

FIGURE 1

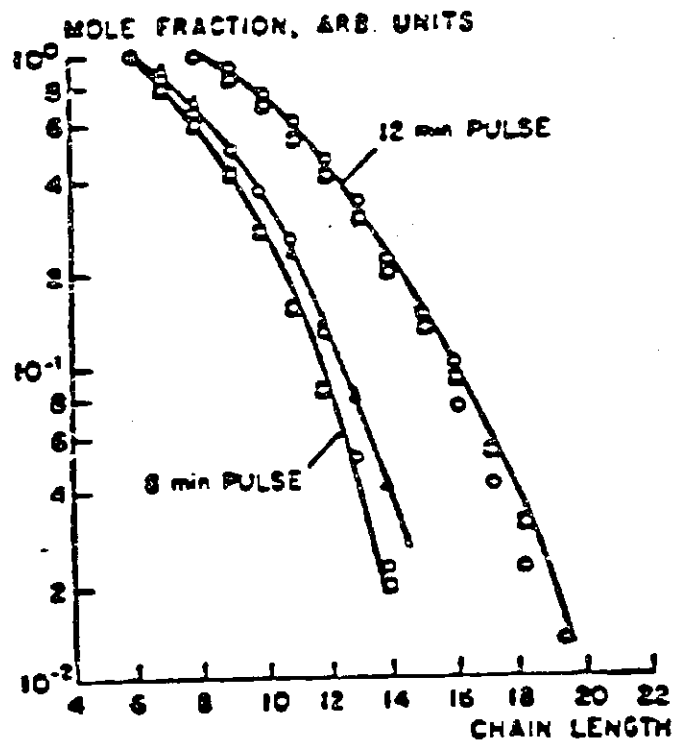


FIGURE 2

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. 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_3C	380	EXCELLENT
χ - Fe_3C	257	EXCELLENT
FeC	250	EXCELLENT
Ni_3C (hcp)	PARAMAGNETIC	INERT
NiC	220	SOME

FIGURE 3**Slurry Bubble Demonstrations**

Plants	Rheinprussen Plant	Mobil (Low Wax)	Mobil (High Wax)
Temp., °C	258	250	258
Pressure, psig	176	221	221
SV, NL/gF ₂ /hr	3,400	2,600	2,400
CO+H ₂ Conv., %	89.0	86.8	82.2
Product Yield, gHC/gF ₂ /hr	0.57	0.37	0.41

PLT 752

FISCHER-TROPSCH CATALYST PRECIPITATION

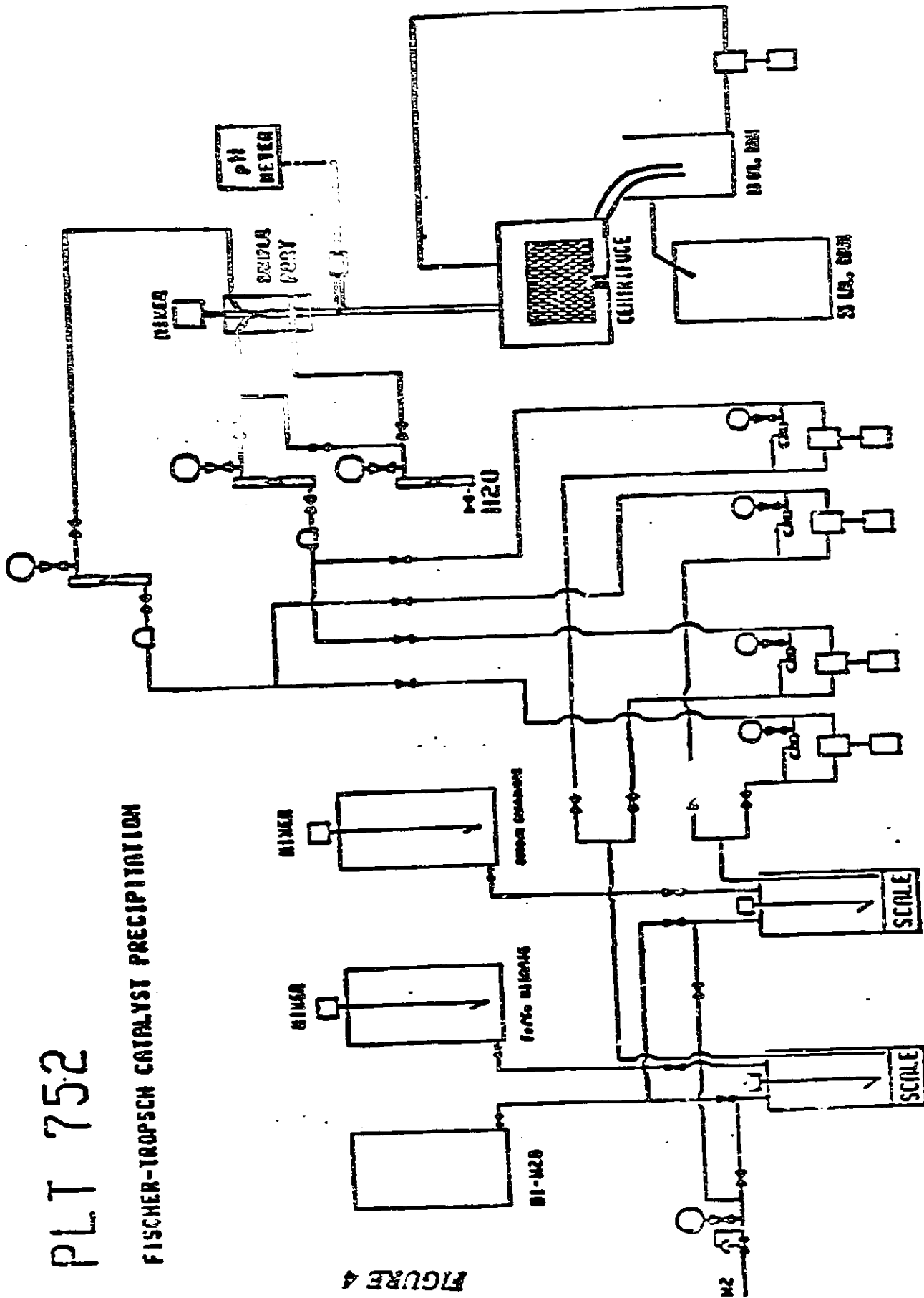


FIGURE 4

FIGURE 5
F-T CATALYST PREPARATION REACTOR

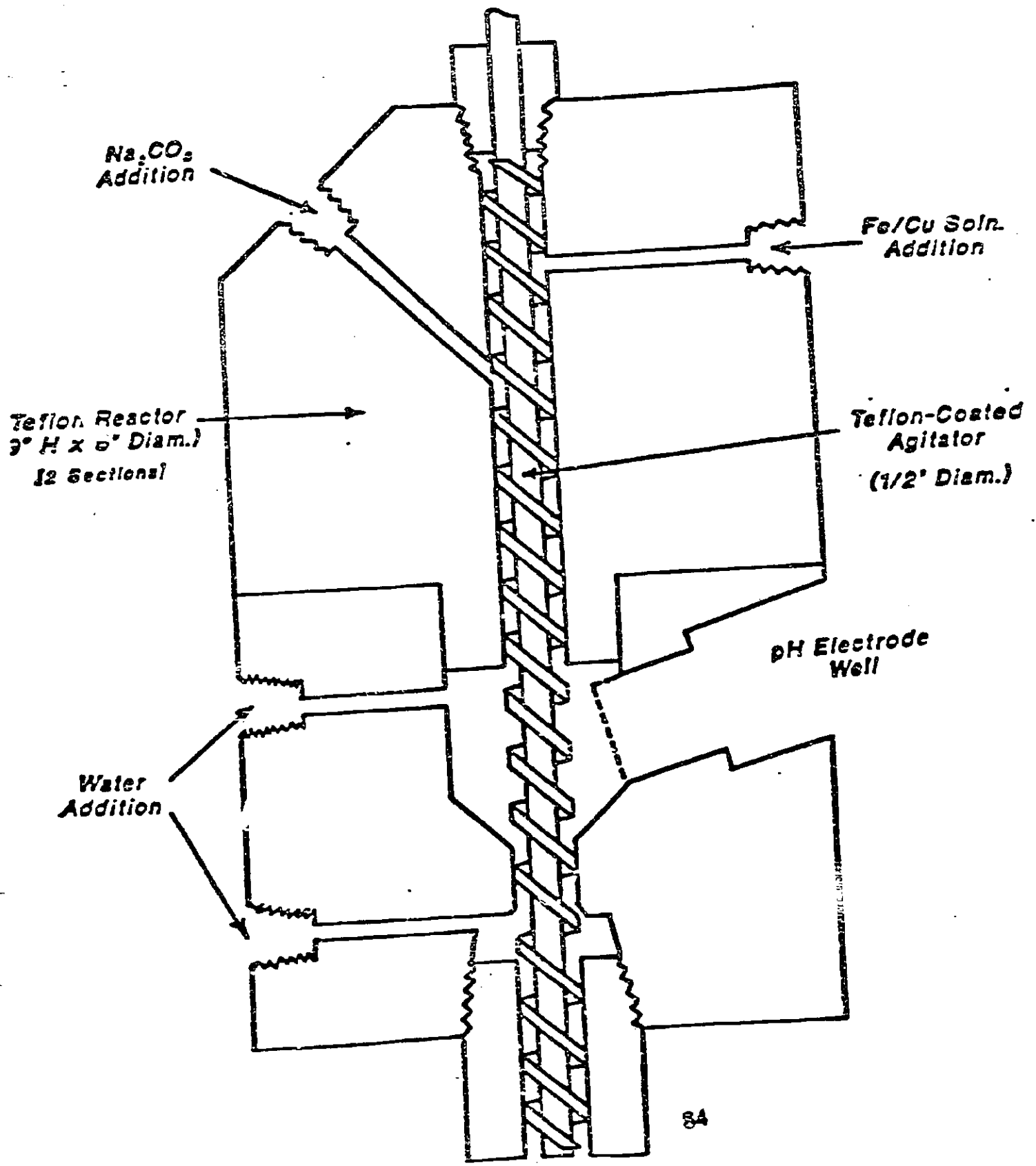


FIGURE 6
PHOTOGRAPHS OF PLANT 752

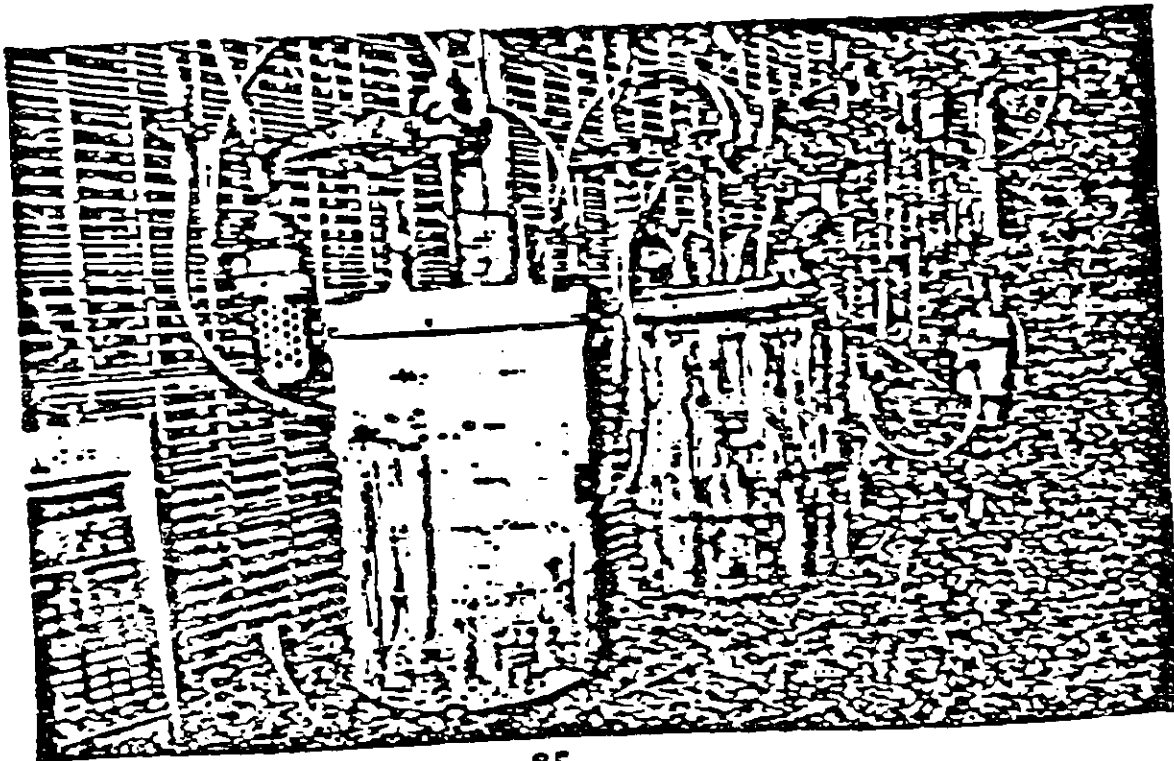
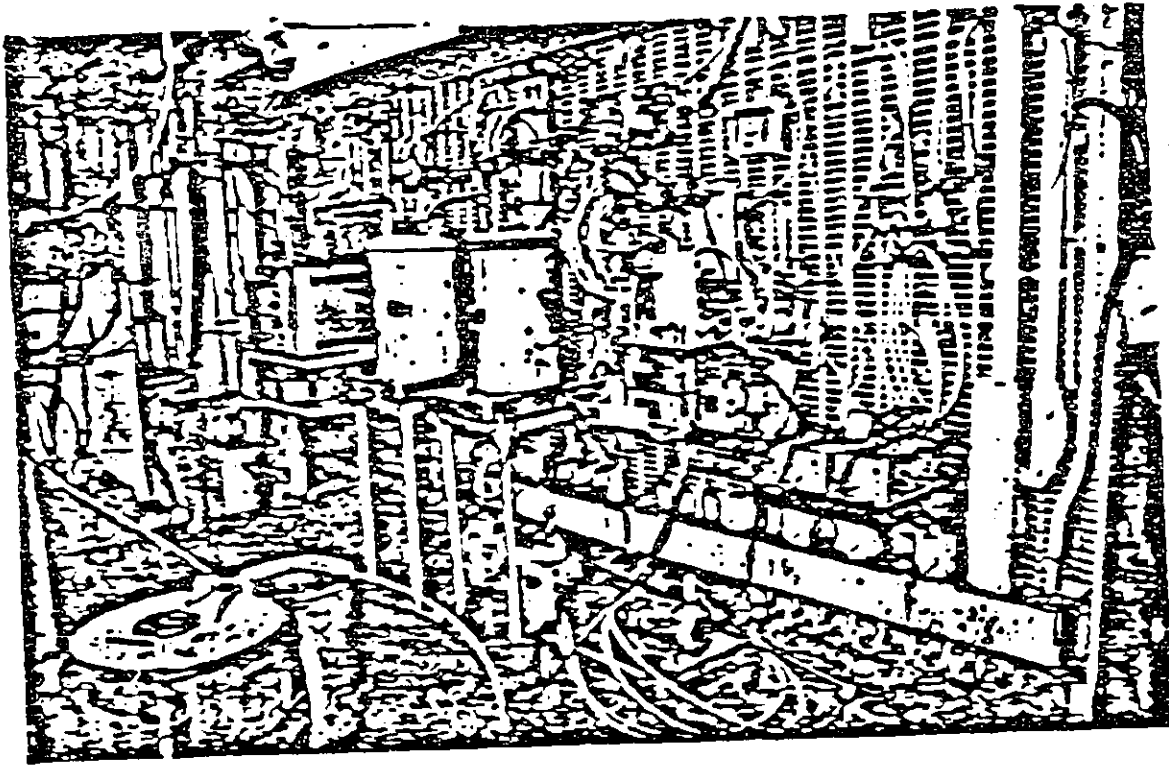


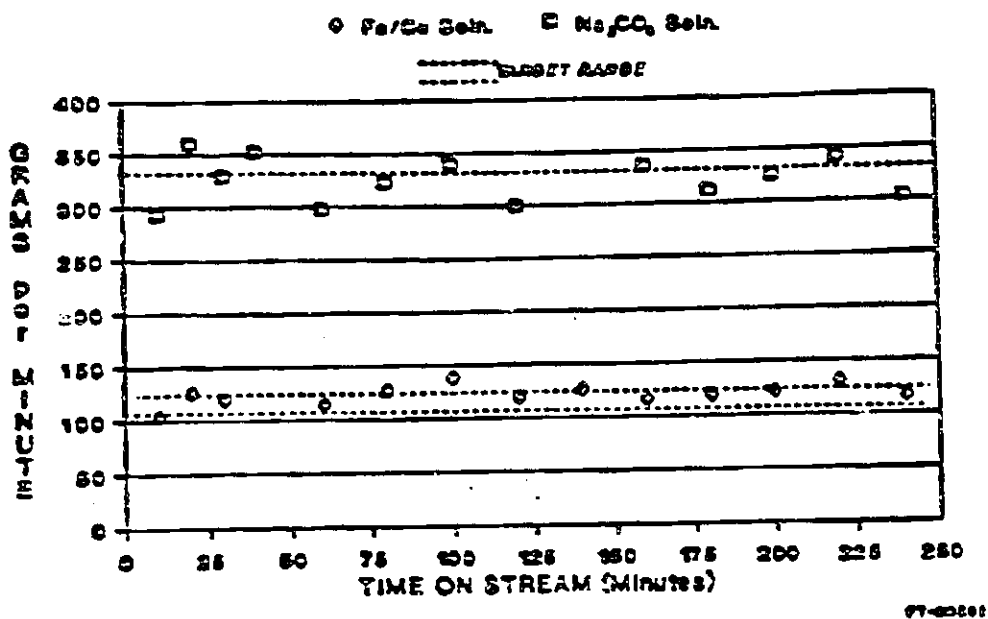
FIGURE 7

TYPICAL PREPARATION CONDITIONS
for PPTD. Fe CATALYSTS

- Fe/Na₂CO₃ Mole Ratio = 0.65
- Feed Solns.
 - Fe/Cu 5.0% Fe, 0.15% Cu (Nitrates)
 - Na₂CO₃ 5.3%
 - SiO₂ 0.1% (to Na₂CO₃ , as Na₂SiO₄)
- Feed Rates
 - Fe/Cu Soln. 115 g/min
 - Carbonate Soln. 315 g/min
 - Water 400 g/min
- 25°C, pH 5.0-5.5, 3-4 Hr Duration
- Production Rate ~500g Fe₂O₃ /Hr
 - Pptn. Zone Solids ~2 Wt%
 - Outlet Solids ~1 Wt%

FIGURE 8

F-T CATALYST PLANT 752
 RUN 32 - FEED RATES



F-T CATALYST PLANT 752
 RUN 32 - pH READINGS

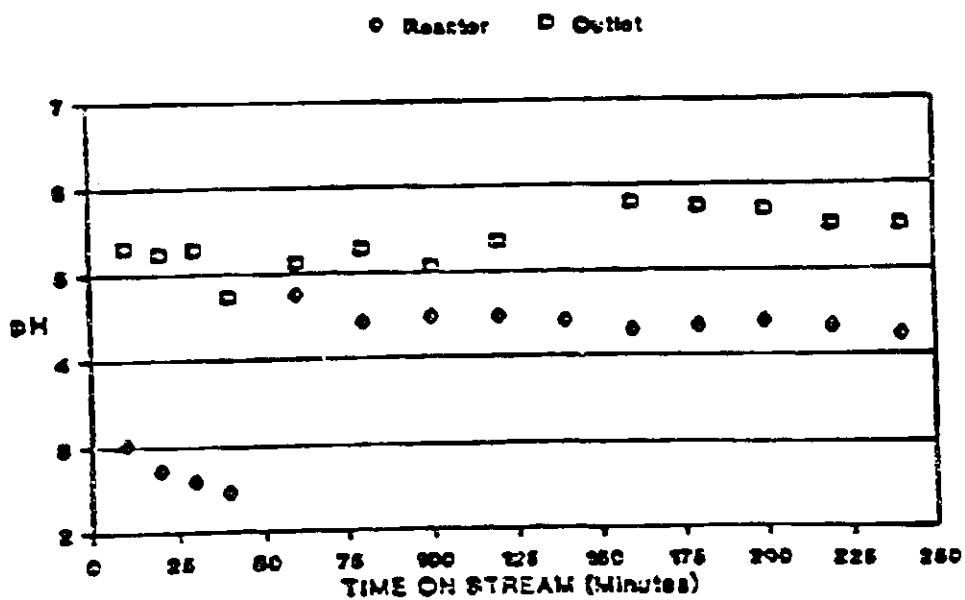
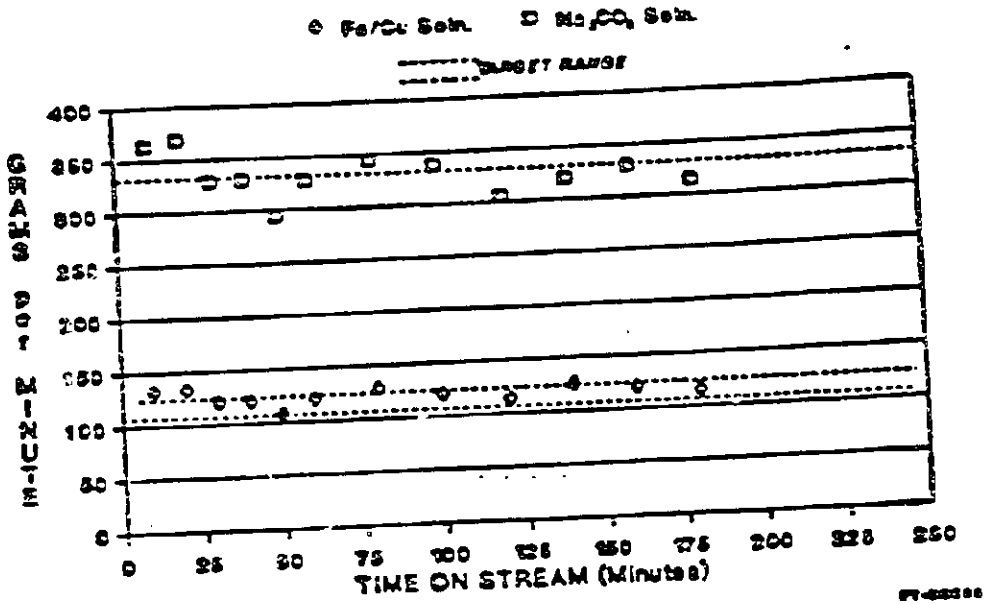


FIGURE 9

F-T CATALYST PLANT 752
 RUN 33 - FEED RATES



F-T CATALYST PLANT 752
 RUN 33 - pH READINGS

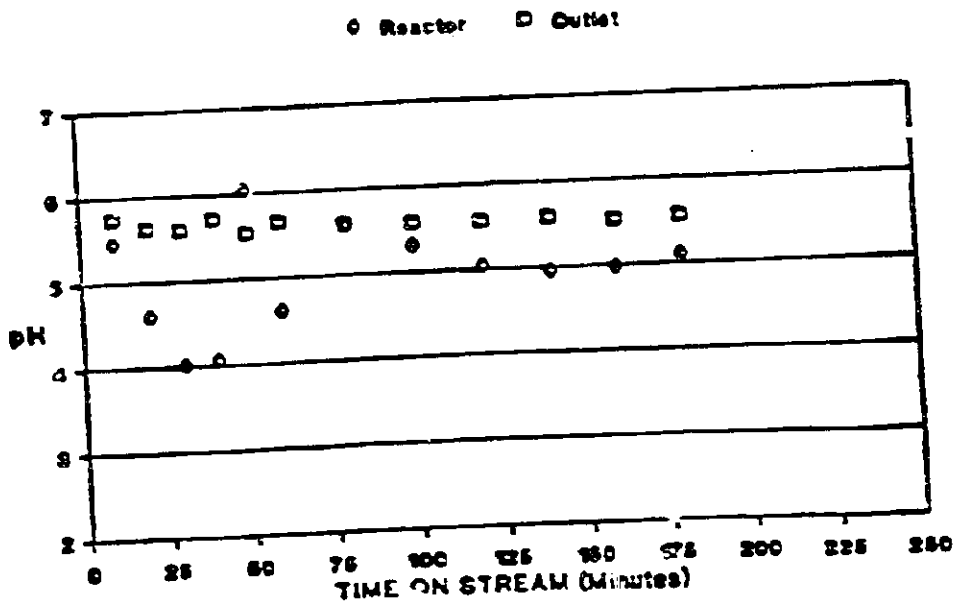
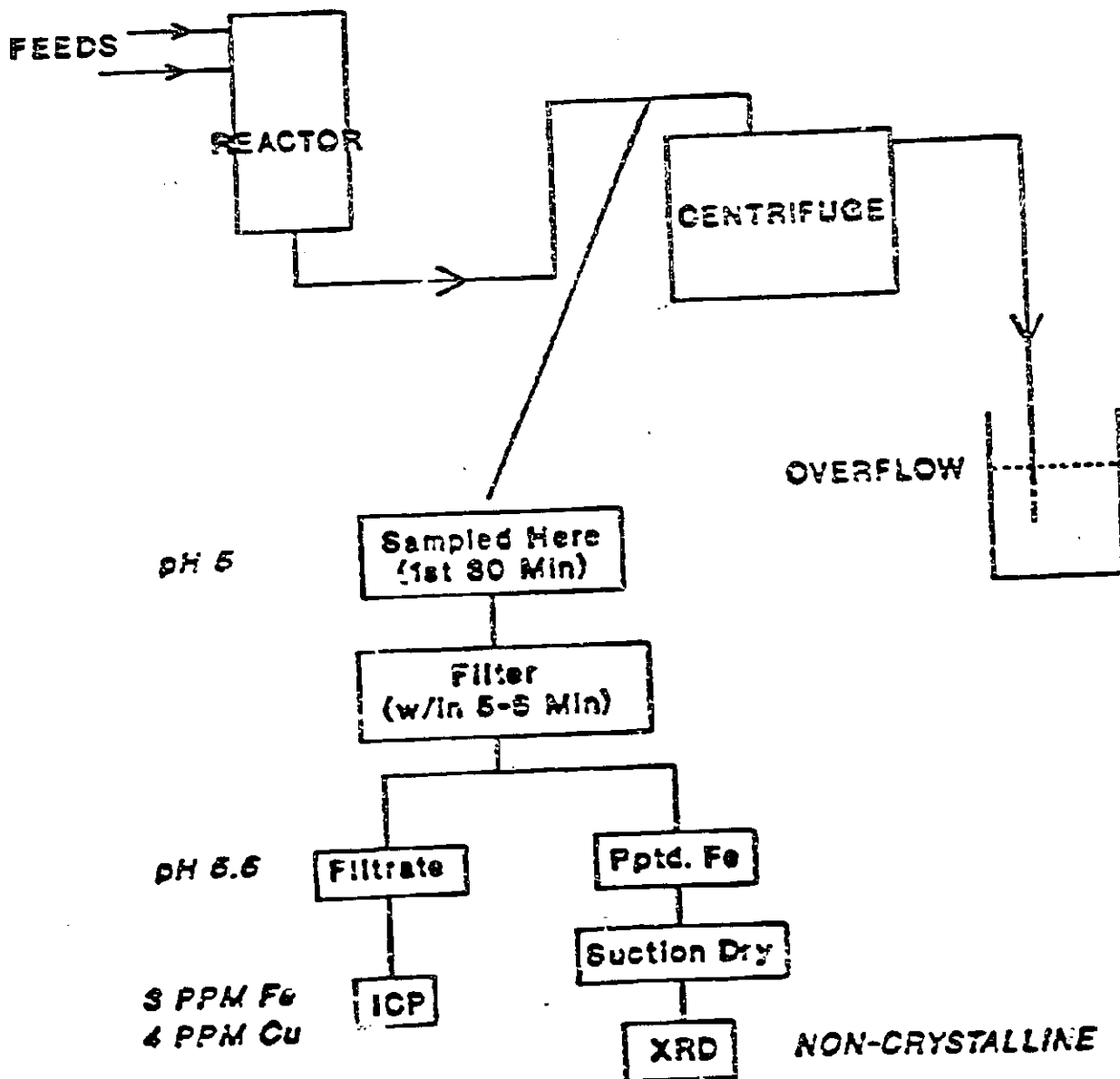


FIGURE 10

PLANT 752 PRECIPITATION STEP Fe, Cu, Si WEIGHT BALANCE

RUN #	30	32	33
<u>FEED ANALYSIS</u>			
Fe/Cu SOLUTION Fe WT %	5.04	4.47	5.07
Fe/Cu SOLUTION Cu WT %	0.17	0.159	0.167
Na SOLUTION Na WT%	NA	2.35	2.44
Na SOLUTION Si PPM	-	-	532
<u>WEIGHTS FED</u>			
Fe/Cu SOLUTION, g	17,444	29,664	21,819
Na SOLUTION, g	NA	NA	55785
Fe, g	879.18	1340.28	1106.22
Cu, g	29.65	47.67	36.44
Si, g	-	-	31.3
<u>WEIGHT RECOVERED</u> (AS DRIED SOLID)			
DIRECT FILTERED, g	827.04	880.50	898.76
LOI, WT%	16.56	12.91	14.28
Fe, WT% VF	66.30	65.70	64.80
Cu, WT% VF	2.26	2.27	2.15
Si, WT% VF	.20	-	1.35
OVERFLOW FILTERED, g	414.92	1205.30	903.20
LOI, WT%	16.81	14.37	13.89
Fe, WT% VF	66.00	66.20	64.60
Cu, WT% VF	2.27	2.39	2.19
Si, WT% VF	.12	-	1.74
SUM Fe, g	625.06	1187.05	1001.65
SUM Cu, g	23.42	42.07	33.60
SUM Si, g	0.18	-	23.9
<u>WEIGHT BALANCE</u>			
Fe, WT%	77.92	88.57	80.55
Cu, WT%	78.98	88.25	92.20
Si, WT%	-	-	76.4

FIGURE II
F-T PPTD. Fe CATALYST
PII. 752/Run 32



9-NOV-92 08:38:17

FILE SC01F1USER1:92A919.DD CREATED ON 7-NOV-1992

INTENSITY (CPS) *100

2THETA STEP TIME (SEC)	= 10.00
2THETA STEP SIZE (DEG)	= 0.040
INSTRUMENT	5

Non-crystalline material

FIGURE 12

Pt. 752, Run 32
Initial Ppt.

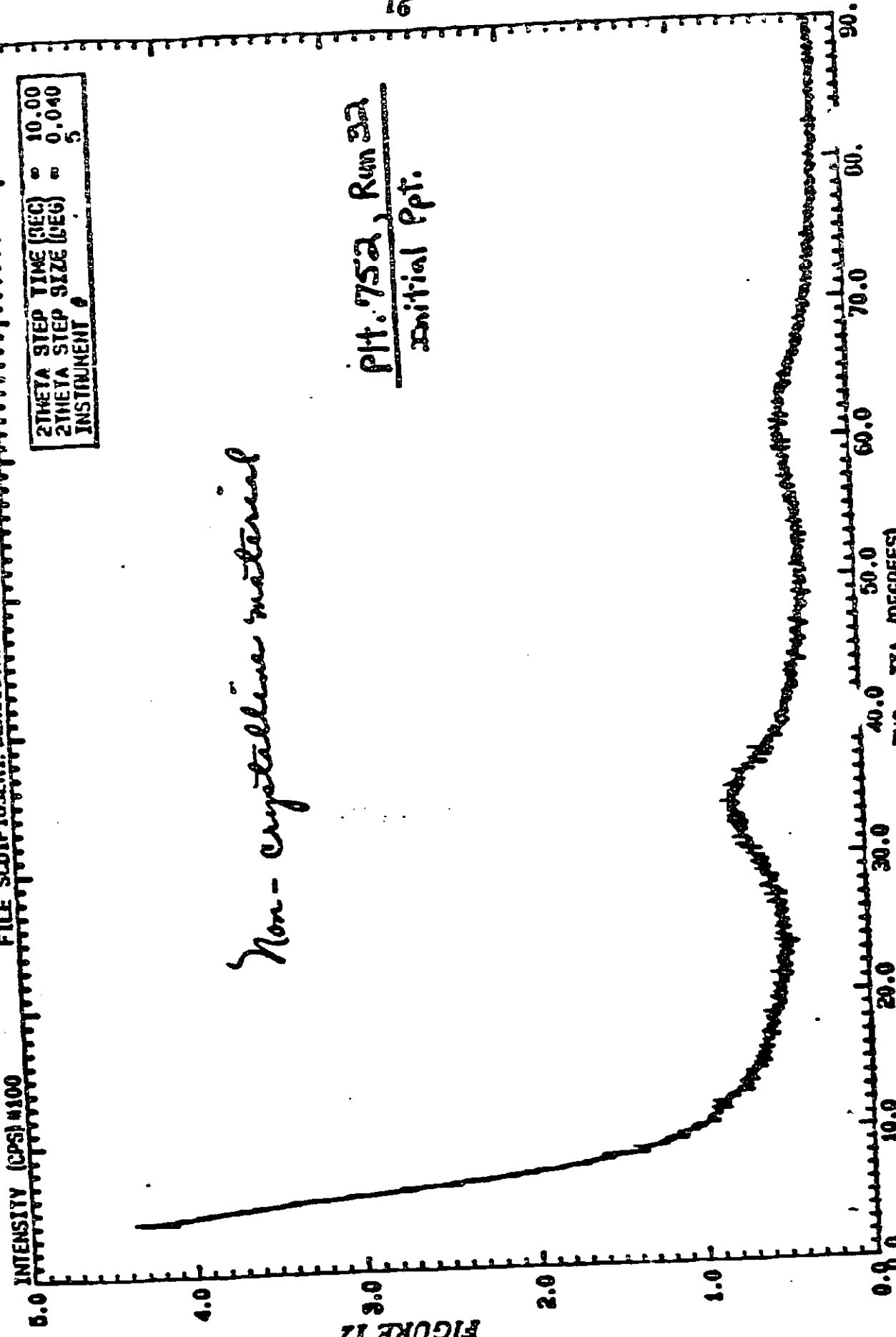


FIGURE 13

WORK-UP OF PLT 752 PRECIPITATED CATALYST

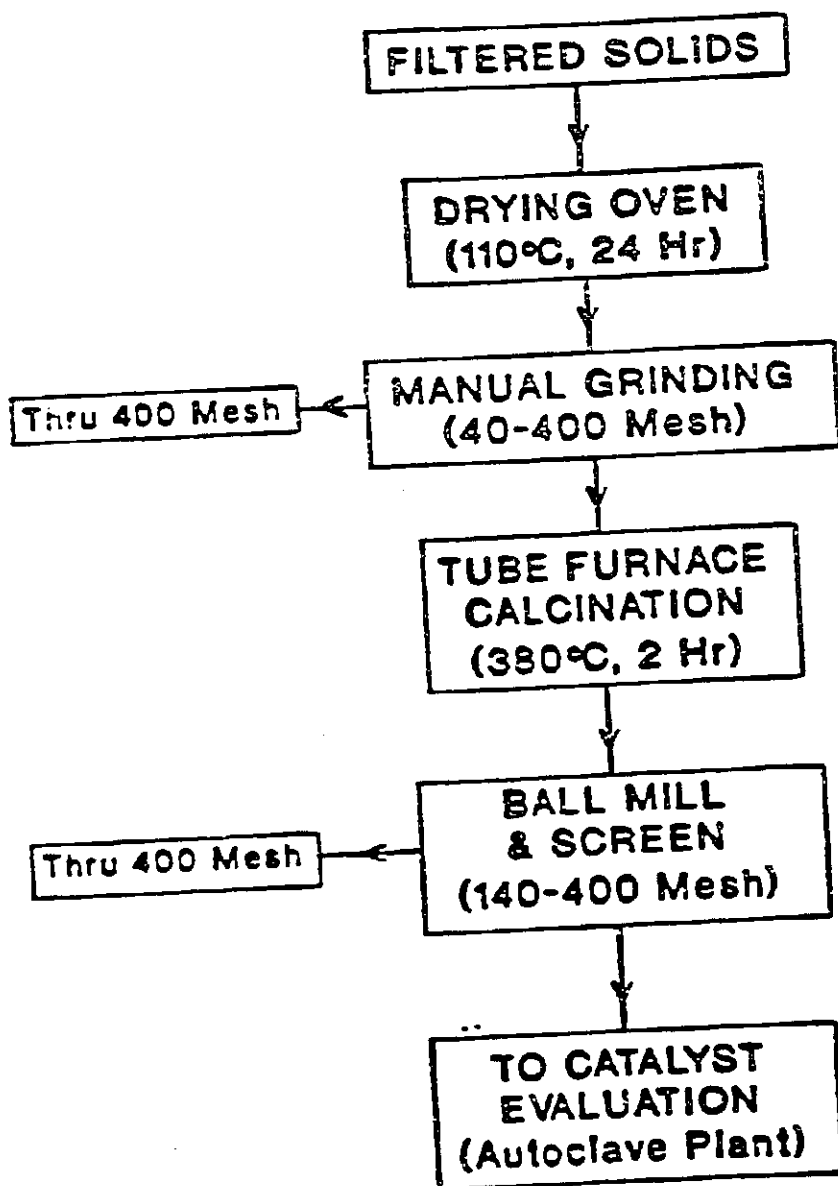


FIGURE 14

F-T Fe CATALYST YIELD
 % Yield After Grinding and Sizing,
 On Calcined Catalyst Basis

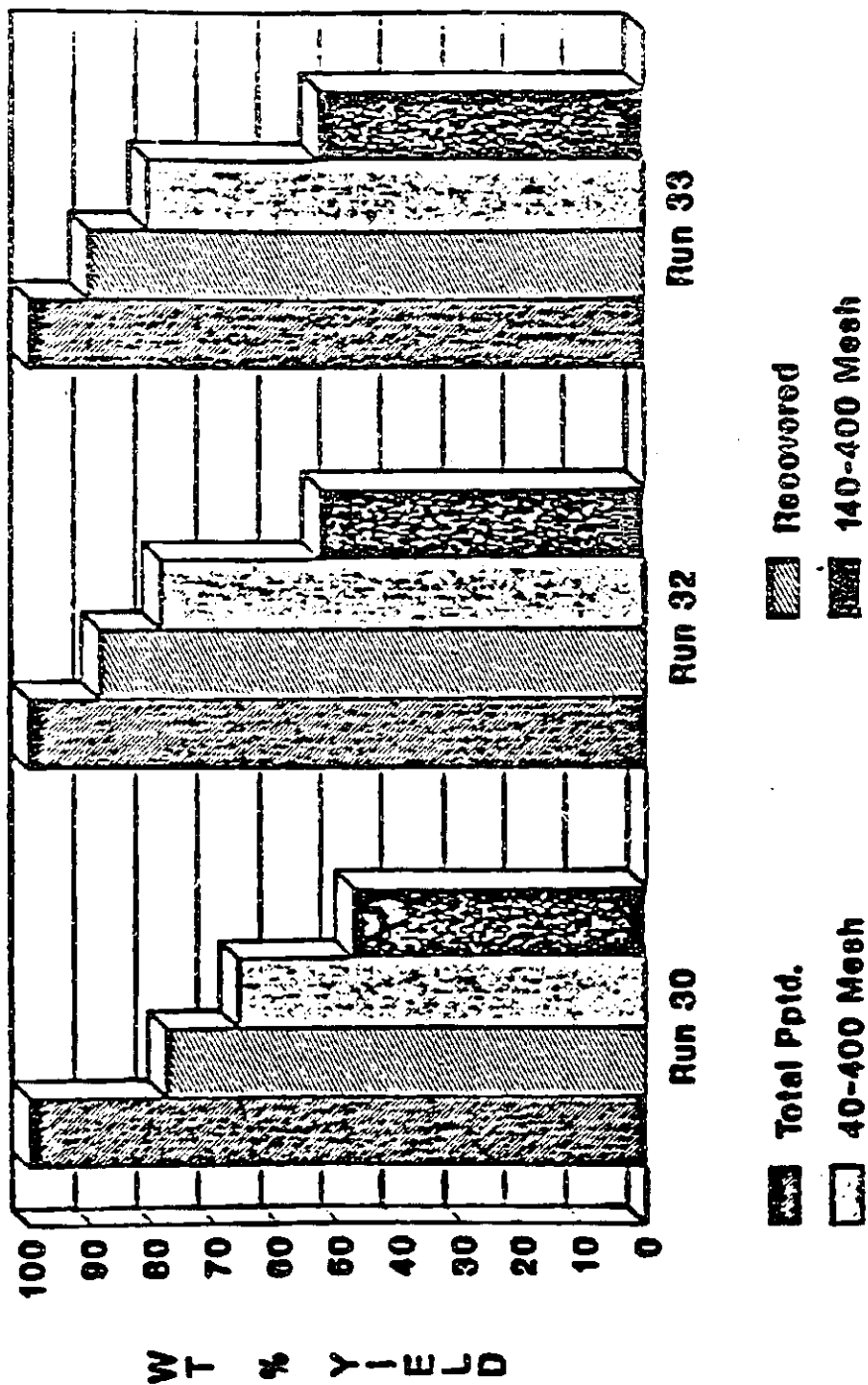


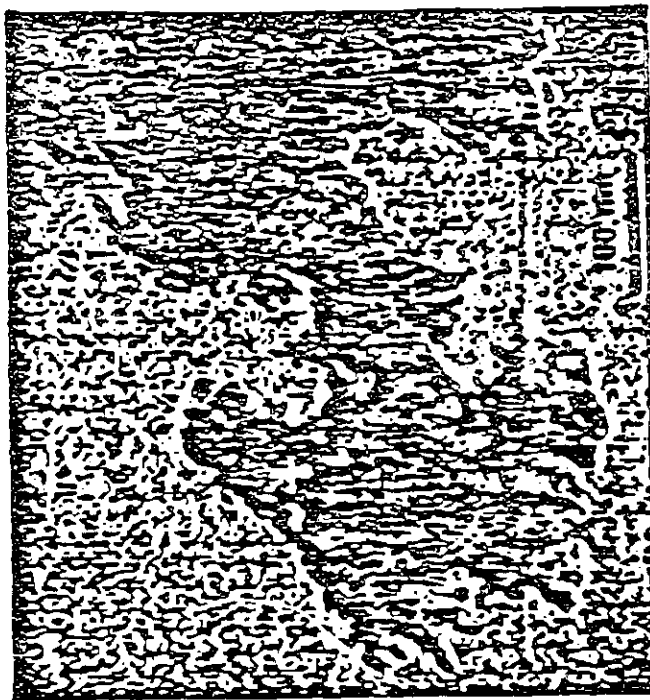
FIGURE 15

CATALYST PREPARATION STUDY
 PHYSICAL PROPERTIES

Fe/Cu OXIDES FROM CATALYST PREPARATION PLANT	METALS, WT%			Na, ppm	BET	
	Fe	Cu	Si		SA, m ² /g	PV, cc/g
RUN 30, DIRECT	65.5	2.1	N/A	47	97	0.47
RUN 30, OVERFLOW	66.0	2.3	N/A	<100	108	0.44
RUN 32, DIRECT	64.5	2.2	N/A	19	133	0.30
RUN 32, OVERFLOW	64.3	2.3	N/A	<100	157	0.35
RUN 33, DIRECT	62.5	2.1	1.3	31	244	0.29
RUN 33, OVERFLOW	60.0	2.1	1.3	<100	257	0.29

FIGURE 16

STEM ANALYSIS: RUN 30



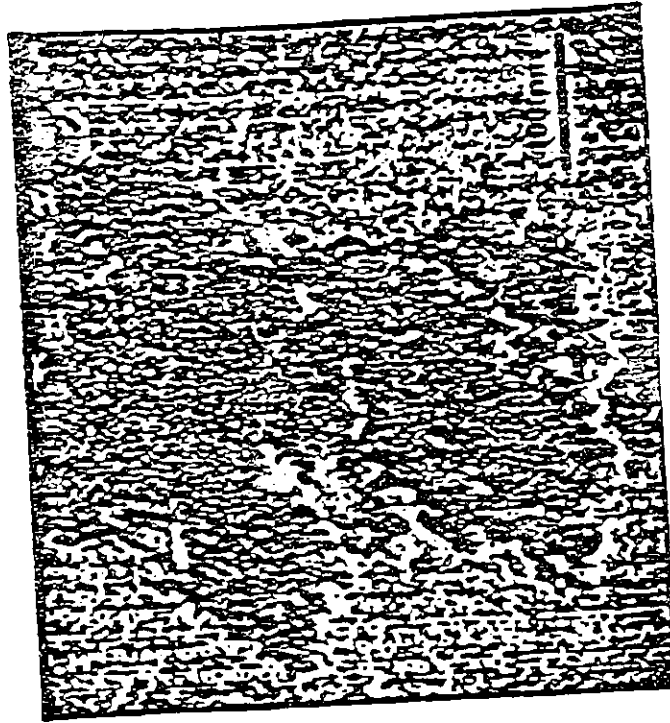
OVERFLOW FILTERED



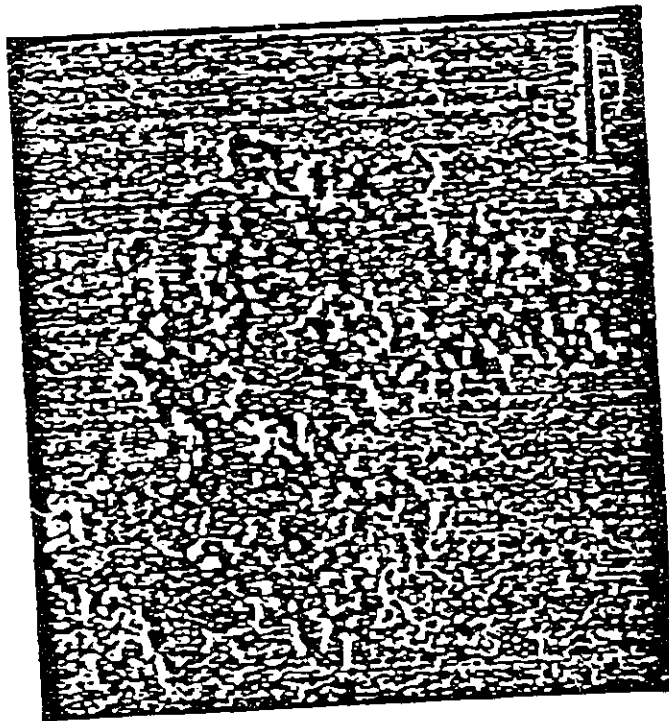
DIRECT FILTERED

FIGURE 17

STEM ANALYSIS: RUN 32



OVERFLOW FILTERED



DIRECT FILTERED

RUN 11 6753 119

INTENSITY (CPS) #100

FILE XRD6FX1: 938538.X1 CREATED ON 19-AUG-1993

90-AUG-93 14:21:17

2THETA STEP TIME (SEC) = 2.02
2THETA STEP SIZE (DEG) = 0.040
INSTRUMENT # 4

- A' (1) Fe_5Ca #20-500
- X (4) $Fe_{25}C$ #96-1248
- (2) Fe_2C #17-0977 (possible)
- (1) Fe_2C #6-1249 (possible)
- (5) Fe_2C 6-686 possible
of Fe_2C #17-939
- X (2) h. h_{001} #10-1115
- (1) Fe 6-696 (possible)
- (8) Fe_2C 3-619 (possible)
- (1) Fe_2C 31-712 (possible)

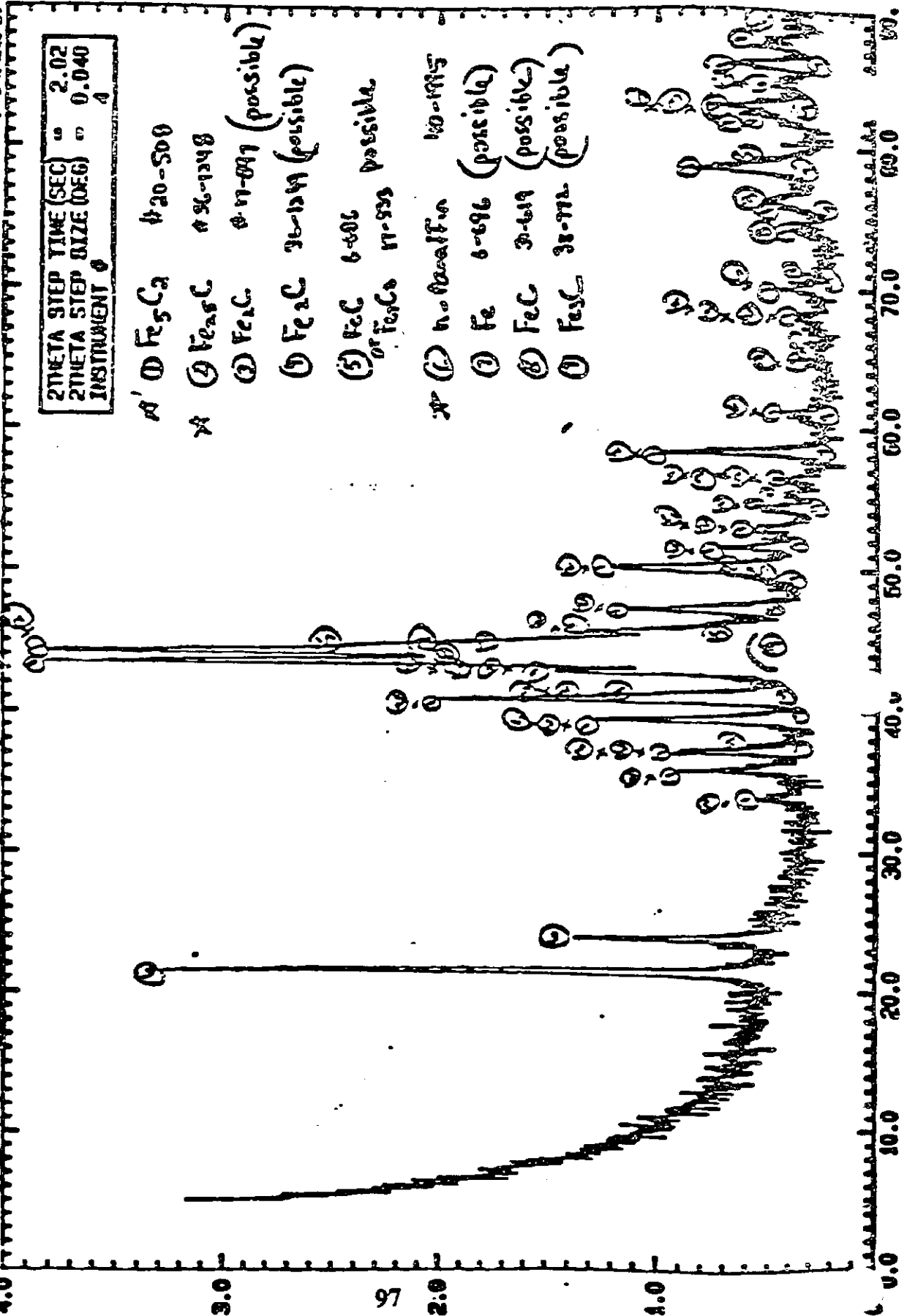


FIGURE 18

DATA FROM AUTOMATIC

FIGURE 19

**THE FOUR POTASSIUM LAURATE RUNS:
PERFORMANCE AT STANDARD CONDITIONS**

RUN NO.	42	43	45	49
MODE OF K ADDITION	SOLID K LAURATE		K LAURATE IN SOLUTION	K ₂ CO ₃ + K LAURATE IN SOLUTION
TOTAL K, g/100 g Fe	3.6	2.1	3.7	3.0
CO CONVERSION, %	70 ^a	73	70 ^b	70
SELECTIVITIES				
C ₁	2.5	4.1	4.5	2.7
C ₂	0.8	1.1	1.9	0.7
C ₃	2.5	2.7	2.9	2.1
C ₄	0.6	1.0	1.1	0.6
C ₅	3.9	4.7	5.5	3.8
C ₆	0.6	1.0	1.1	0.6
C ₇	2.8	3.4	3.9	2.8
OLEFIN/PARAFFIN RATIO				
C ₂ /C ₃	3.1	2.5	1.5	3.0
C ₃ /C ₄	6.5	4.7	5.0	6.3
C ₄ /C ₅	4.7	3.4	3.5	4.7

1. SPACE VELOCITY WAS LOWERED FROM STANDARD 2.4 NL/HR • G Fe.
2. TEMPERATURE WAS INCREASED TO 290° C FROM STANDARD 245° C.

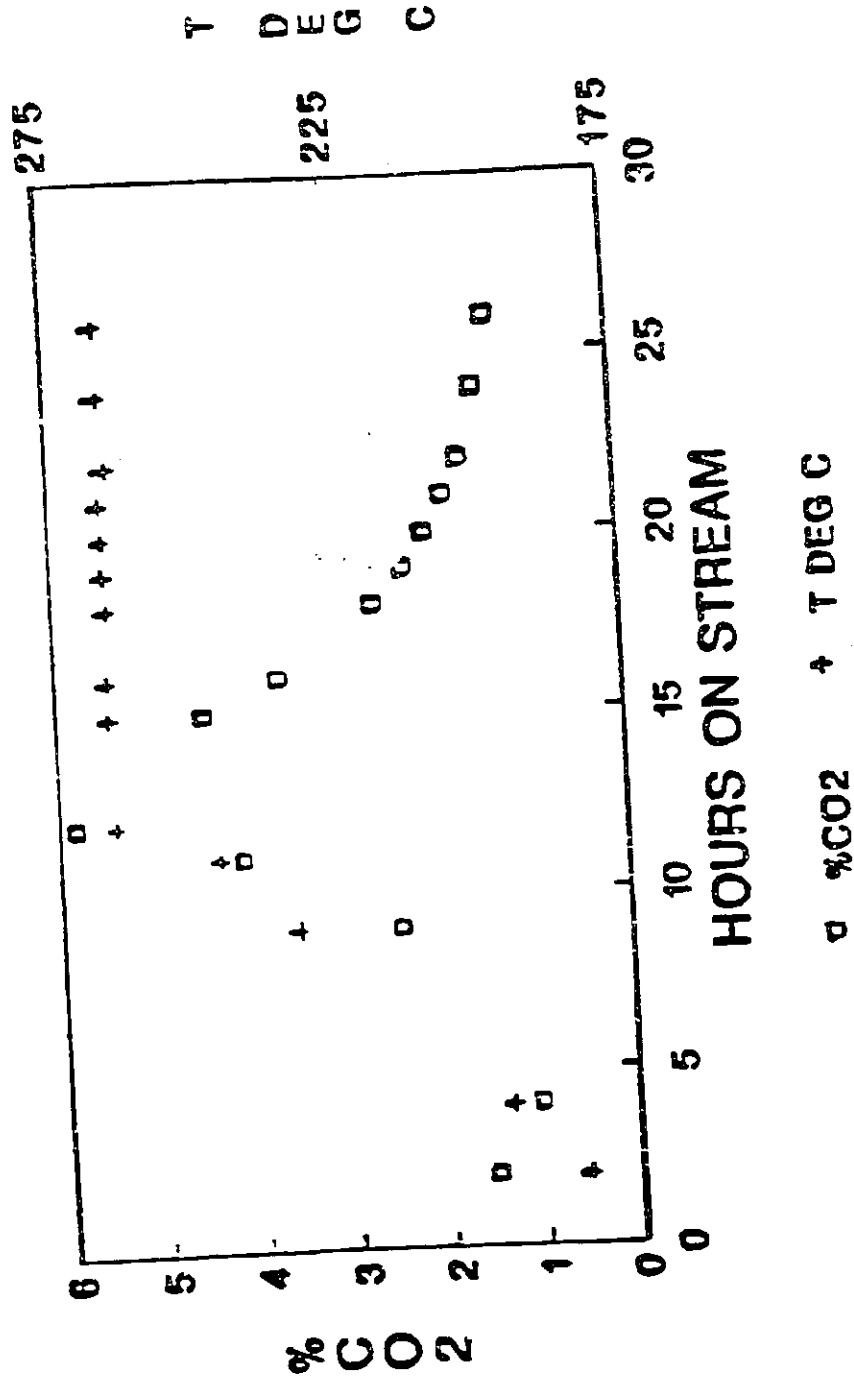
FIGURE 20

METAL OXIDE USED FOR RUNS WITH CARBON MONOXIDE ACTIVATION

OXIDE PREP FLT NO.	AUTOCLAVE FLT RUN NO.	MESH RANGE	METALS, WT% (AS REC'D)			BET	
			Fe	Cu	Si	SA, m ² /g	PV, cc/g
39	71	-140 + 400	55.6	3.12	1.25	204	30
	72						

PLANT 701 RUN 71 CO2 DURING ACTIVATION

FIGURE 21



PLANT 701 RUN 72 CO2 DURING ACTIVATION

FIGURE 22

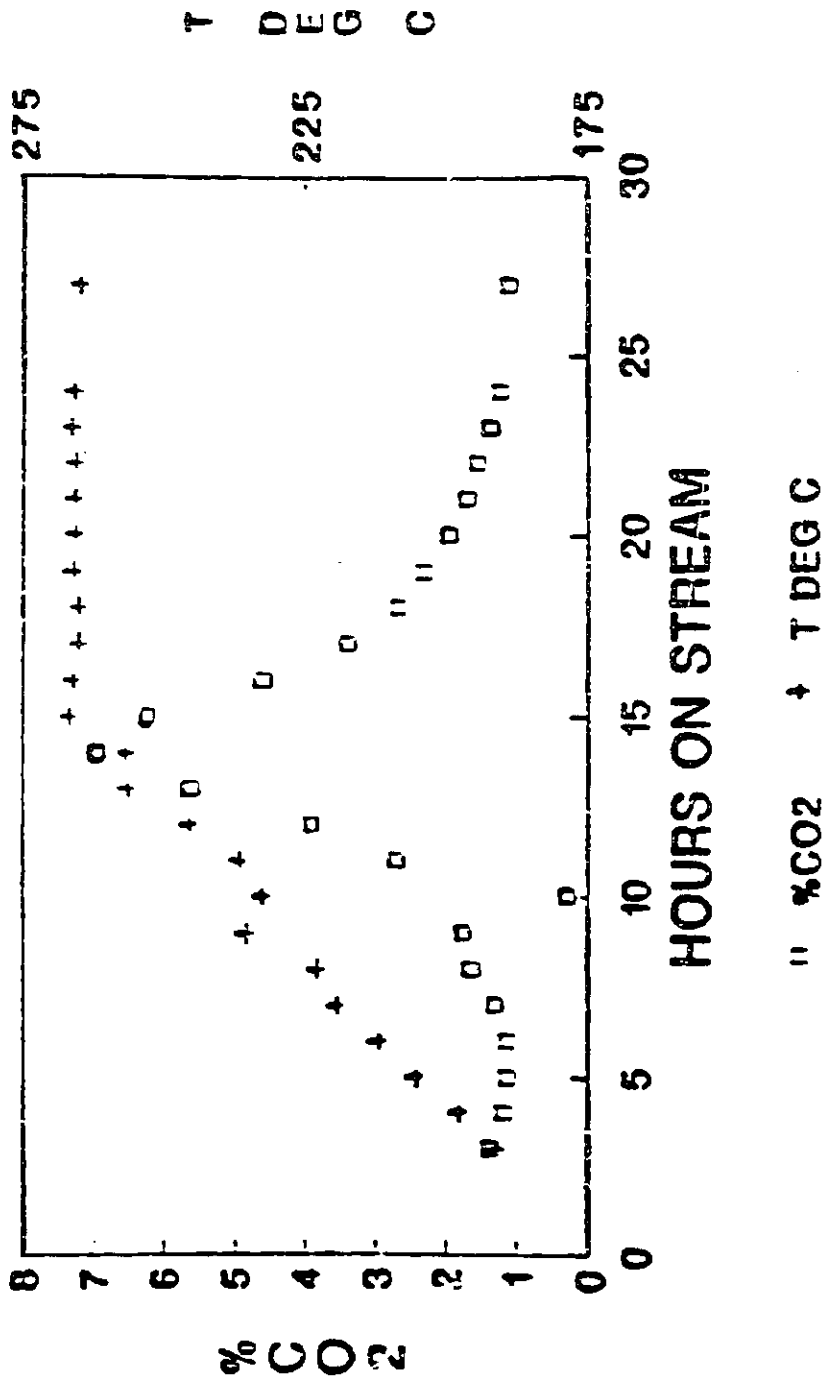
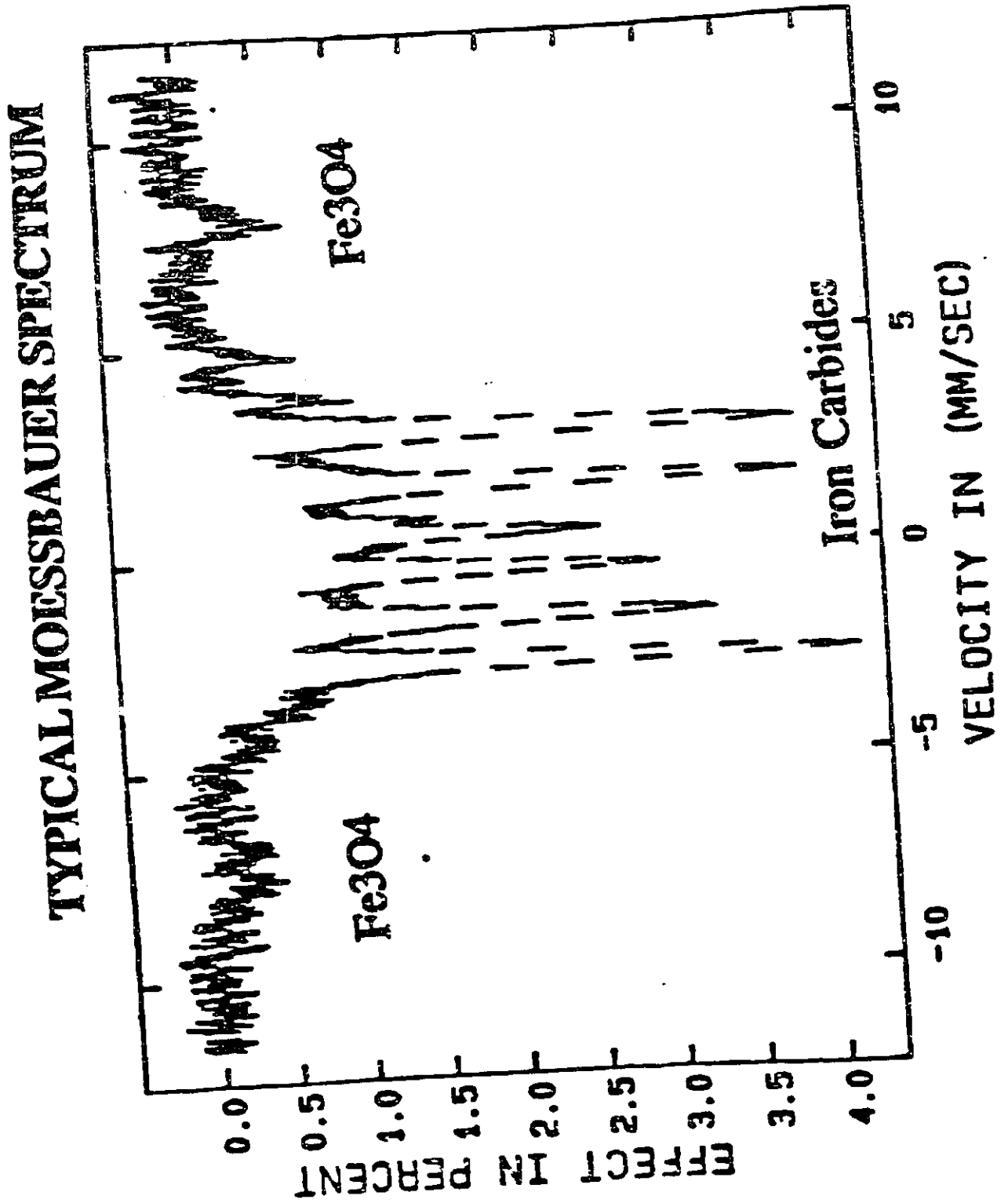


FIGURE 23



Moessbauer of Fischer Tropsch Catalysts

Composition vs Hour on Stream Run 32

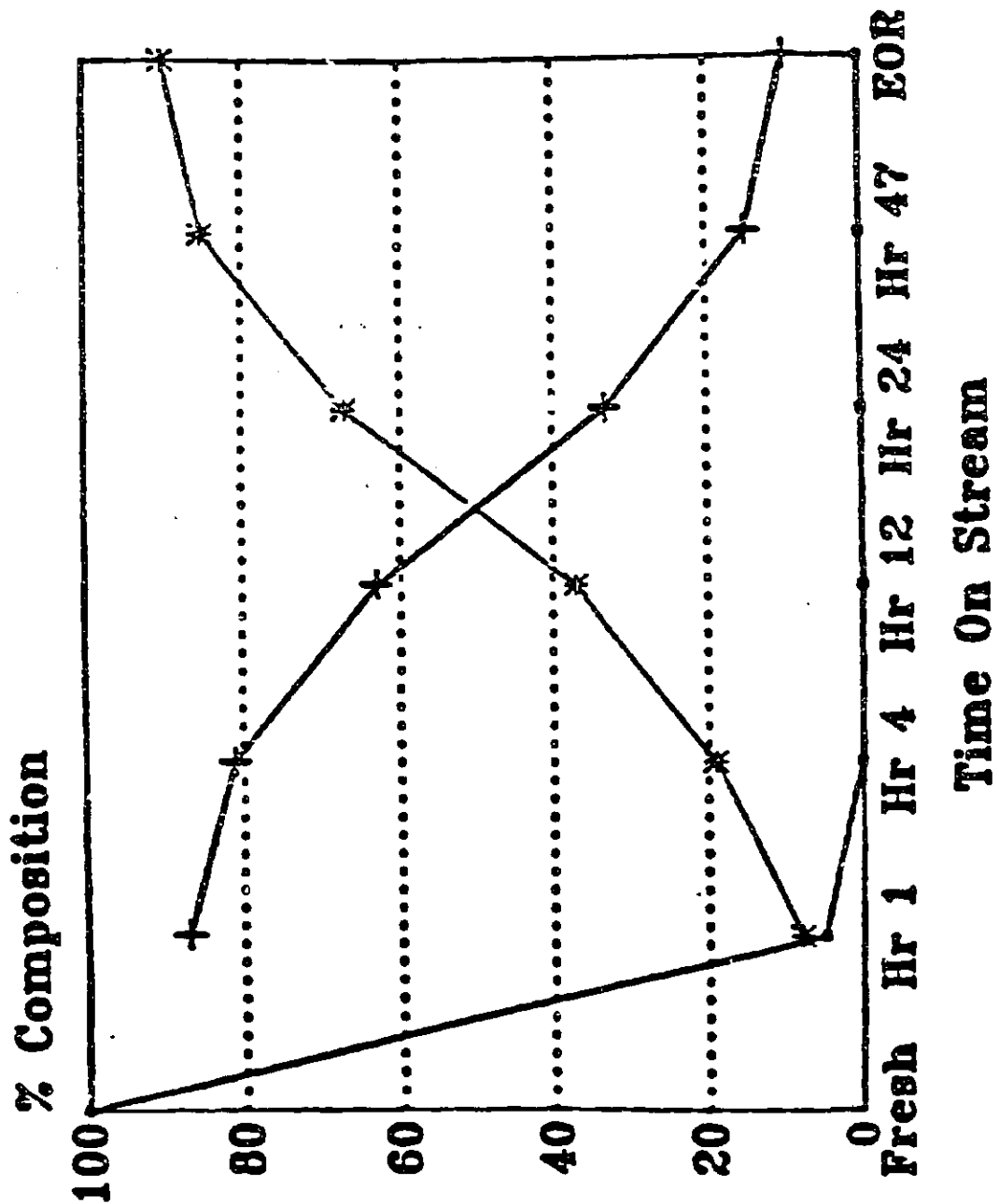


FIGURE 24

○ Fe₂O₃
+ Fe₃O₄
* FeCx

FIGURE 25
DIFFRACTION PATTERNS FOR FISCHER-TROPSCH SLURRY AS A FUNCTION
OF REACTION TIME

