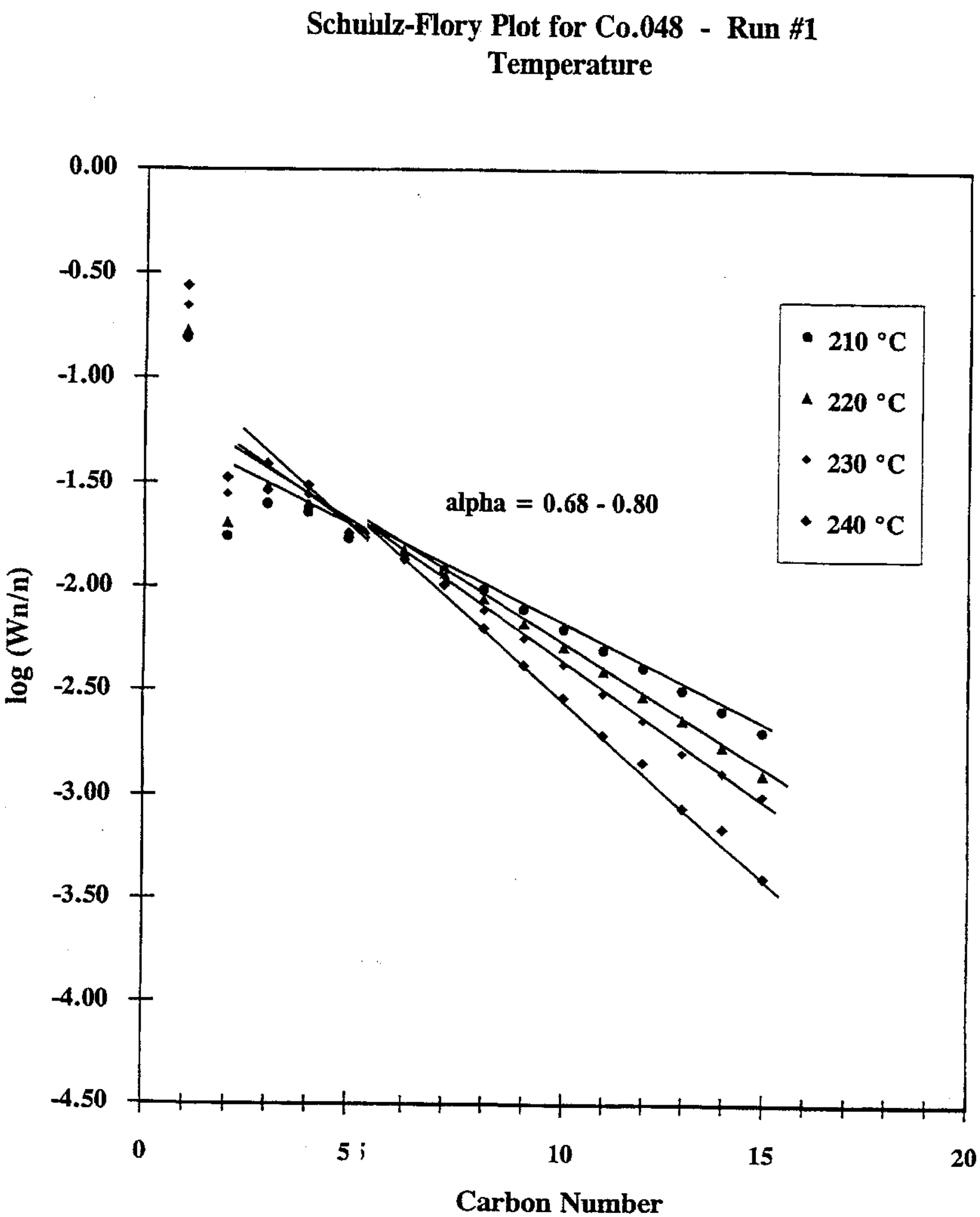
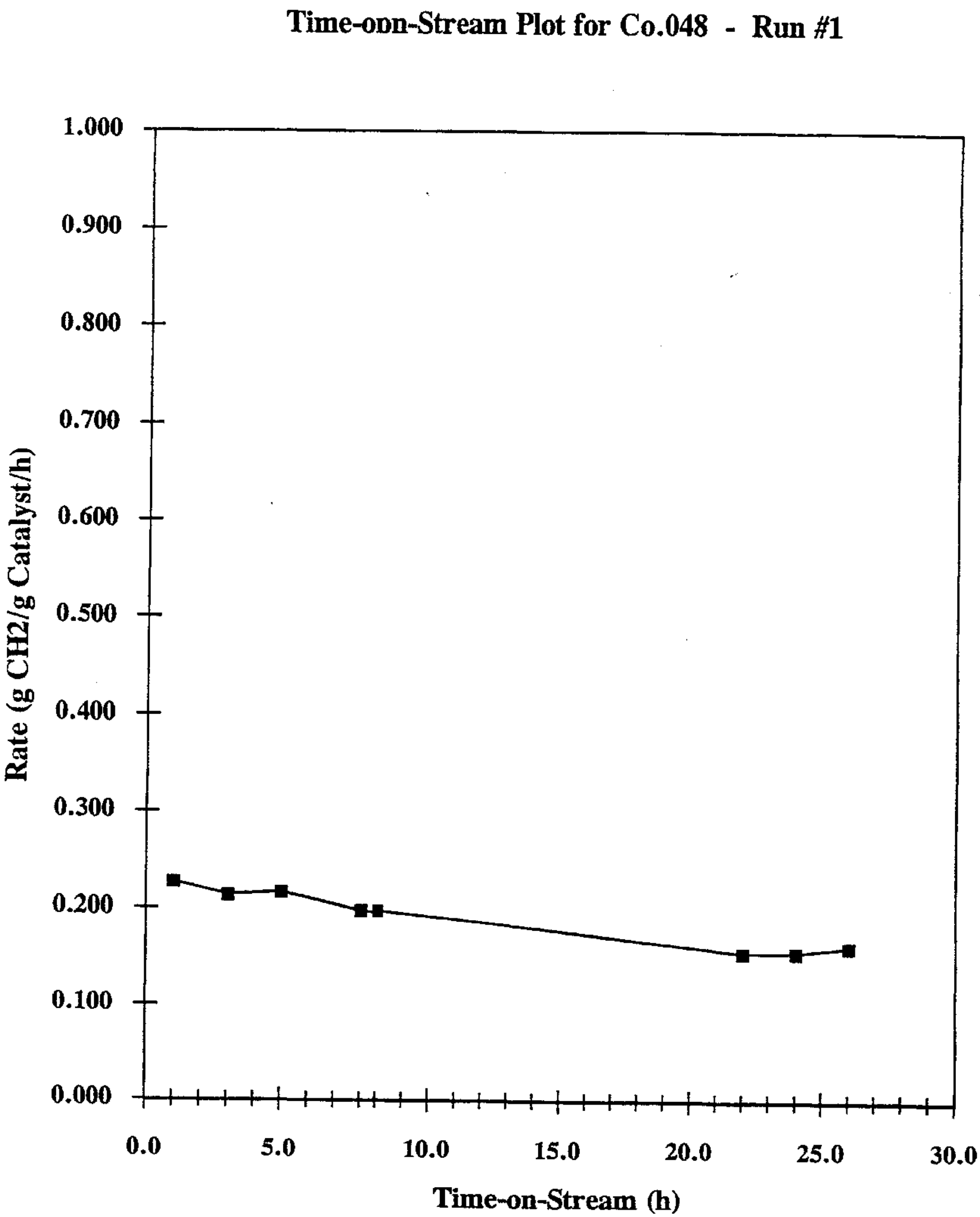


Schululz-Flory Plot for Co.048 - Run #1
Temperature
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
log (Wn/n)
0
5
10
15
20
Carbon Number
alpha = 0.68 - 0.80
210 °C
220 °C
230 °C
240 °C


Time-oon-Stream Plot for Co.048 - Run #1
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Rate (g CH2/g Catalyst/h)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Time-on-Stream (h)

(Co.049 - Run #1

Co wt%	NM wt %%	Promotor wt%		Support
20	Ru 0.500	K 0.10		Al2O3

SUMMMARY REACTION DATA

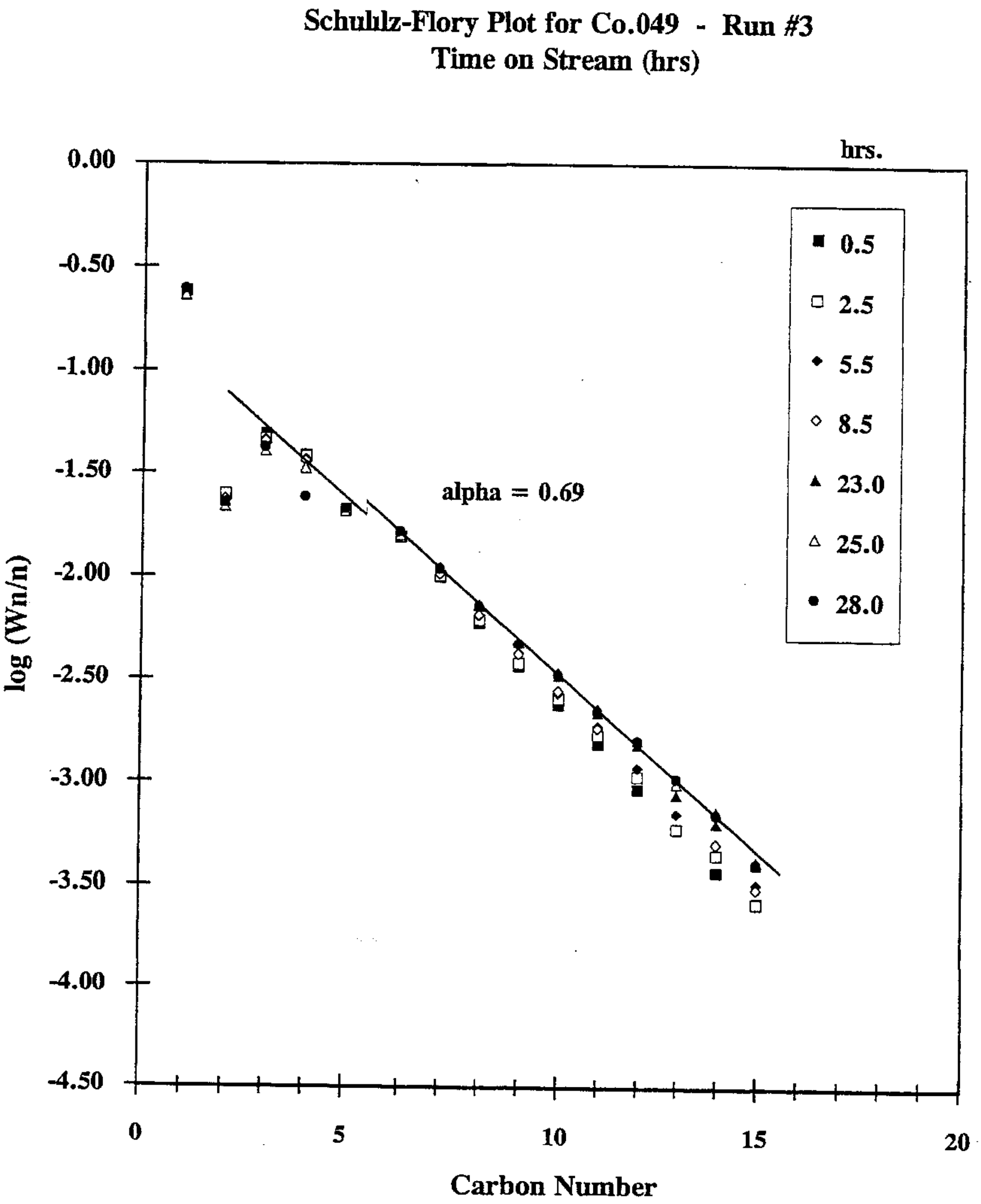
Reaction Conditions:

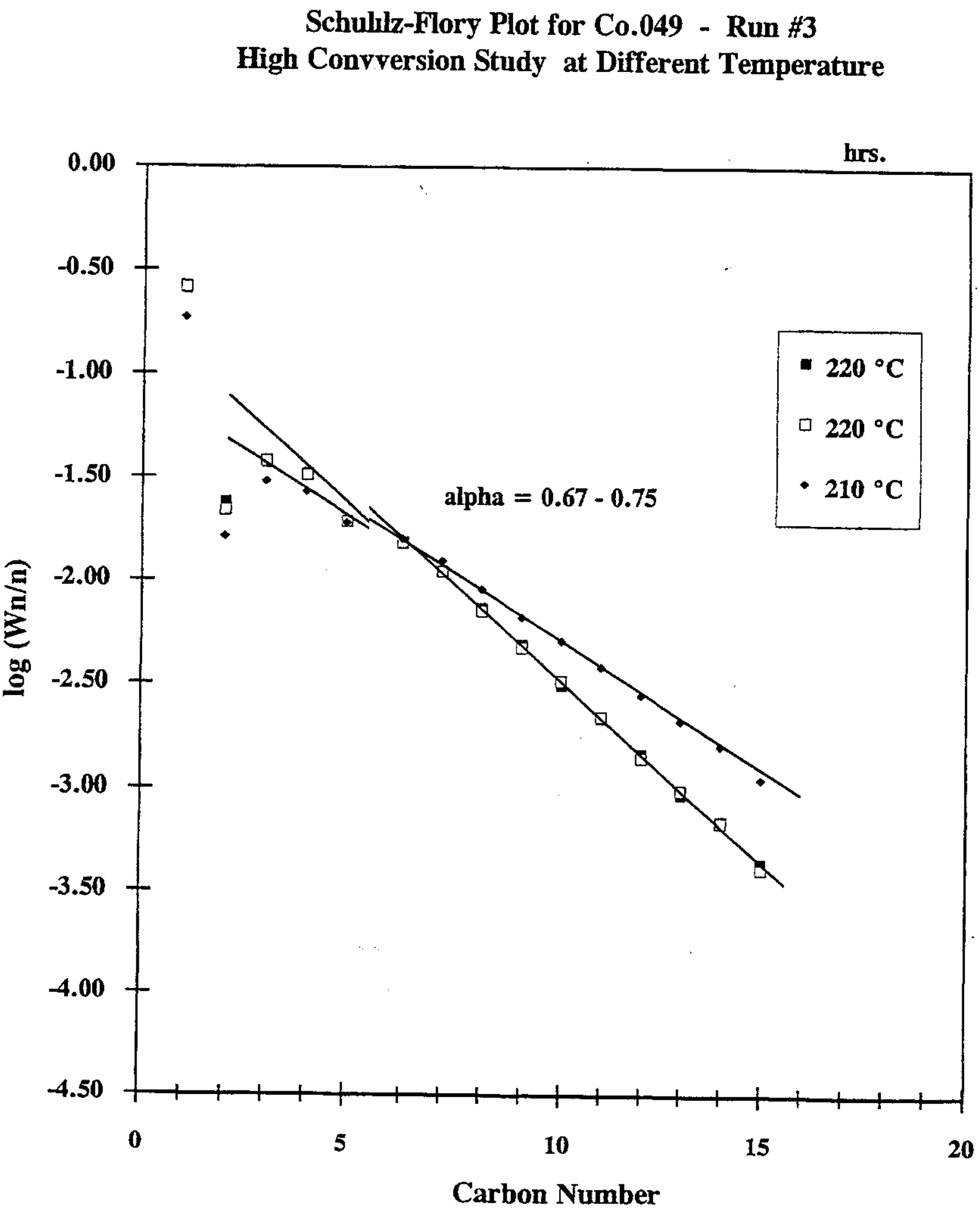
P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catatalyst = 0.218 g
WHSV = 111.82 1/hr
time on streamm = 26.0 hrs

CO2 (g/g cat/hr) = 0.043
CO2 (% of CO) = 0.2
O/P = 5.63

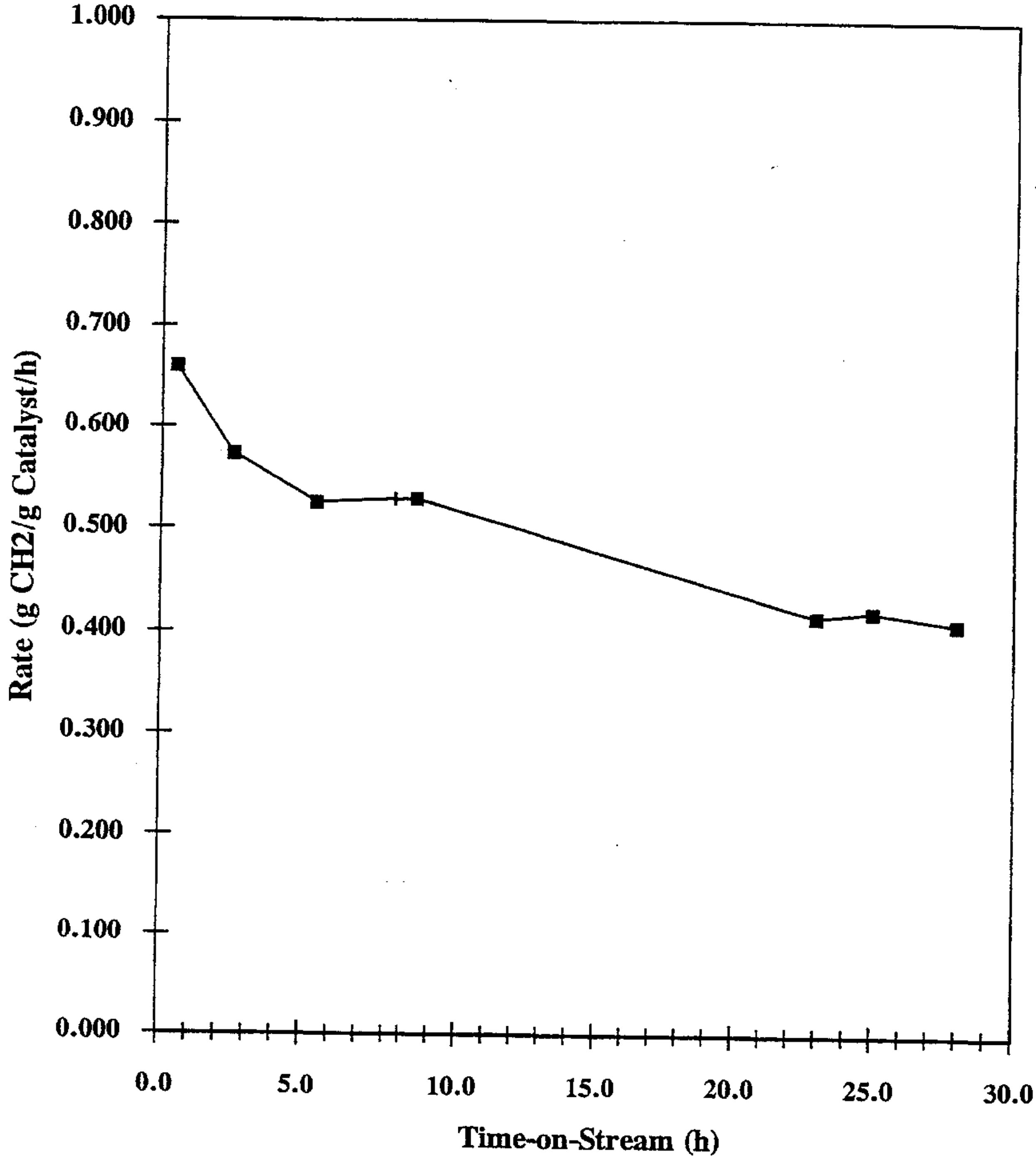
CO converersion (%)	7.1
rate (g CHH2/g cat/hr)	0.37
alpha	0.69
C1 (wt%))	23.4
C2 - C4 ((wt%)	25.7
C5 - C12 (wt%)	45.8
C13 + (wt%)	5.1

7/11/94


Schulilz-Flory Plot for Co.049 - Run #3
Time on Stream (hrs)
hrs.
0.5
2.5
5.5
8.5
23.0
25.0
28.0
alpha = 0.69
log (Wn/n)
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0
5
10
15
20
Carbon Number


Schulilz-Flory Plot for Co.049 - Run #3
High Convversion Study at Different Temperature
hrs.
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
log (Wn/n)
220 °C
220 °C
210 °C
alpha = 0.67 - 0.75
0
5
10
15
20
Carbon Number

Time-oon-Stream Plot for Co.049 - Run #3



CCo.049 - Run #3

Co wt%	NM wt %%	Promotor wt%		Support
20	Ru 0.500	K 0.10		Al2O3

SUMMMARY REACTION DATA*

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catatalyst = 0.184 g
WHSV = 2.333 1/hr
time on streamm = 30.0 hrs

CO2 (g/g cat/hr) = 0.131
CO2 (% of CO) = 3.8
O/P = 0.67

Ea = 30.9 kcal/mol

CO converrsion (%)	44.6
rate (g CHH2/g cat/hr)	0.45
alpha	0.68
C1 (wt%))	25.3
C2 - C4 ((wt%)	25.8
C5 - C12 (wt%)	44.4
C13 + (wwt%)	4.4

* high conversion stuudy

Co.053 - Run #1

Co wt%	NM wt %	Promotor wt%		Support
20	Ru 0.500			Al2O3

SUMMARY REACTION DATA

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catalyst = 0.192 g
WHSV = 13.37 1/hr
time on stream = 24.5 hrs

CO2 (g/g cat/hr) = 0.049
CO2 (% of CO) = 0.2
O/P = 3.07

CO conversion (%)	7.0
rate (g CH2/g cat/hr)	0.41
alpha	0.62
C1 (wt%)	27.3
C2 - C4 (wt%)	31.3
C5 - C12 (wt%)	39.4
C13 + (wt%)	2.1

7/11/94

CCo.053 - Run #1

Co wt%	NM wt %%	Promotor wt%		Support
20	Ru 0.500			Al2O3

SUMMARY REACTION DATA*

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catatalyst = 0.192 g
WHSV = 3.334 1/hr
time on streanm = 31.0 hrs

CO2 (g/g cat/hr) = 0.081
CO2 (% of CO) = 1.6
O/P = 0.79

CO converersion (%)	28.5
rate (g CHH2/g cat/hr)	0.42
alpha	0.64
C1 (wt%))	26.8
C2 - C4 ((wt%)	28.4
C5 - C12 (wt%)	41.9
C13 + (wwt%)	2.9

* high conversion stuudy

PPerformance of Co.053

Dates:s: 05/16/94 - 05/17/94 Run #1

flow rate = 90.0 cc/min, loading= 0.0.2 g, WHSV = 13.4 1/hr, H2/CO ratio in feed = 2

time on stream, hr	0.5	2.5	5.0	8.0	24.5	26.5
reaction temperature, °C	220	220	220	220	220	220
pressure, atm	1.0	1.0	1.0	1.0	1.0	1.0
flow, cc/min	90.0	90.0	90.0	90.0	90.0	90.0
C1 - C15 product distribution, weighght %						
C1	25.80	26.60	25.34	26.77	27.52	28.43
C2	5.02	5.11	4.89	5.16	5.27	5.03
C3	13.60	13.61	12.92	13.44	13.31	12.93
C4	13.54	13.42	12.81	13.26	13.00	12.71
C5	11.94	11.79	11.37	11.71	11.54	11.33
C6	8.94	8.61	8.49	8.89	8.47	8.35
C7	6.91	6.96	7.99	6.92	6.86	6.67
C8	4.76	4.74	5.47	4.65	4.74	4.76
C9	3.16	3.10	3.63	3.12	3.22	3.17
C10	2.23	2.23	2.62	2.20	2.30	2.32
C11	1.51	1.47	1.74	1.49	1.51	1.73
C12	1.11	1.04	1.07	1.05	0.99	1.25
C13	0.67	0.64	0.83	0.61	0.58	0.59
C14	0.48	0.41	0.48	0.43	0.37	0.45
C15	0.34	0.26	0.35	0.29	0.32	0.27
alpha chain growth probability	0.63	0.61	0.63	0.62	0.62	0.61
C1 - C50 estimated total product distsribution, weight %						
C1	25.6	26.5	25.2	26.6	27.3	28.5
C2 - C4	31.9	32.1	30.4	31.7	31.3	30.7
C5 - C12	40.3	39.7	42.1	39.8	39.4	39.0
C13 - C50	2.2	1.8	2.3	1.9	2.1	1.8
CO conversion, %	8.7	8.0	7.8	7.7	7.0	6.8
rate, g CH2/g cat/hr	0.51	0.47	0.46	0.45	0.41	0.40
CO2 formation, %	0.3	0.3	0.2	0.2	0.2	0.2

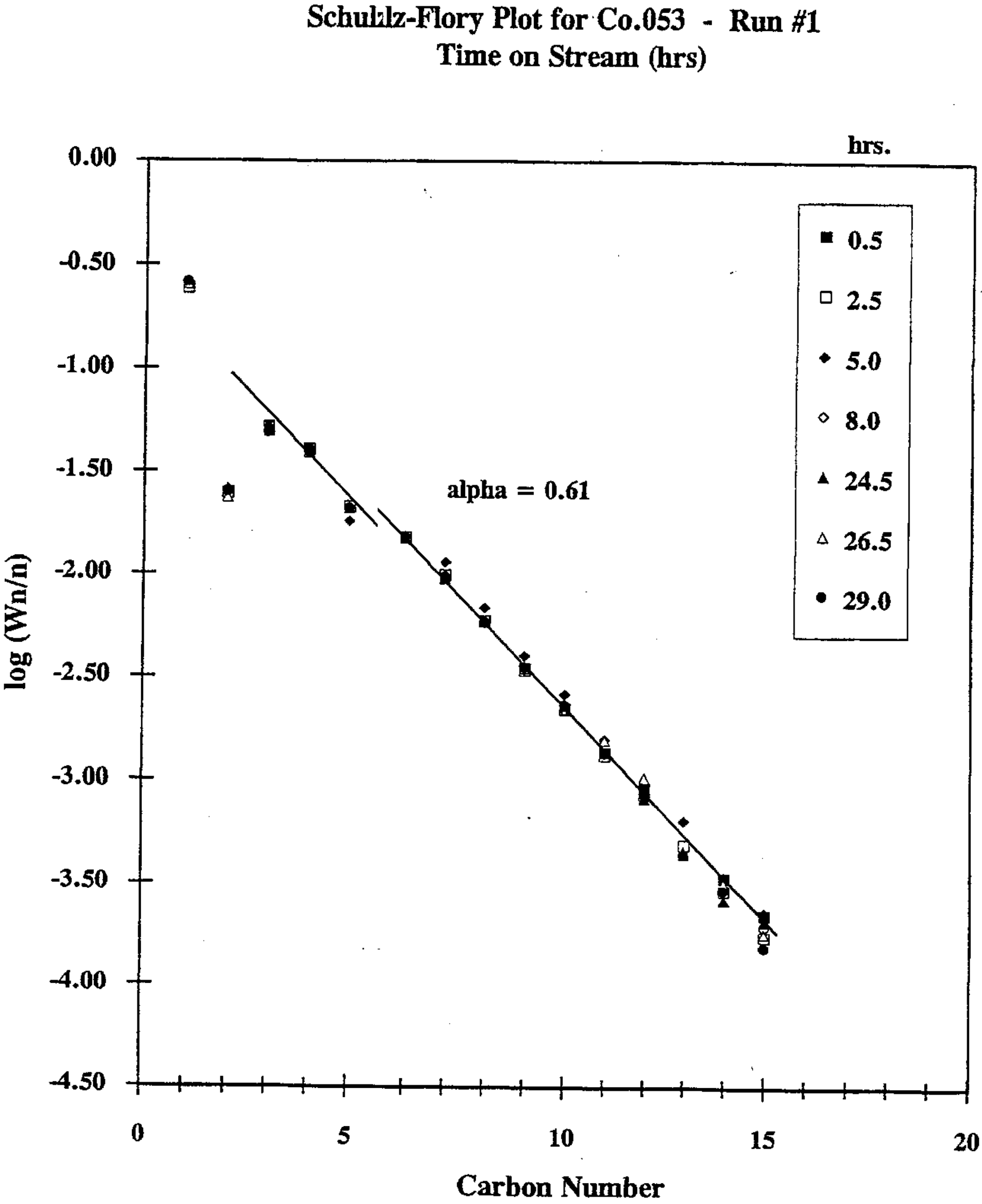
PPerformance of Co.053

Dates:s: 05/16/94 - 05/17/94   Run #1

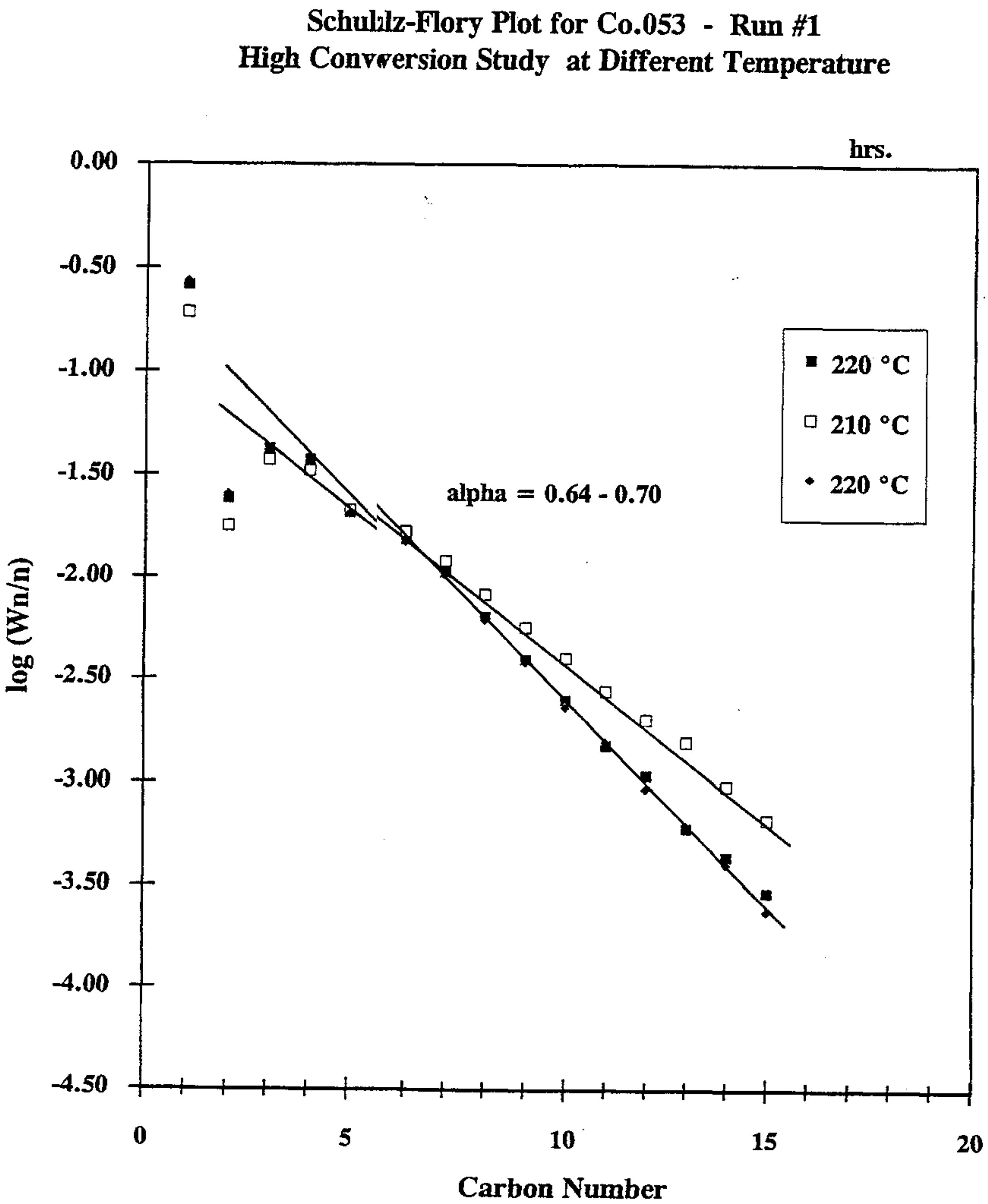
flow rate = 90.0 cc/min, loading= ≈ 0.2 g, WHSV = 13.4 1/hr, H2/CO ratio in feed = 2

time on stream, hr	29.0	31.0	33.0	35.0
reaction temperature, °C	220	220	210	220
pressure, atm	1.0	1.0	1.0	1.0
flow, cc/min	90.0	22.5	22.5	22.5
C1 - C15 product distribution, weigight %				
C1	28.10	27.11	19.99	28.61
C2	5.18	4.77	3.52	5.07
C3	13.18	11.38	9.66	11.64
C4	12.92	12.66	11.21	12.70
C5	11.49	11.60	11.53	11.28
C6	8.45	8.94	9.86	8.19
C7	6.73	7.43	8.49	7.18
C8	4.70	5.16	6.63	4.95
C9	3.20	3.58	5.13	3.45
C10	2.31	2.52	4.03	2.33
C11	1.50	1.68	3.06	1.74
C12	1.04	1.32	2.45	1.13
C13	0.57	0.79	2.07	0.81
C14	0.41	0.62	1.36	0.57
C15	0.23	0.44	1.01	0.36
alpha chain growth probability	0.60	0.64	0.70	0.63
C1 - C50 estimated total product dislistribution, weight %				
C1	28.1	26.8	19.5	28.5
C2 - C4	31.3	28.4	23.8	29.3
C5 - C12	39.0	41.9	49.8	39.9
C13 - C50	1.6	2.9	6.8	2.4
CO conversion, %	6.8	28.5	16.6	26.3
rate, g CH2/g cat/hr	0.40	0.42	0.24	0.38
CO2 formation, %	0.2	1.6	1.0	1.4

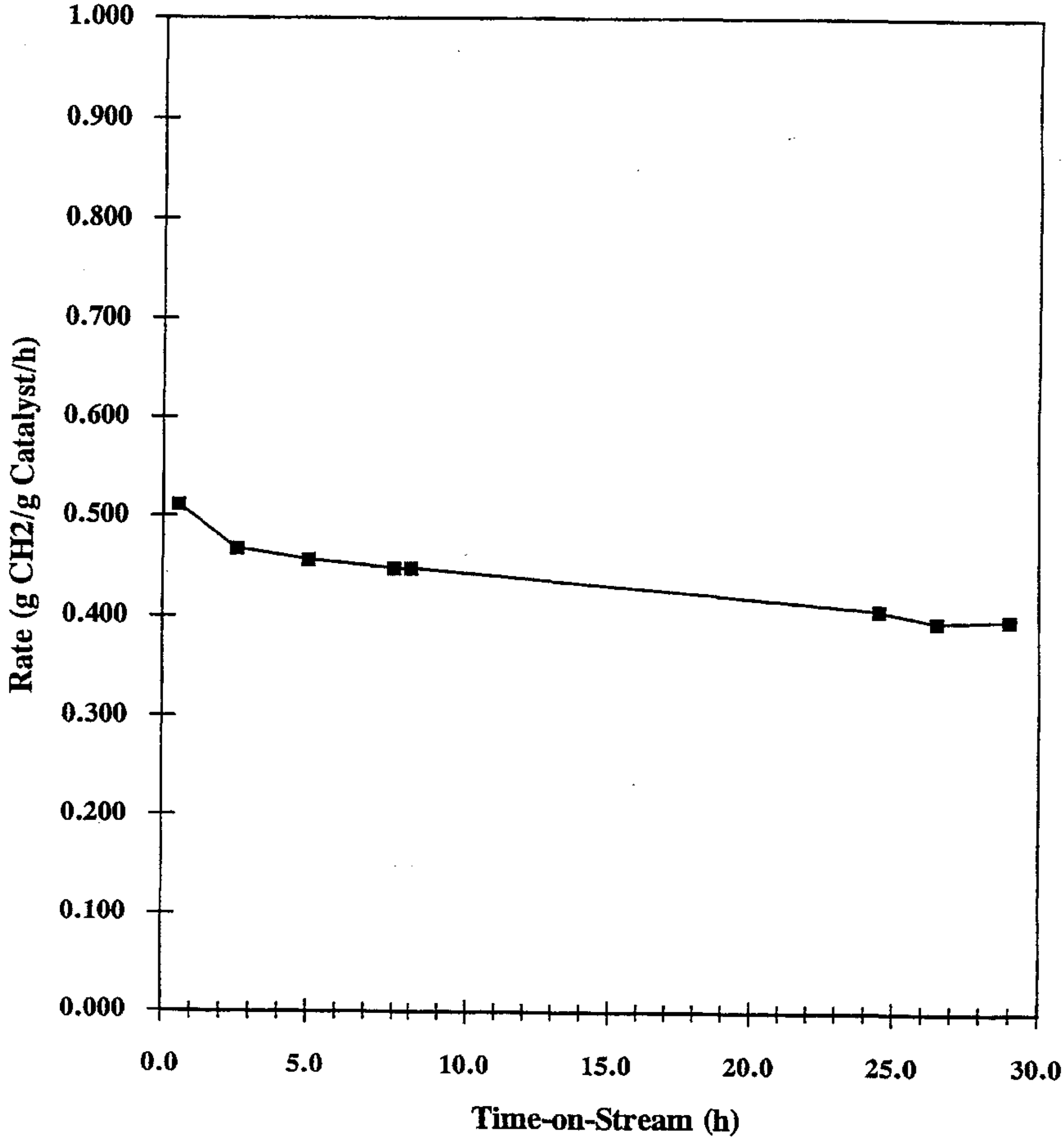
7/11/94



Schulilz-Flory Plot for Co.053 - Run #1
Time on Stream (hrs)
hrs.
0.5
2.5
5.0
8.0
24.5
26.5
29.0
alpha = 0.61
log (Wn/n)
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0
5
10
15
20
Carbon Number


Schulilz-Flory Plot for Co.053 - Run #1
High Convwersion Study at Different Temperature
hrs.
220 °C
210 °C
220 °C
alpha = 0.64 - 0.70
log (Wn/n)
Carbon Number
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0
5
10
15
20

Time-oon-Stream Plot for Co.053 - Run #1



Co.053 - Run #2

Co wt%	NM wt %	Promotor wt%		Support
20	Ru 0.50			Al2O3

SUMMARY REACTION DATA

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H_2/CO = 2
weight of catalyst = 0.171 g
WHSV = 15.5.03 1/hr
time on stream = 25.5 hrs

CO_2 (g/g cat/hr) = 0.052
CO_2 (% of CO) = 0.2
O/P = 2.35

CO conversion (%)	6.6
rate (g CH_2/g cat/hr)	0.43
alpha	0.63
C1 (wt%)	23.4
C2 - C4 (wt%)	27.4
C5 - C12 (wt%)	46.6
C13 + (wt%)	2.6

PPerformance of Co.053

Dates:s: 05/23/94 - 05/24/94 Run #2

flow rate = 90.0 cc/min, loading= 0.0.2 g, WHSV = 15.0 1/hr, H_2/CO ratio in feed = 2

time on stream, hr	0.5	3.0	5.0	7.0	23.0	25.5
reaction temperature, °C	220	220	220	220	220	220
pressure, atm	1.0	1.0	1.0	1.0	1.0	1.0
flow, cc/min	90.0	90.0	90.0	90.0	90.0	90.0
C1 - C15 product distribution, weighght %						
C1	25.54	22.61	22.33	24.20	22.89	23.57
C2	4.95	4.55	4.41	5.50	4.40	4.51
C3	12.50	11.85	11.52	13.97	11.30	11.43
C4	12.76	12.55	12.16	14.24	11.66	11.64
C5	10.99	11.25	11.01	12.49	10.54	10.28
C6	7.76	8.63	8.03	8.88	7.54	7.28
C7	8.23	9.28	10.73	7.23	11.11	10.91
C8	5.74	6.46	7.10	4.82	7.43	7.33
C9	3.88	4.32	4.55	3.15	4.85	4.78
C10	2.77	3.13	3.21	2.05	3.25	3.27
C11	1.82	2.02	2.07	1.49	2.08	2.05
C12	1.21	1.49	1.22	0.85	1.34	1.23
C13	0.86	0.84	0.79	0.52	0.73	0.79
C14	0.56	0.59	0.51	0.35	0.52	0.54
C15	0.44	0.43	0.36	0.25	0.37	0.39
alpha chain growth probability	0.64	0.64	0.63	0.60	0.63	0.63
C1 - C50 estimated total product diststribution, weight %						
C1	25.2	22.4	22.3	24.1	22.8	23.4
C2 - C4	29.8	28.7	28.0	33.6	27.3	27.4
C5 - C12	42.1	46.0	47.4	40.7	47.5	46.6
C13 - C50	2.9	2.9	2.4	1.6	2.4	2.6
CO conversion, %	7.1	6.7	6.5	6.3	6.4	6.6
rate, g CH_2/g cat/hr	0.47	0.44	0.43	0.42	0.42	0.43
CO_2 formation, %	0.2	0.2	0.2	0.2	0.2	0.2

IPerformance of Co.053

Dates:s: 05/23/94 - 05/24/94 Run #2

flow rate = 90.0 cc/min, loading= = 0.2 g, WHSV = 15.0 1/hr, H2/CO ratio in feed = 2

time on stream, hr	27.5
reaction temperature, °C	220
pressure, atm	1.0
flow, cc/min	90.0

C1 - C15 product distribution, weigight %

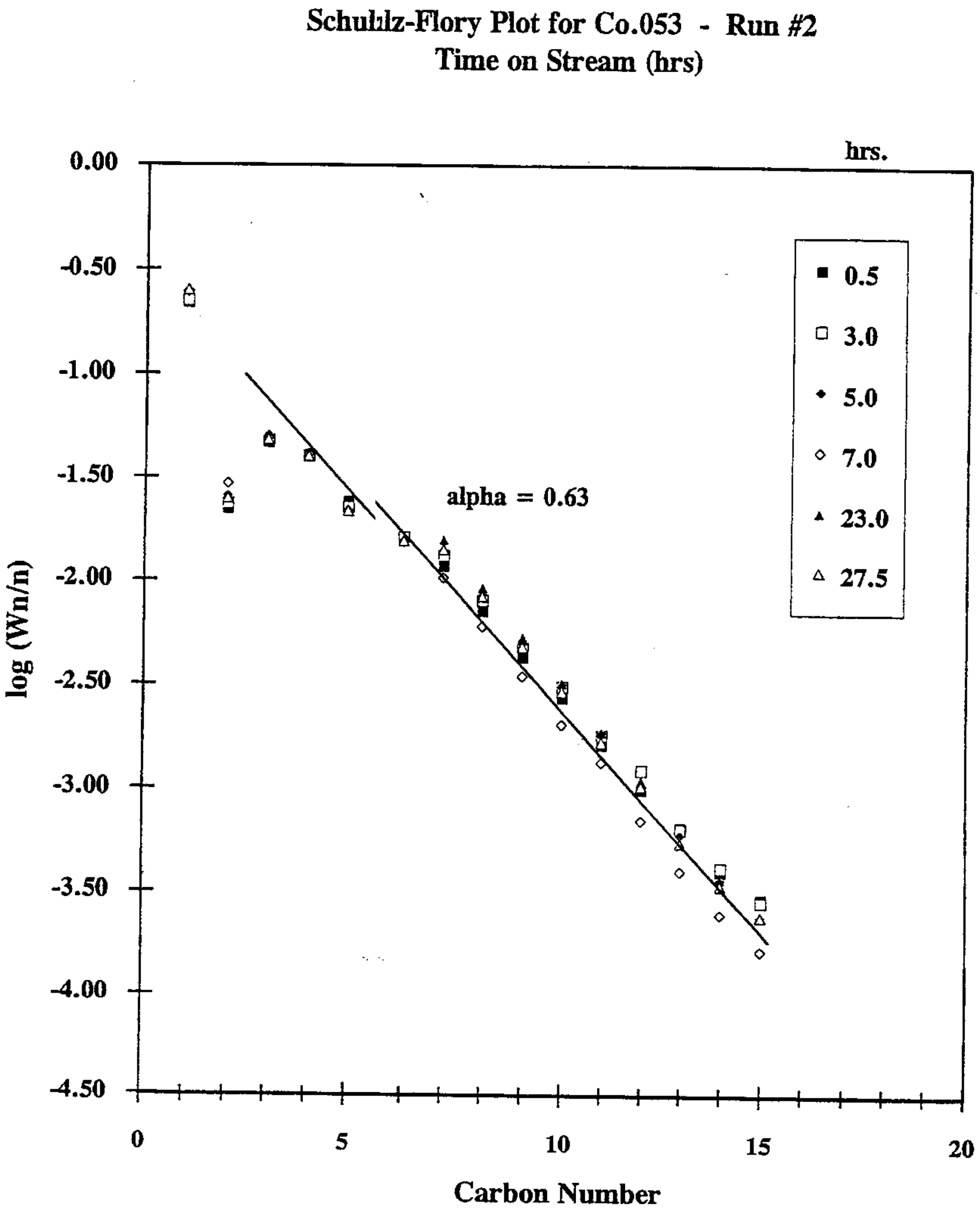
C1	24.31
C2	4.64
C3	11.85
C4	12.09
C5	10.69
C6	7.71
C7	9.95
C8	6.73
C9	4.37
C10	2.97
C11	1.88
C12	1.25
C13	0.72
C14	0.48
C15	0.36
alpha chain growth probability	0.63

C1 - C50 estimated total product dididistribution, weight %

C1	24.2
C2 - C4	28.4
C5 - C12	45.0
C13 - C50	2.4

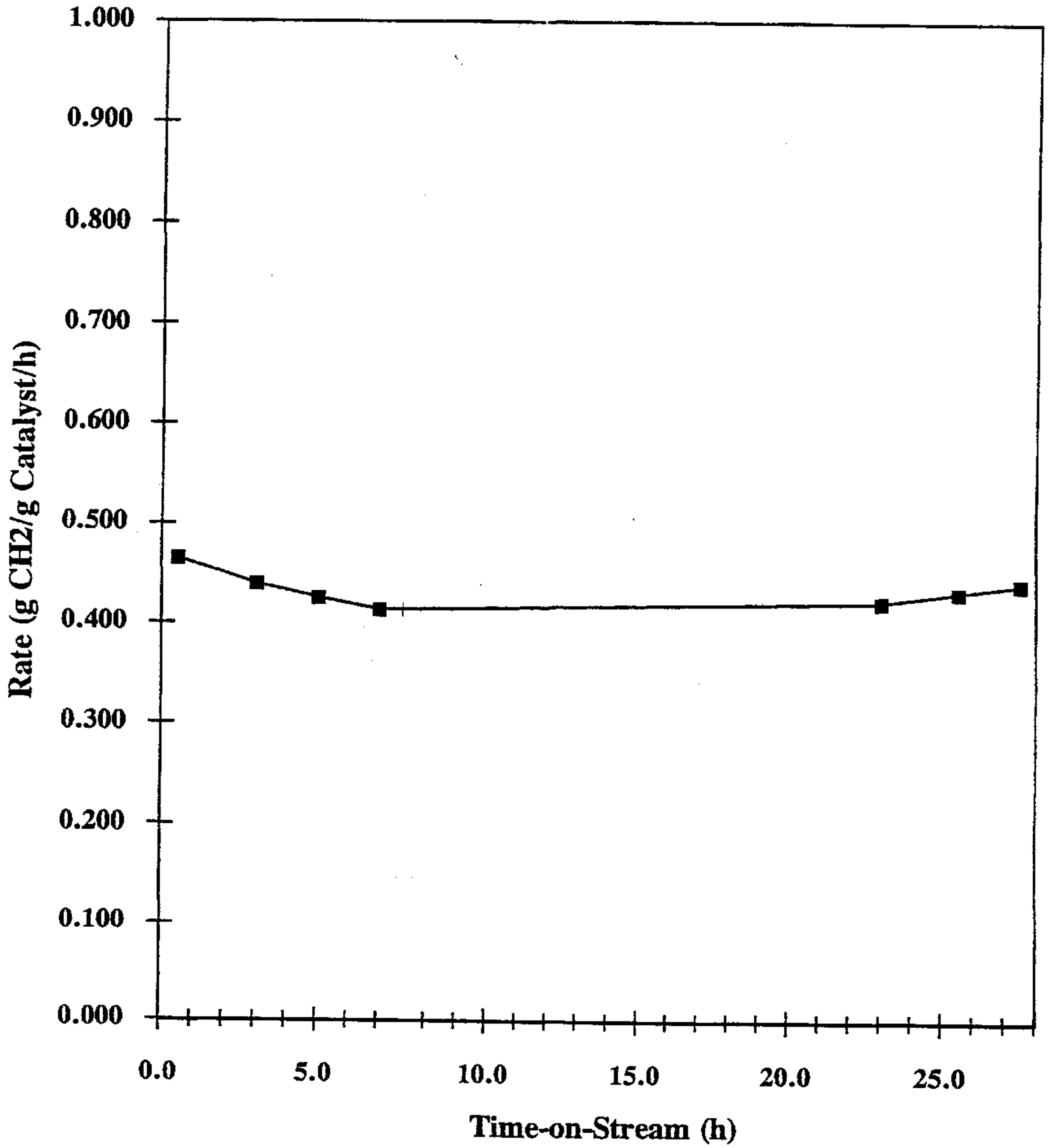
CO conversion, %	6.7
rate, g CH2/g cat/hr	0.44
CO2 formation, %	0.2

7/11/94



Schulilz-Flory Plot for Co.053 - Run #2
Time on Stream (hrs)
hrs.
0.5
3.0
5.0
7.0
23.0
27.5
alpha = 0.63
log (Wn/n)
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0
5
10
15
20
Carbon Number

Time-oon-Stream Plot for Co.053 - Run #2



(Co.053 - Run #3

Co wt%	NM wt %%	Promotor wt%		Support
20	Ru 0.500			Al2O3

SUMMARY REACTION DATA

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catatalyst = 0.194 g
WHSV = 13.3.25 1/hr
time on streanm = 24.5 hrs

CO2 (g/g cat/hr) = 0.027
CO2 (% of CO) = 0.1
O/P = 1.67

CO converersion (%)	7.8
rate (g CHH2/g cat/hr)	0.45
alpha	0.62
C1 (wt%))	27.6
C2 - C4 ((wt%)	30.4
C5 - C12 (wt%)	40.1
C13 + (wwt%)	1.9

7/11/94

Co.053 - Run #3

Co wt%	NM wt %	Promotor wt%		Support
20	Ru 0.500			Al2O3

SUMMARY REACTION DATA*

Reaction Conditions:

P = 1.0 atm
T = 220 °C
H2/CO = 2
weight of catalyst = 0.194 g
WHSV = 3.31 1/hr
time on stream = 27.5 hrs

CO2 (g/g cat/hr) = 0.044
CO2 (% of CO) = 0.9
O/P = 0.52

CO conversion (%)	31.5
rate (g CH2/g cat/hr)	0.46
alpha	0.65
C1 (wt%)	25.4
C2 - C4 (wt%)	28.1
C5 - C12 (wt%)	43.6
C13 + (wt%)	3.0

* high conversion study

PPerformance of Co.053

Dates: :: 06/27/94 - 06/28/94 Run #3

flow rate = 90.0 cc/min, loading= 0.0.2 g, WHSV = 13.3 1/hr, H2/CO ratio in feed = 2

time on stream, hr	0.5	3.5	6.5	9.5	12.5	15.5
reaction temperature, °C	220	220	220	220	220	220
pressure, atm	1.0	1.0	1.0	1.0	1.0	1.0
flow, cc/min	90.0	90.0	90.0	90.0	90.0	90.0
C1 - C15 product distribution, weightht %						
C1	27.29	27.67	28.27	28.14	28.27	27.99
C2	4.93	4.91	4.96	4.92	4.92	4.86
C3	13.49	13.44	13.42	13.37	13.32	13.23
C4	13.34	13.22	13.17	13.14	13.06	12.96
C5	12.05	12.10	11.87	11.96	11.91	11.96
C6	8.98	9.09	8.87	9.04	8.97	9.09
C7	6.96	7.07	6.89	6.95	6.95	7.05
C8	4.60	4.57	4.56	4.63	4.64	4.71
C9	2.91	2.87	2.91	2.86	2.91	2.97
C10	1.96	1.86	1.92	1.96	1.97	2.02
C11	1.34	1.30	1.21	1.19	1.24	1.29
C12	0.77	0.77	0.84	0.78	0.80	0.82
C13	0.59	0.47	0.48	0.47	0.44	0.45
C14	0.43	0.37	0.35	0.32	0.33	0.33
C15	0.35	0.27	0.27	0.26	0.27	0.27
alpha chain growth probability	0.63	0.61	0.61	0.61	0.61	0.61
C1 - C50 estimated total product distrtribution, weight %						
C1	26.8	27.4	28.0	27.9	28.0	27.7
C2 - C4	31.2	31.3	31.2	31.1	31.0	30.8
C5 - C12	39.6	39.5	39.0	39.3	39.3	39.7
C13 - C50	2.3	1.8	1.8	1.7	1.8	1.8
CO conversion, %	10.2	8.9	8.8	8.4	8.4	8.1
rate, g CH2/g cat/hr	0.59	0.51	0.51	0.49	0.49	0.47
CO2 formation, %	0.2	0.2	0.2	0.2	0.2	0.2

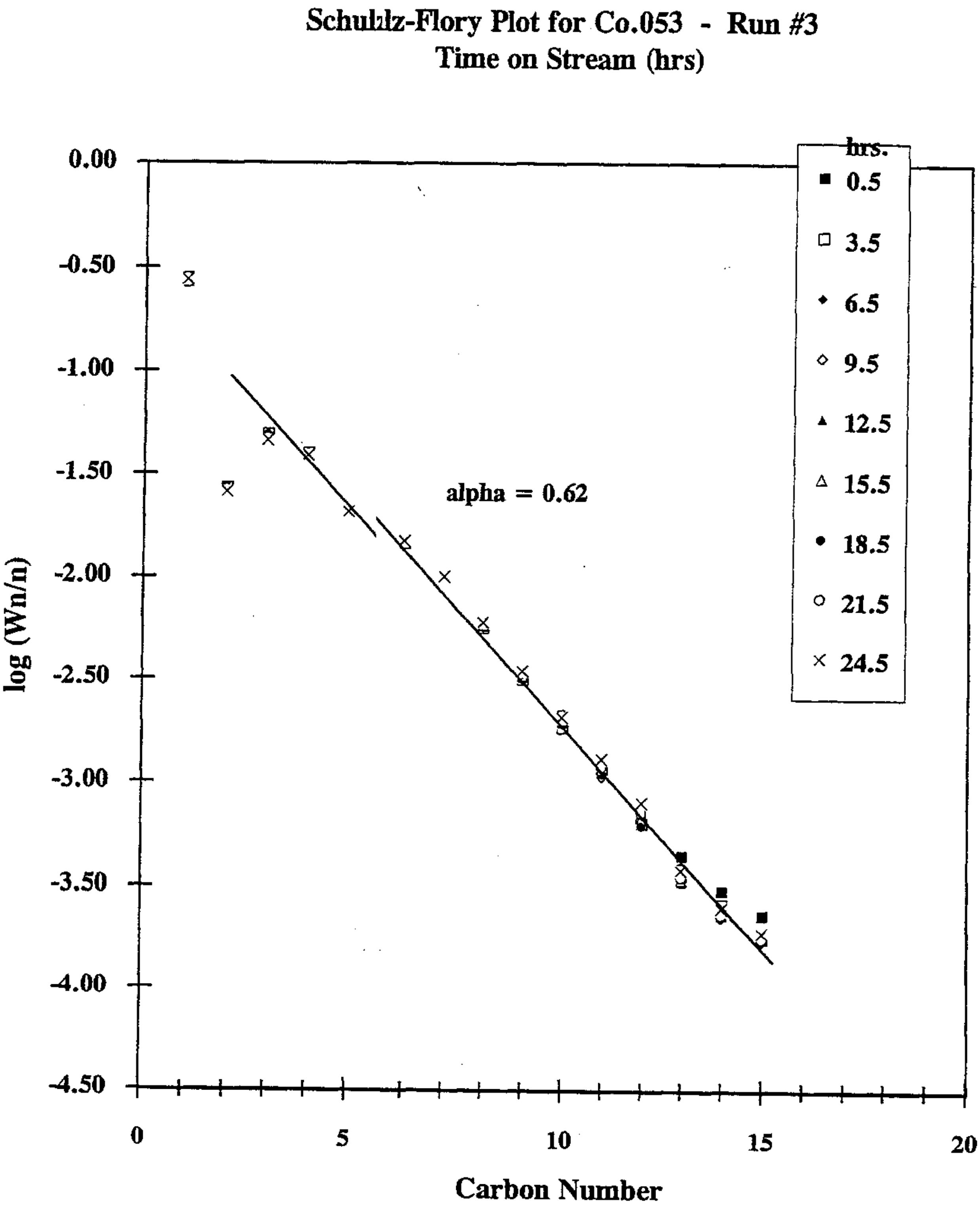
PPerformance of Co.053

Dates:s: 06/27/94 - 06/28/94 Run #3

flow rate = 90.0 cc/min, loading= = 0.2 g, WHSV = 13.3 1/hr, H2/CO ratio in feed = 2

time on stream, hr	18.5	21.5	24.5	27.5	30.5
reaction temperature, °C	220	220	220	220	210
pressure, atm	1.0	1.0	1.0	1.0	1.0
flow, cc/min	90.0	90.0	90.0	22.5	22.5
C1 - C15 product distribution, weigight %					
C1	28.04	27.90	27.82	25.66	20.13
C2	4.86	4.83	4.80	4.63	3.30
C3	13.21	13.12	13.03	11.21	9.45
C4	12.93	12.91	12.81	12.57	10.87
C5	11.89	11.87	11.80	12.01	11.57
C6	9.07	9.08	9.04	9.50	10.08
C7	7.02	7.08	7.11	7.79	8.73
C8	4.70	4.78	4.85	5.42	6.82
C9	3.03	3.05	3.13	3.63	5.19
C10	2.08	2.14	2.08	2.50	4.19
C11	1.30	1.32	1.44	2.06	3.22
C12	0.75	0.87	0.97	1.24	2.44
C13	0.52	0.46	0.50	0.77	1.76
C14	0.34	0.33	0.35	0.57	1.32
C15	0.26	0.27	0.29	0.45	0.92
alpha chain growth probability	0.61	0.61	0.62	0.65	0.70
C1 - C50 estimated total product didistribution, weight %					
C1	27.8	27.7	27.6	25.4	19.8
C2 - C4	30.7	30.6	30.4	28.1	23.2
C5 - C12	39.7	40.0	40.1	43.6	50.7
C13 - C50	1.7	1.8	1.9	3.0	6.3
CO conversion, %	8.0	7.9	7.8	31.5	17.5
rate, g CH2/g cat/hr	0.47	0.46	0.45	0.46	0.25
CO2 formation, %	0.2	0.1	0.1	0.9	0.5

7/11/94



Schulilz-Flory Plot for Co.053 - Run #3
Time on Stream (hrs)
hrs.
0.5
3.5
6.5
9.5
12.5
15.5
18.5
21.5
24.5
alpha = 0.62
log (Wn/n)
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0
5
10
15
20
Carbon Number

7/11/94

Schulilz-Flory Plot for Co.053 - Run #3
High Convversion Study at Different Temperature