry Bubble Demonstrations

Plants	Rheinprussen Plant	Mobil (Low Wax)	Mobil (High Wax)
Temp., °C	268	260	258
Pressure, psig	176	221	221
SV, NL/kgFe/hr	3,400	2,600	2,400
$CO+H_2$ Conv., %	89.0	86.8	82.2
Product Yield, gHC/gFe/hr	0.57	0.37	0.41

PILOT PLANT
BW 12/12/90
MODIFIED 11/6/92
TO SHOW
ACTUAL FLOW THRU FEED
TREATERS

PLANT 700
"ISO-SYNTHESIS" CATALYST EVALUATION

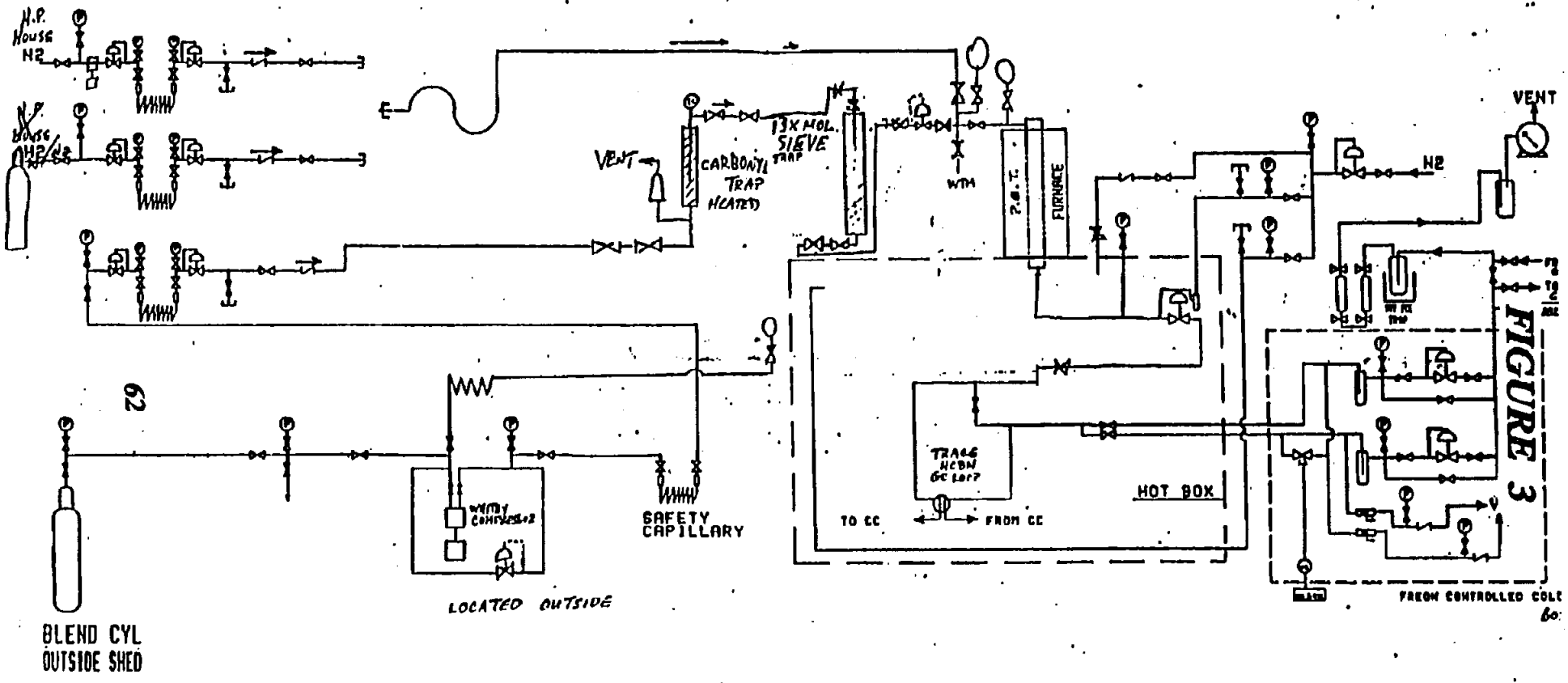

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FIGURE 3

THREE CONDITION TEST

KEY VARIABLES	CONDITION 1	CONDITION 2	CONDITION 3
PRESSURE, PSIG	287	287	287
TEMP, °C	211	231	231
FEED RATE, (NL/HR G Co)	4.9	4.9	2.5

FIGURE 4

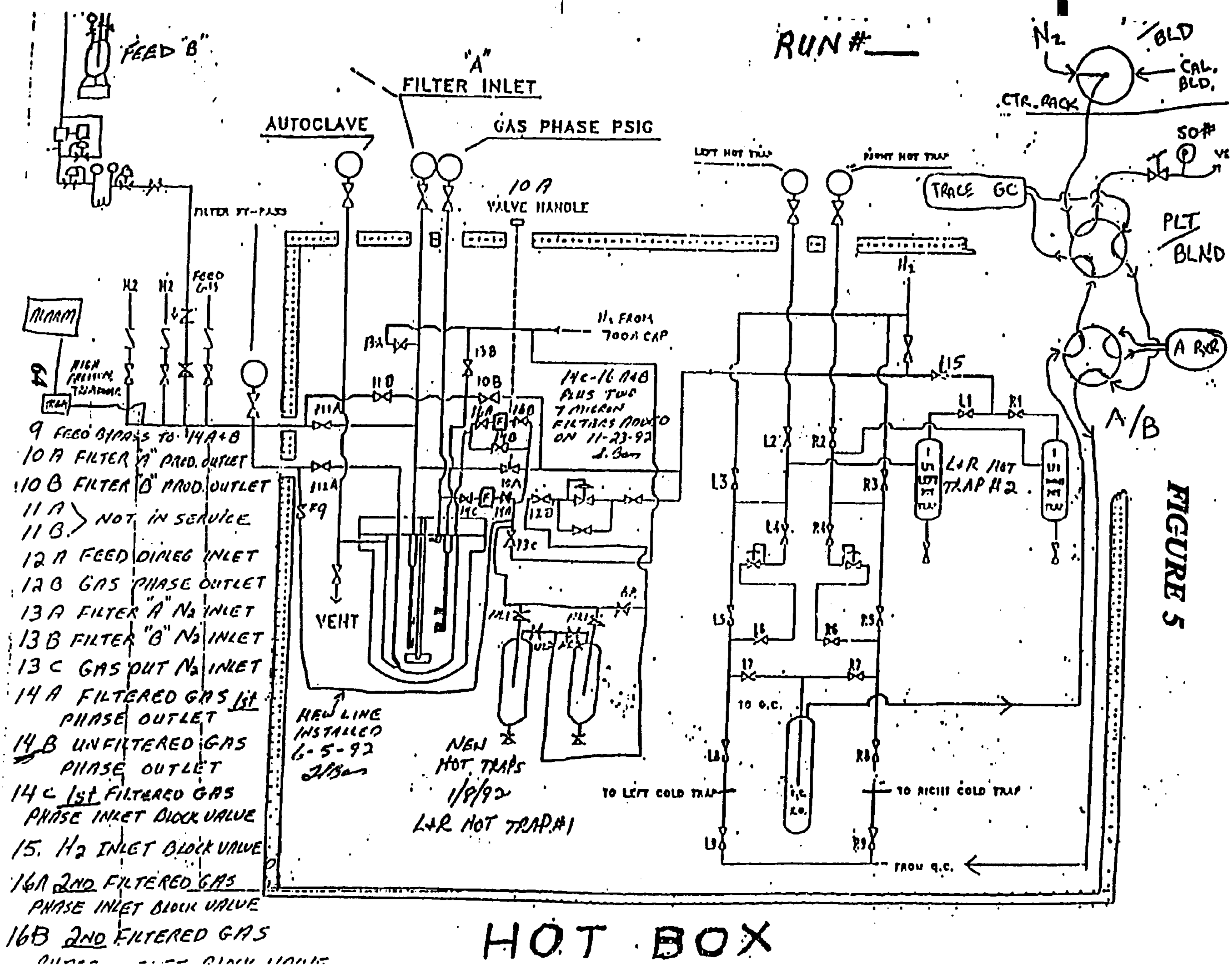

RUN #
FEED "B"
ALARM
HIGH PRESSURE TRANSDUCER
H2
H2
FEED GAS
FILTER BY-PASS
AUTOCLAVE
"A"
FILTER INLET
GAS PHASE PSIG
10 A
VALVE HANDLE
B
H2 FROM 7000 CAP
14c-16 A&B PLUS TWO 7 MICRON FILTERS ADDED ON 11-23-92
11 D
10B
13B
11A
12A
12D
13C
VENT
NEW LINE INSTALLED 6-5-92
NEW HOT TRAPS 1/8/92
L&R HOT TRAP #1
LEFT HOT TRAP
RIGHT HOT TRAP
TRACE GC
CTR. RACK
N2
/BLD
CAL. BLD.
SO#
PLT BLND
A RxR
A/B
H2
L15
L1
R1
L&R HOT TRAP #2
L2
R2
L3
R3
L4
R4
L5
R5
L6
R6
L7
R7
TO G.C.
L8
R8
TO LEFT COLD TRAP
TO RIGHT COLD TRAP
L9
R9
FROM G.C.
9 FEED BYPASS TO 14A+B
10 A FILTER "A" PROD. OUTLET
10 B FILTER "B" PROD. OUTLET
11 A
11 B } NOT IN SERVICE
12 A FEED DIPLEG INLET
12 B GAS PHASE OUTLET
13 A FILTER "A" N2 INLET
13 B FILTER "B" N2 INLET
13 C GAS OUT N2 INLET
14 A FILTERED GAS 1st PHASE OUTLET
14 B UNFILTERED GAS PHASE OUTLET
14 C 1st FILTERED GAS PHASE INLET BLOCK VALVE
15. H2 INLET BLOCK VALVE
16A 2ND FILTERED GAS PHASE INLET BLOCK VALVE
16B 2ND FILTERED GAS
HOT BOX

FIGURE 5

FIGURE 6

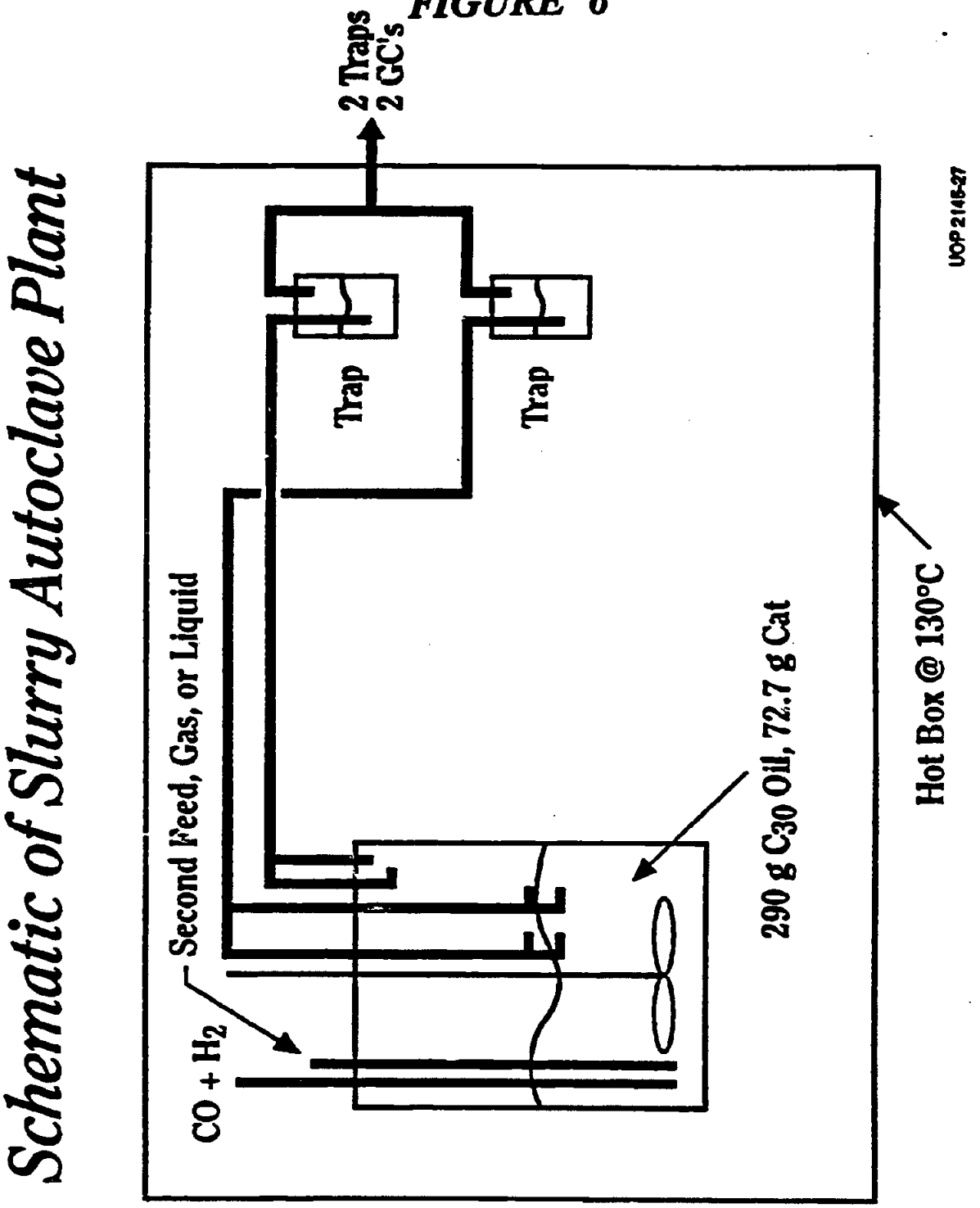
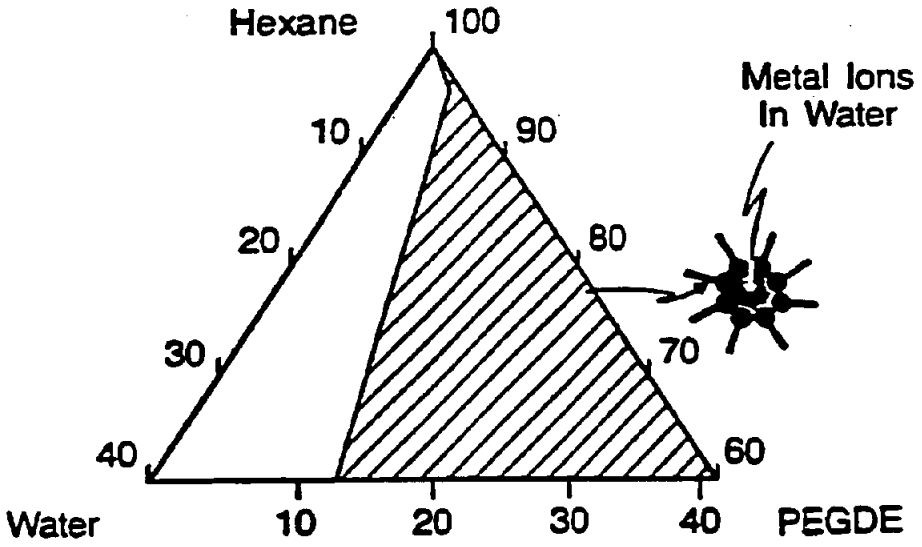

Schematic of Slurry Autoclave Plant
2 Traps
2 GC's
Trap
Trap
Second Feed, Gas, or Liquid
CO + H2
290 g C30 Oil, 72.7 g Cat
Hot Box @ 130°C
UOP 2145-27

FIGURE 7

REVERSE MICELLE PROCEDURE FOR PREPARING SMALL METAL PARTICLES WITH A NARROW SIZE DISTRIBUTION

(P. Stenius et al., International Patent Application PLT/SE81/0091, 1981)



PEGDE: PENTAETHYLENE GLYCOL DODECYL ETHER

PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand

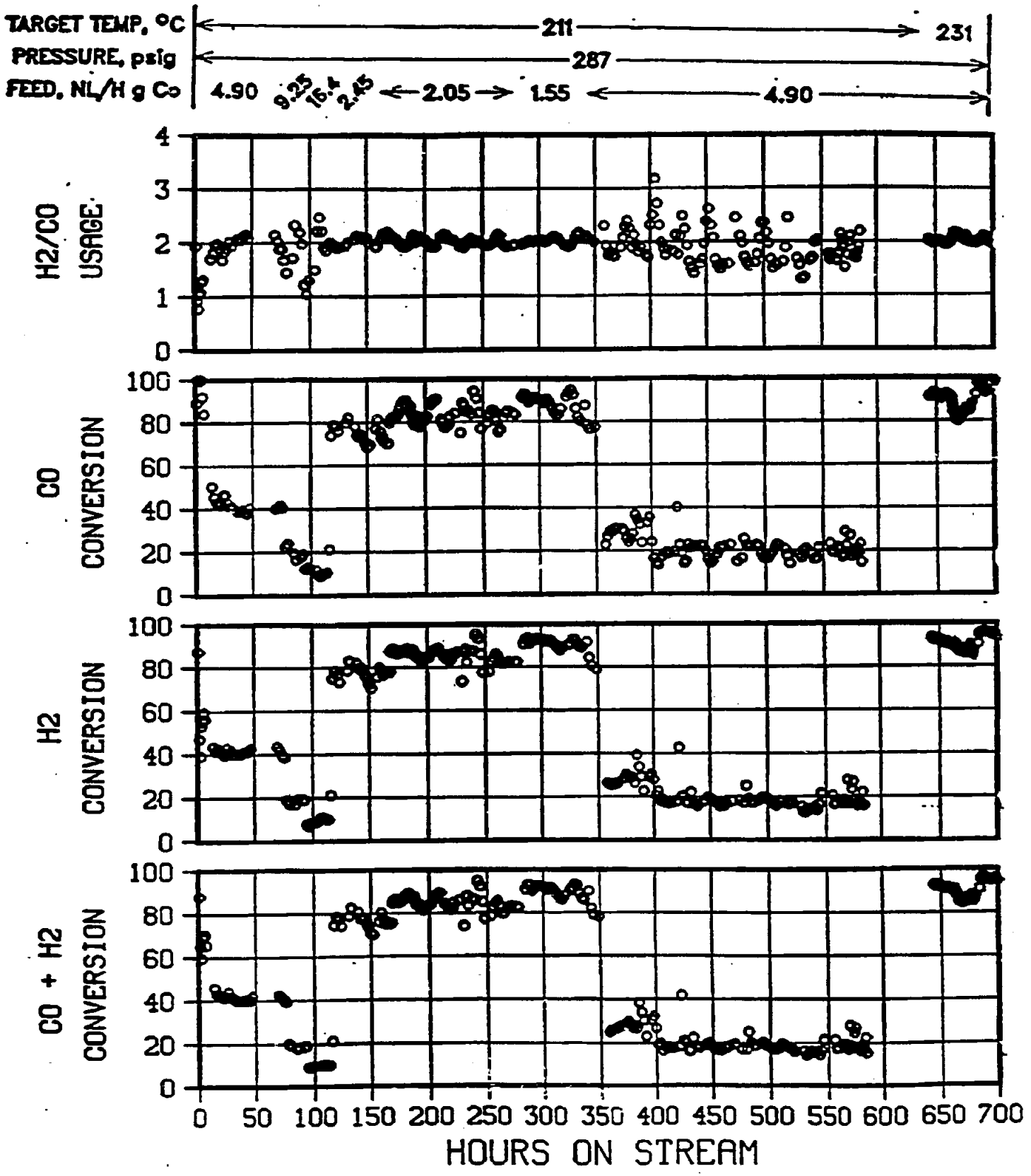


FIGURE 9

PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand

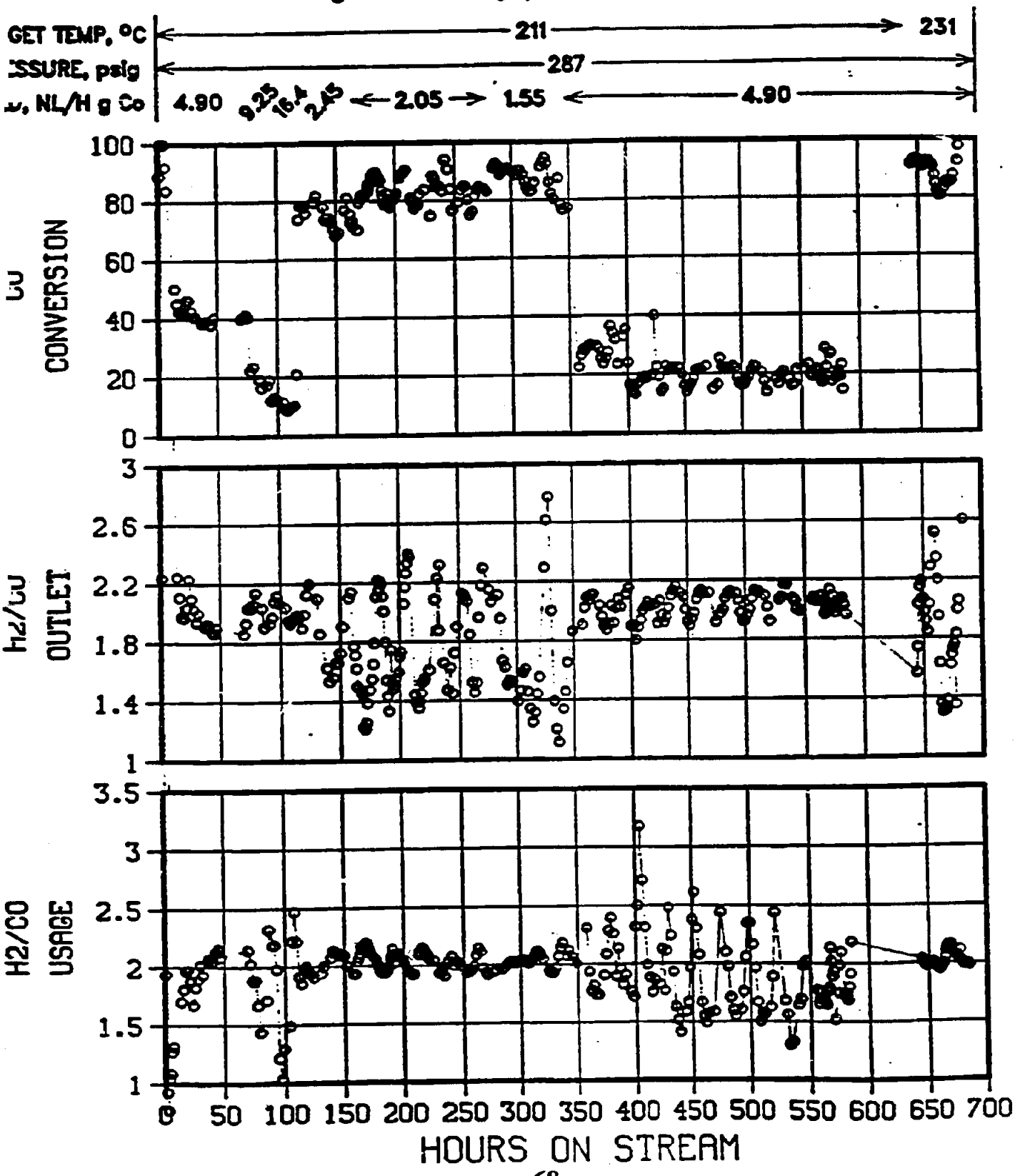


FIGURE 10

PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand

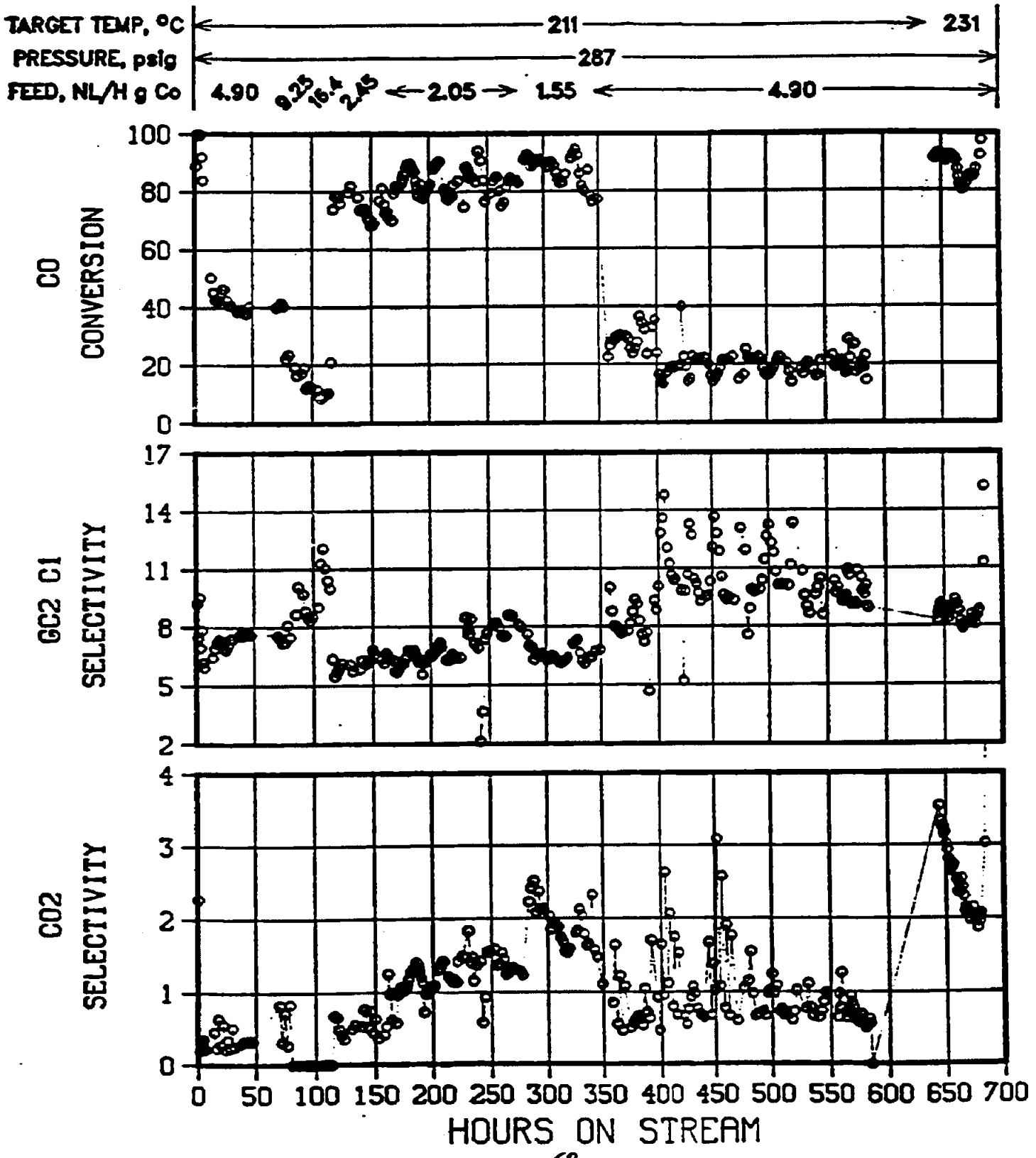


FIGURE 11

PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand

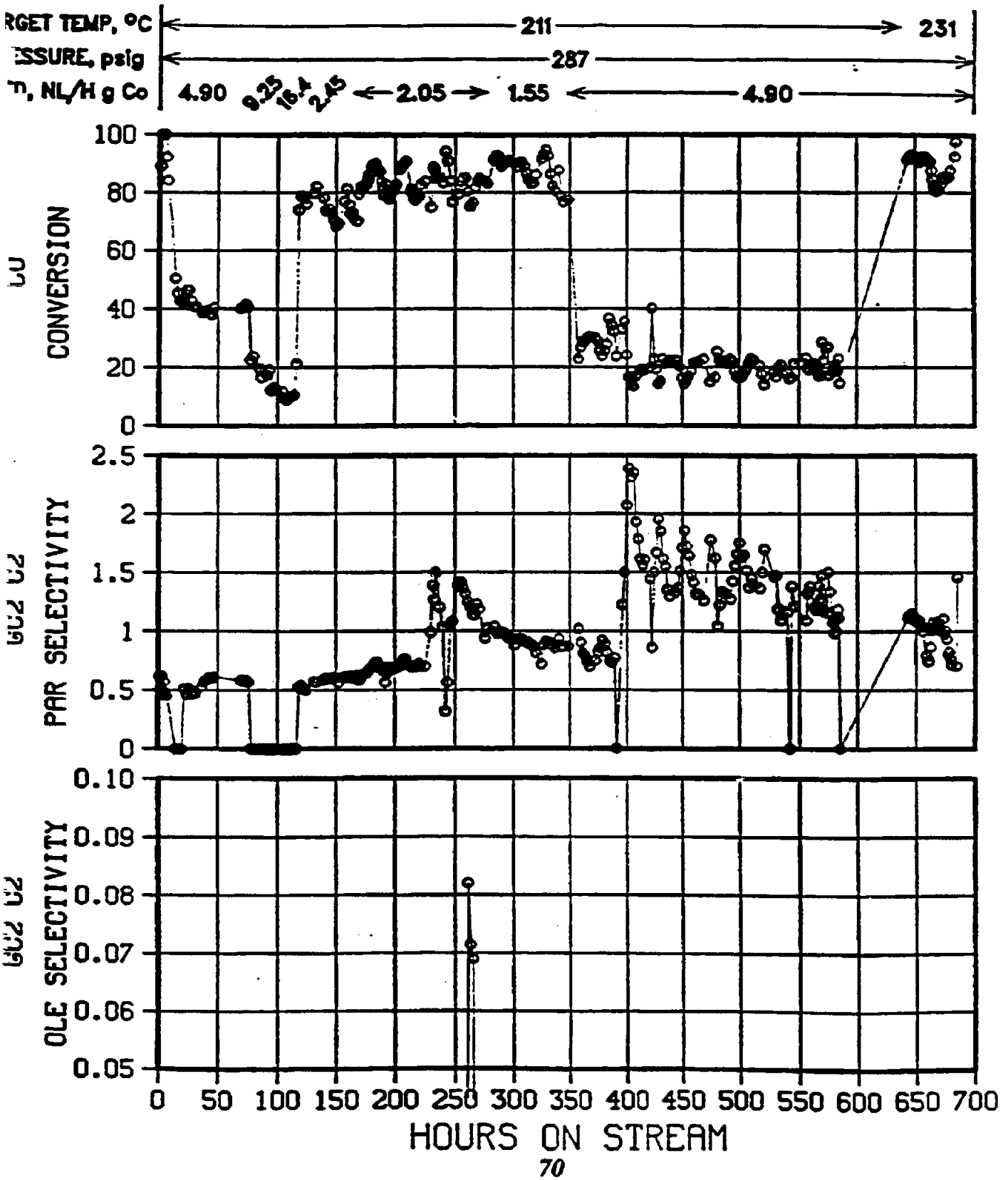


FIGURE 12

PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand

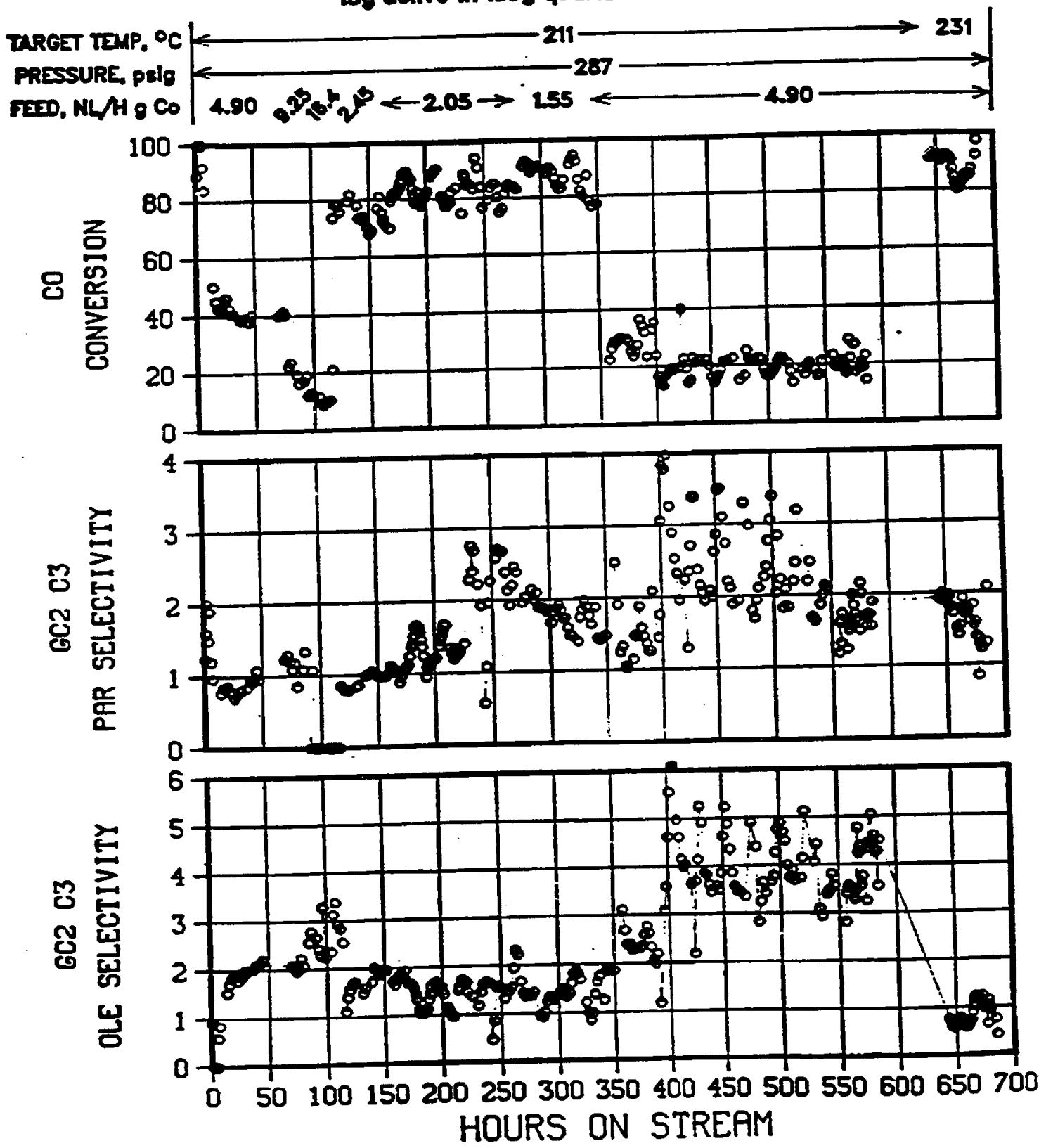
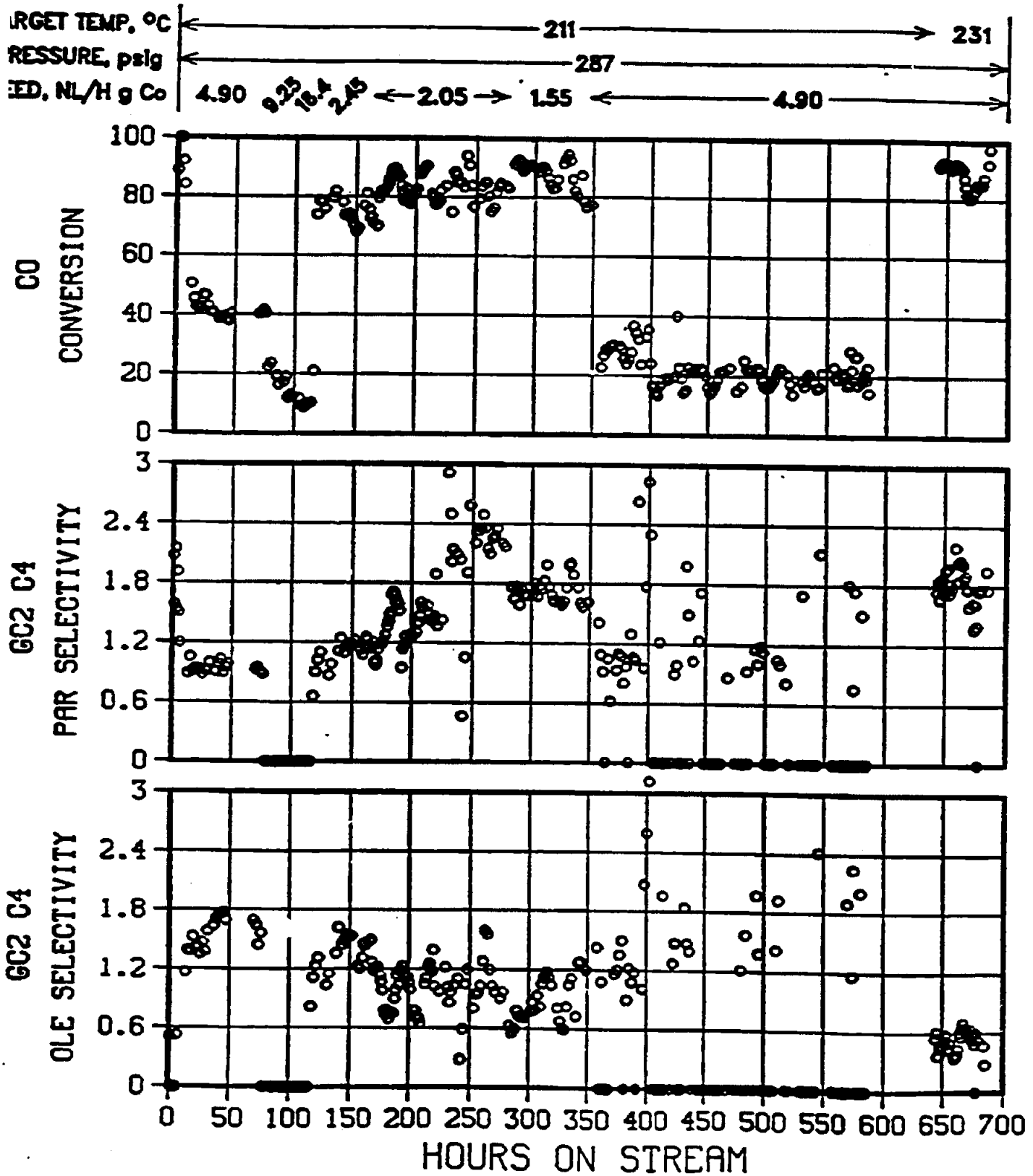


FIGURE 13

PLT 700A RUN 65 Tarrytown reference catalyst TC–211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

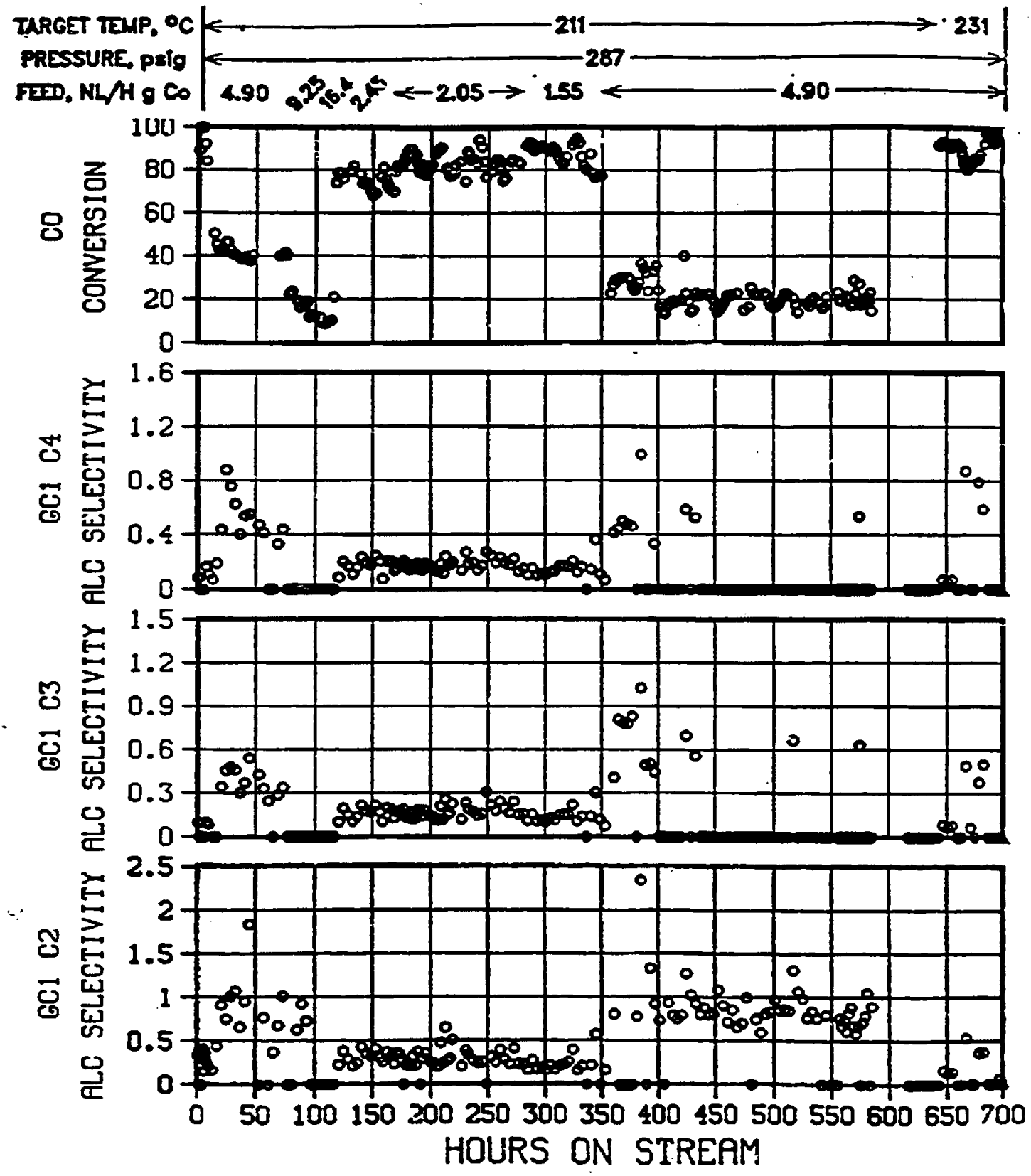
13g active in 155g quartz sand



PLT 700A RUN 65 Tarrytown reference catalyst TC-211

Co,Mn,Zr on acid washed Y 2:1 H_2:CO in feed

13g active in 155g quartz sand



COMPARISON OF MAGNESIA-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 63)[1]	ULTRA PURE MgO	Co, 7.3; Mn, 0.61 Zr, 0.93; Ru, 1.2	15/10		
DES PLAINES (Run 69)[2]	ULTRA PURE MgO	Co, 8.0; Ru, 0.84 Zr, 0.99	10/13	30/13	50/11
DES PLAINES (Run 72)[2]	ULTRA PURE MgO	Co, 7.5; Mn, 0.60 Ru, 0.60; Zr, 0.90	10/24	65/30	80/27

1. REVERSE MICELLE IMPREGNATION
2. AQUEOUS IMPREGNATION

FIGURE 15

FIGURE 16

PLT 700A RUN 63 Co,Ru,Mn,Zr on MgO

6531-100 w/7.3% Co via Reverse Micelle Impregnation 2:1 H_2:CO in feed
13g Active in 160g Alumina

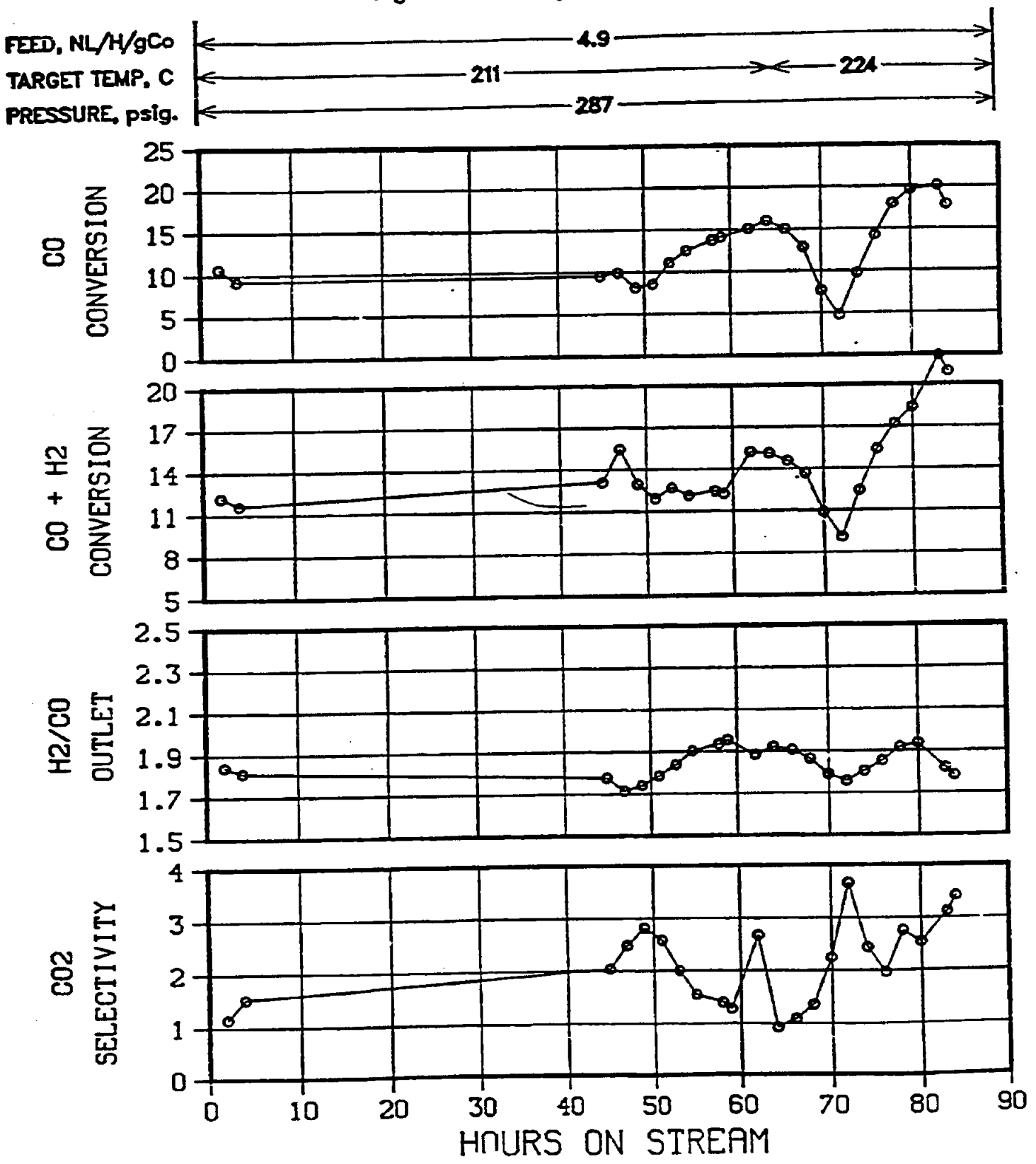


FIGURE 17

PLT 700A RUN 63 Co,Ru,Mn,Zr on MgO

6531-100 w/7.3% Co via Reverse Micelle Impregnation 2:1 H_2:CO in feed
13g Active in 160g Alumina

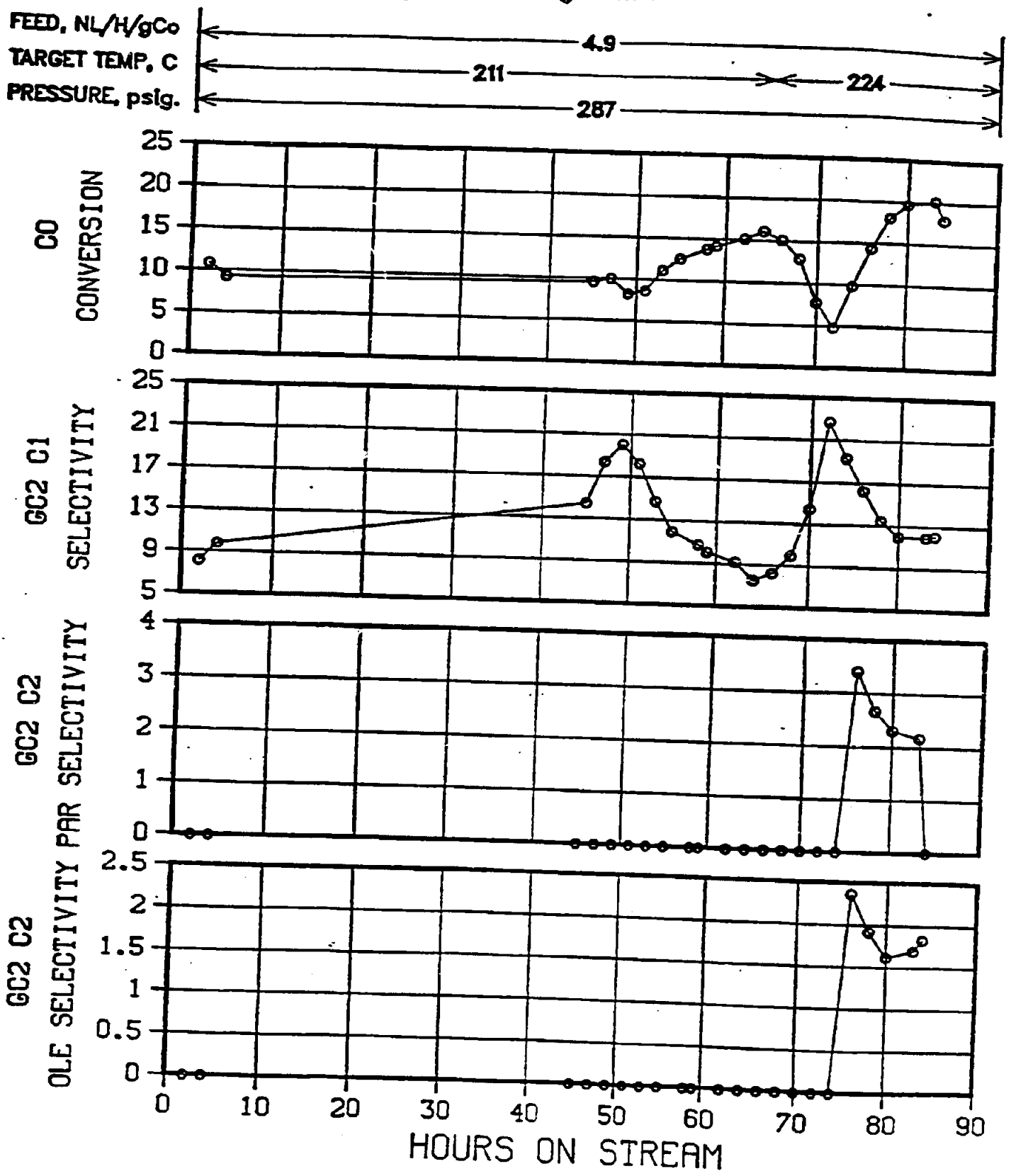


FIGURE 18

PLT 700A RUN 63 Co,Ru,Mn,Zr on MgO

6531-100 w/7.3% Co via Reverse Micelle Impregnation 2:1 H_2:CO in feed

13g Active in 160g Alumina

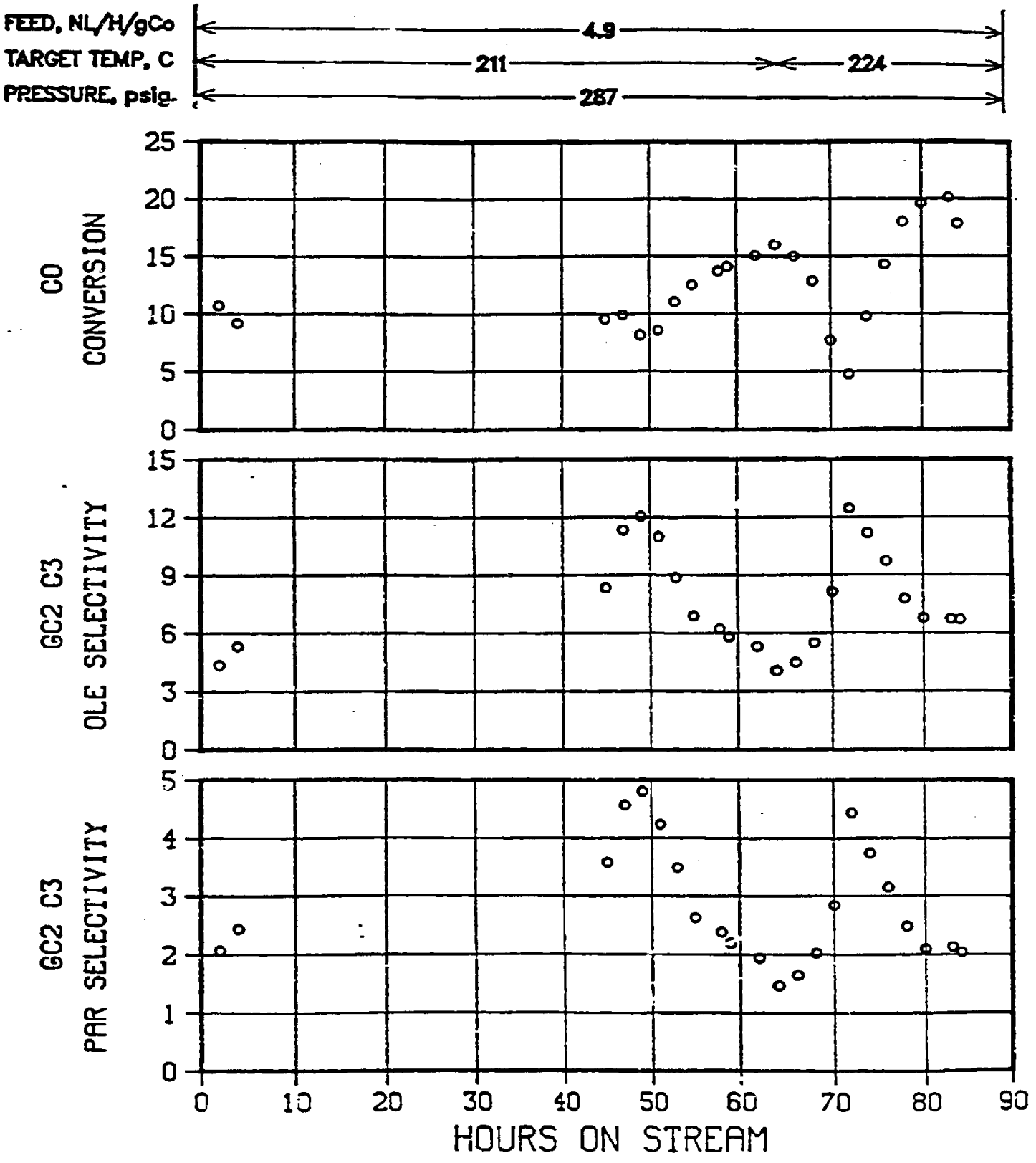


FIGURE 19

PLT 700A RUN 63 Co,Ru,Mn,Zr on MgO

6531-100 w/7.3% Co via Reverse Micelle Impregnation 2:1 H_2:CO in feed
13g Active in 160g Alumina

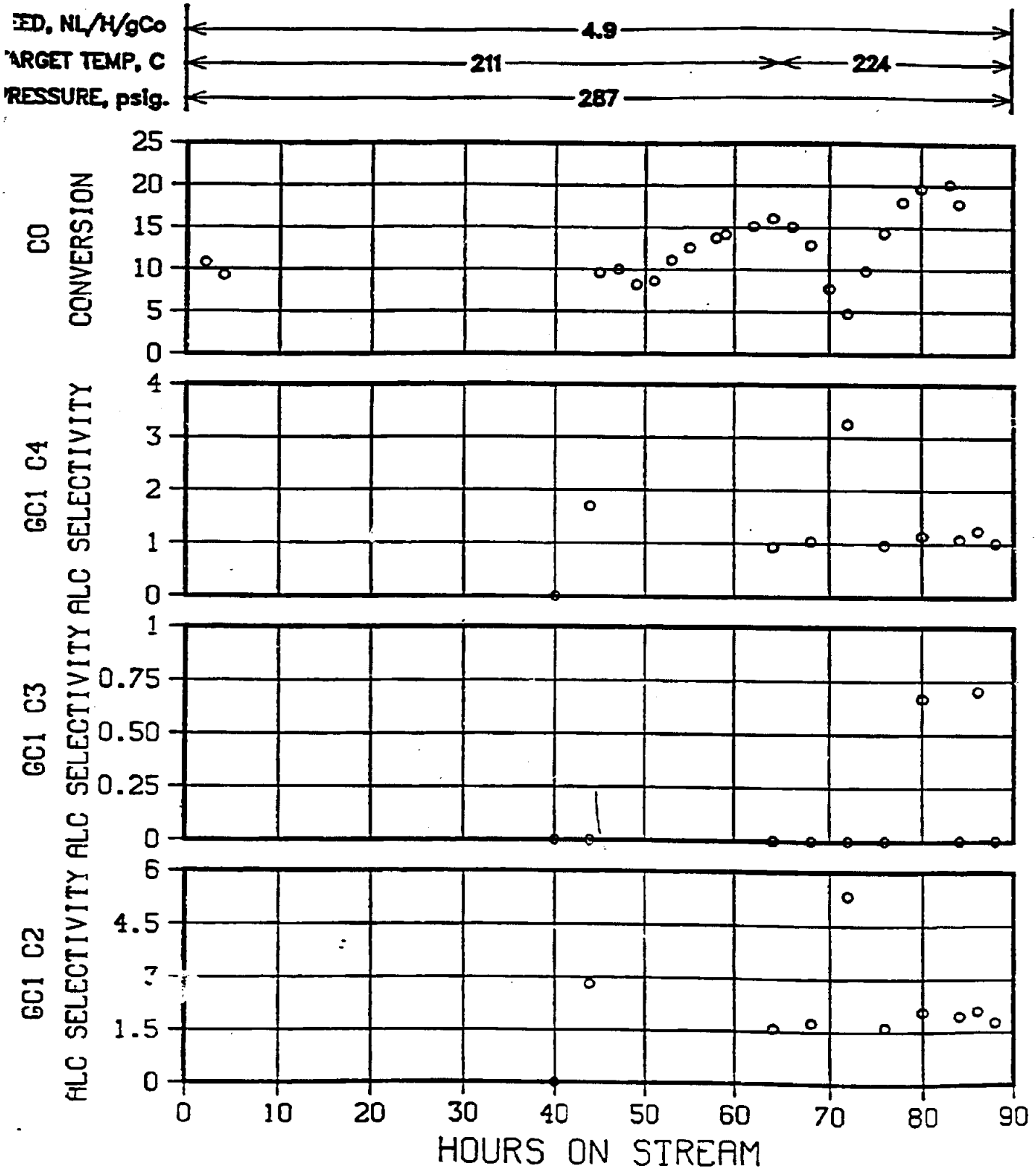


FIGURE 20

Co/Ru CATALYST ON MgO (Prepared by Aqueous Impregnation)

PLT 700A RUN 69 H_2:CO (MOLAR)= 2.0

8.02 % Co , 0.841 % Ru

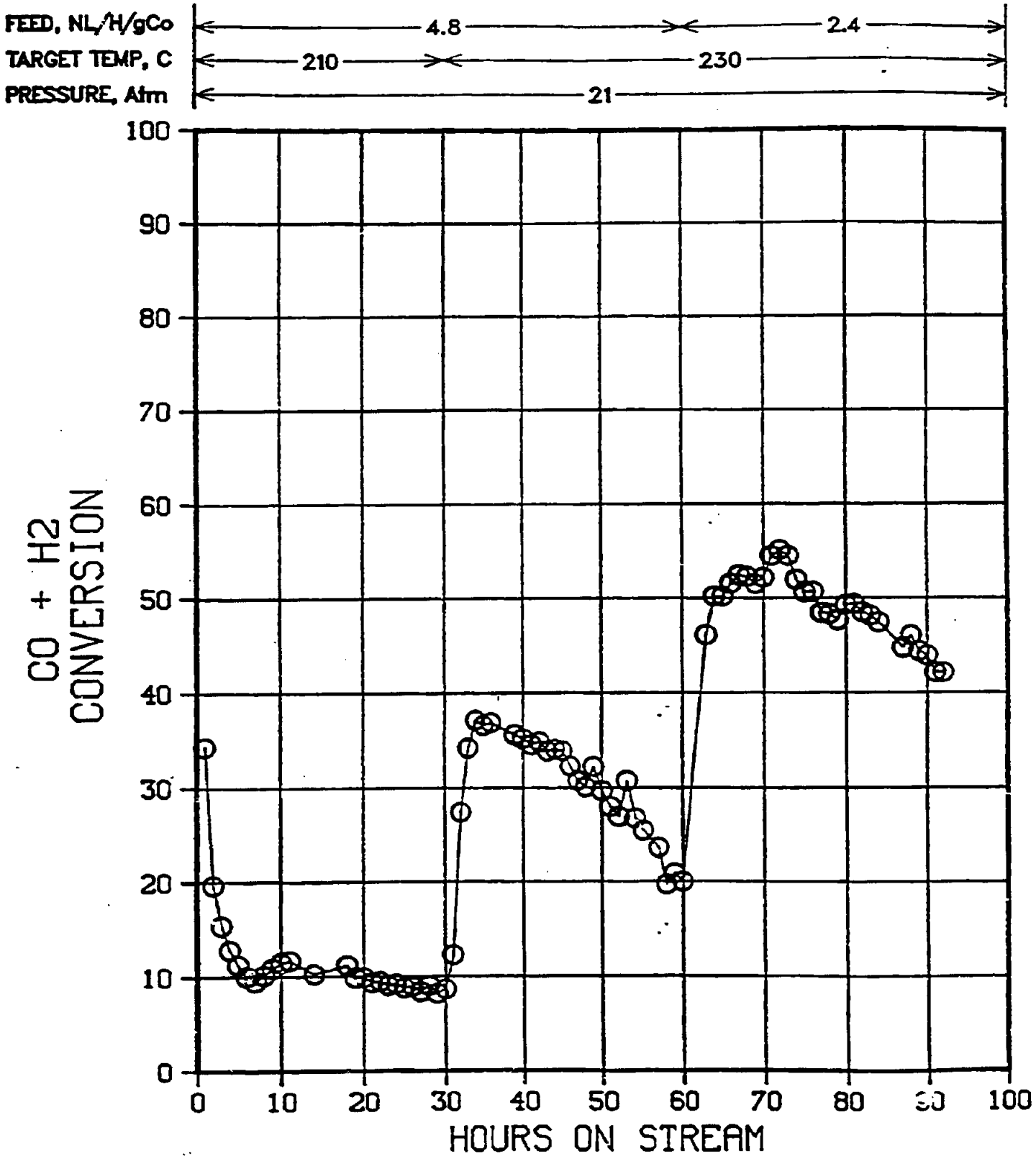


FIGURE 21

c/Ru CATALYST ON MgO (Prepared by Aqueous Impregnation)

PLT 700A RUN 69 H_2:CO (MOLAR)= 2.0

8.02 % Co , 0.841 % Ru

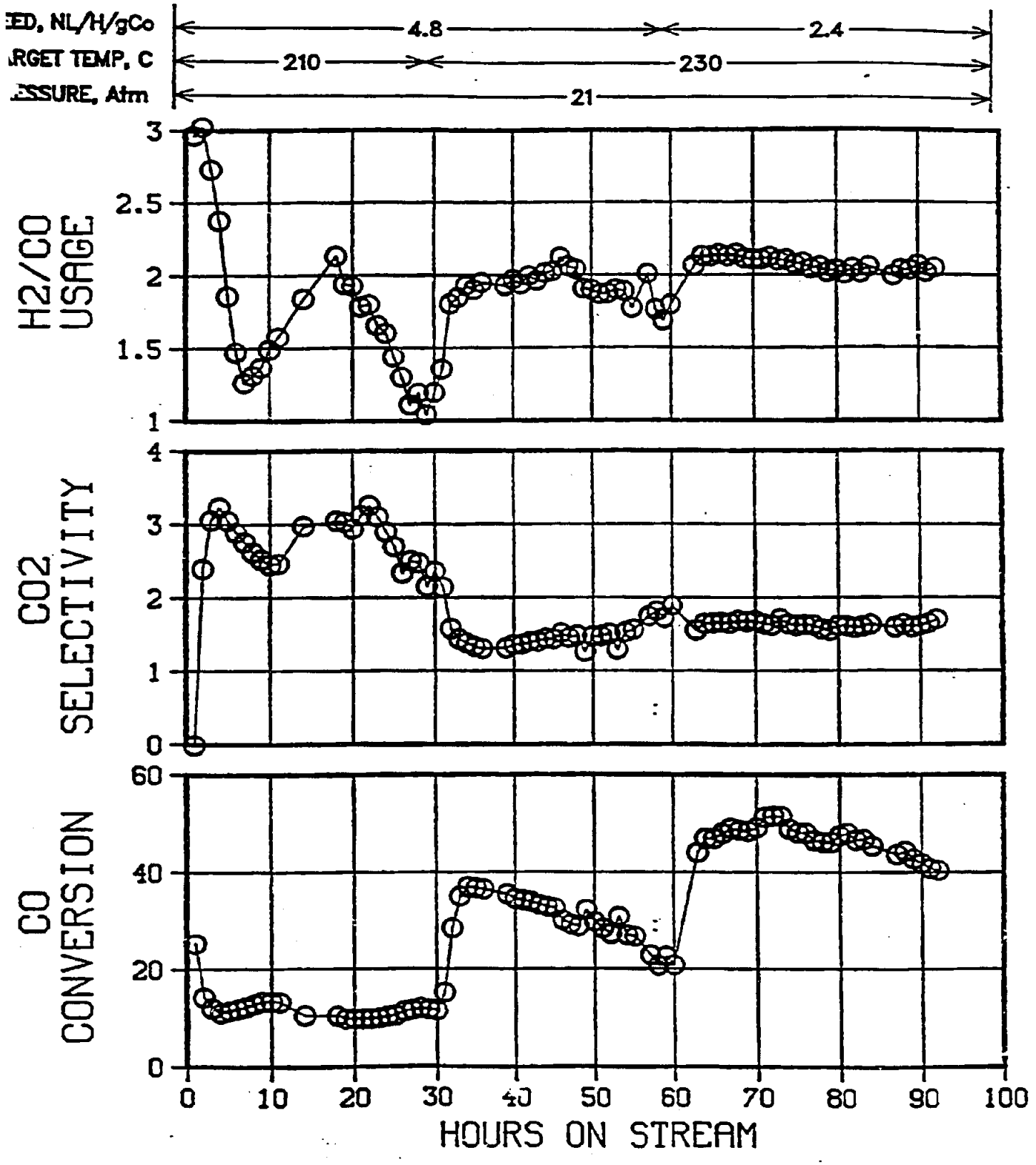


FIGURE 22

Co/Ru CATALYST ON MgO (Prepared by Aqueous Impregnation)

PLT 700A RUN 69 H_2:CO (MOLAR)= 2.0

8.02 % Co , 0.841 % Ru

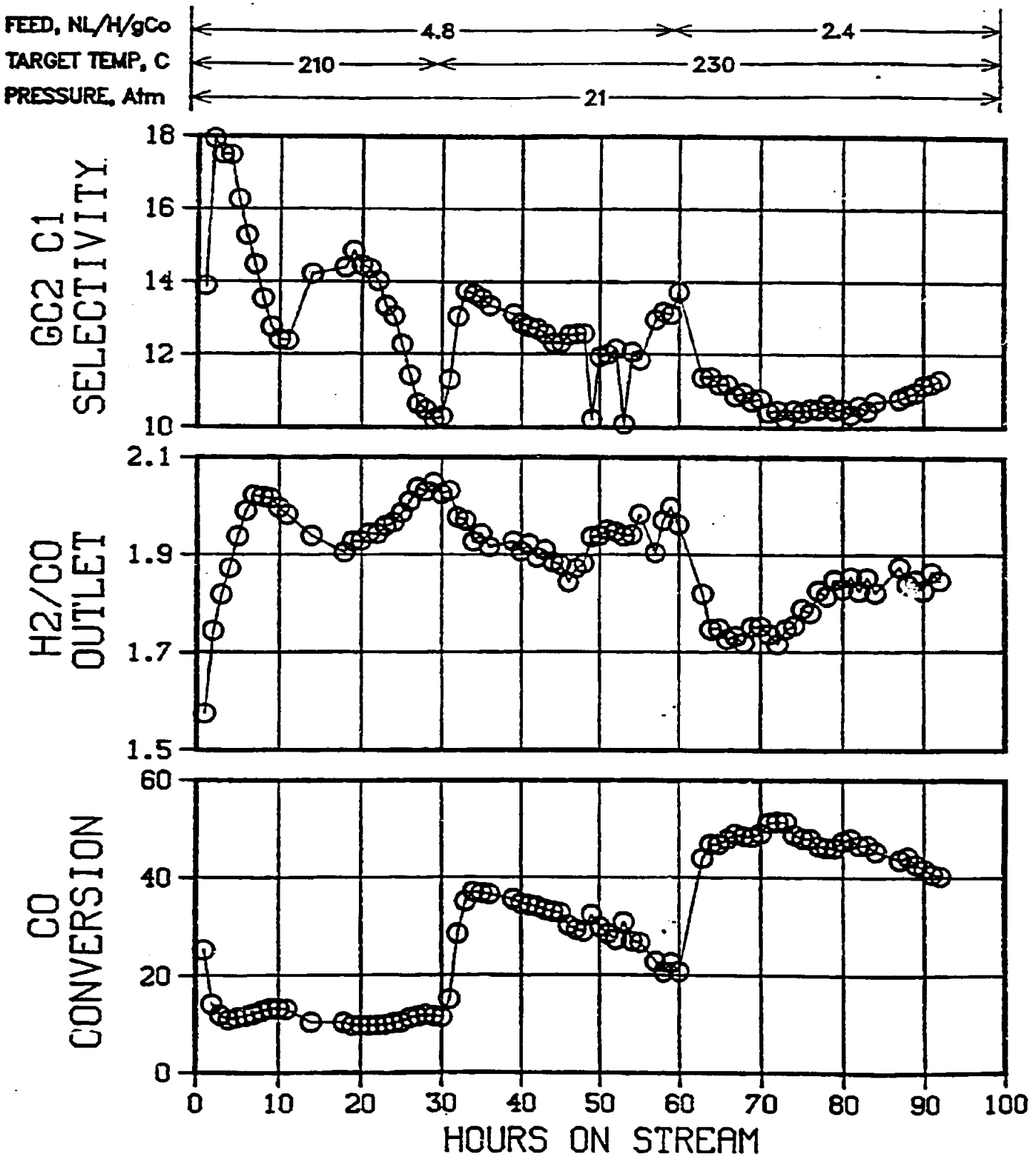
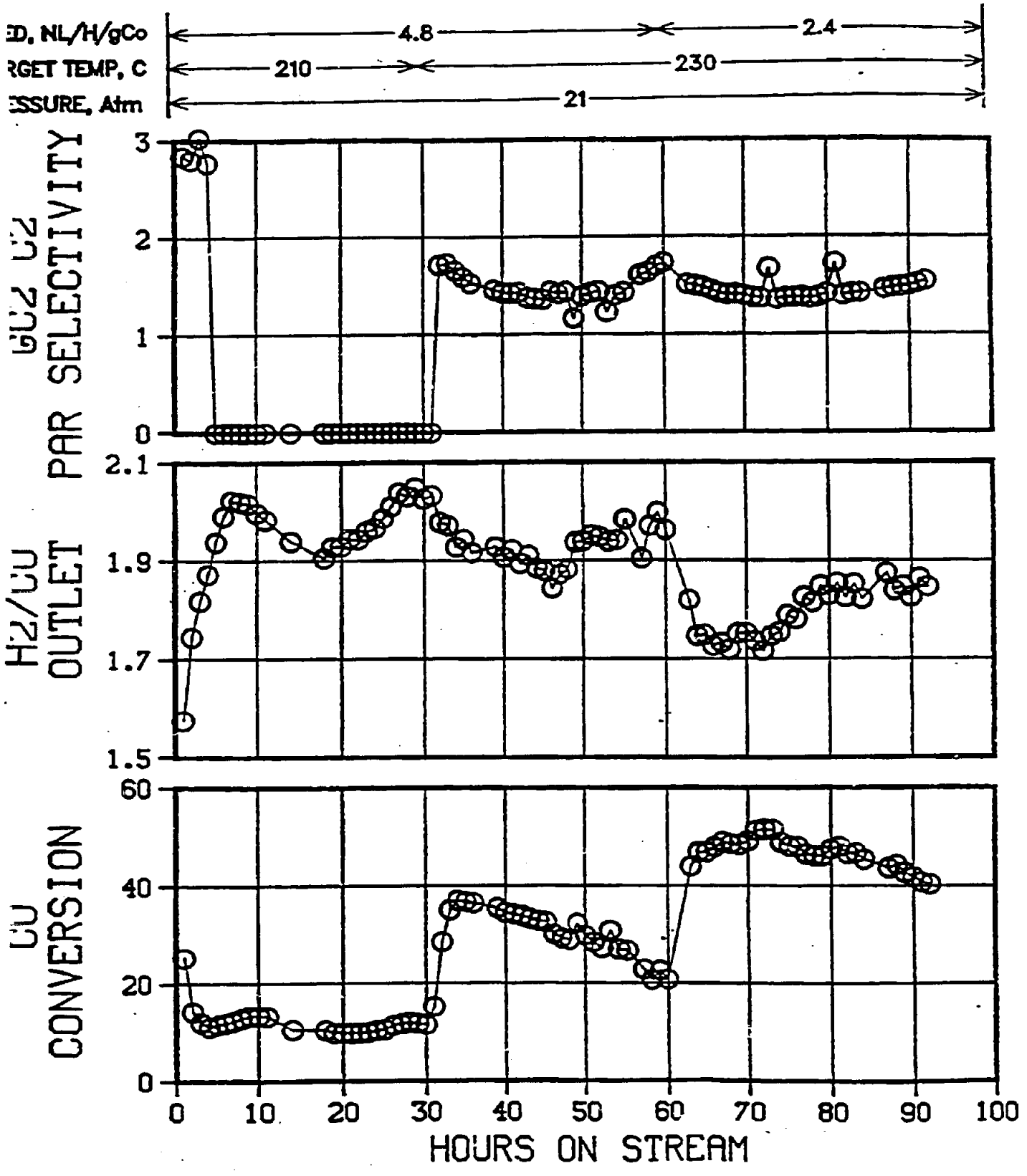


FIGURE 23

₃/Ru CATALYST ON MgO (Prepared by Aqueous Impregnation)

PLT 700A RUN 69 H_2:CO (MOLAR)= 2.0

8.02 % Co , 0.841 % Ru



[redacted]

FIGURE 24

Co/Ru CATALYST ON MgO (Prepared by Aqueous Impragnation)

PLT 700A RUN 69 H_2:CO (MOLAR)= 2.0

8.02 % Co , 0.841 % Ru