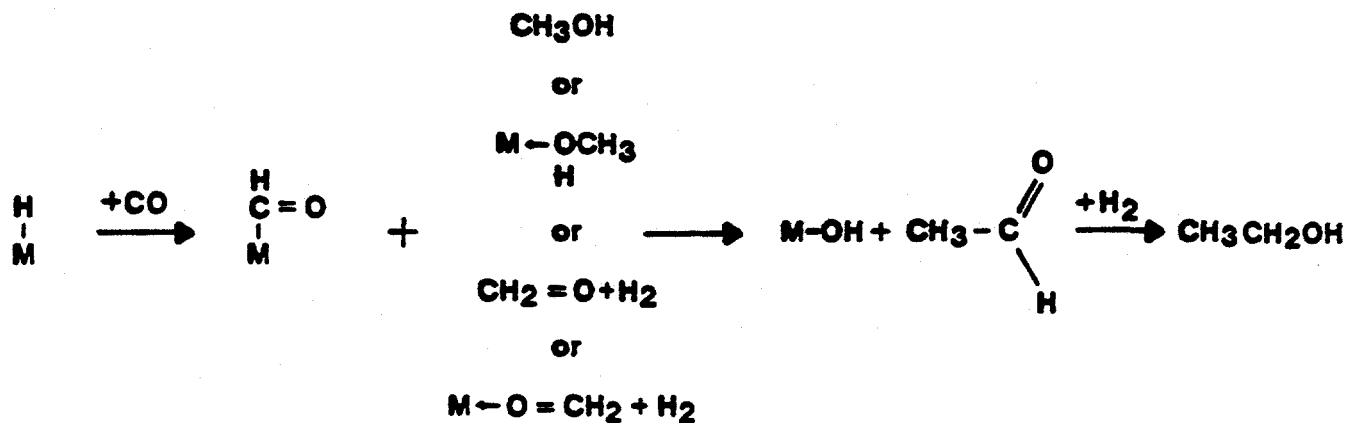


6 FIGURES

Figure 2.

LINEAR GROWTH



BRANCHED GROWTH

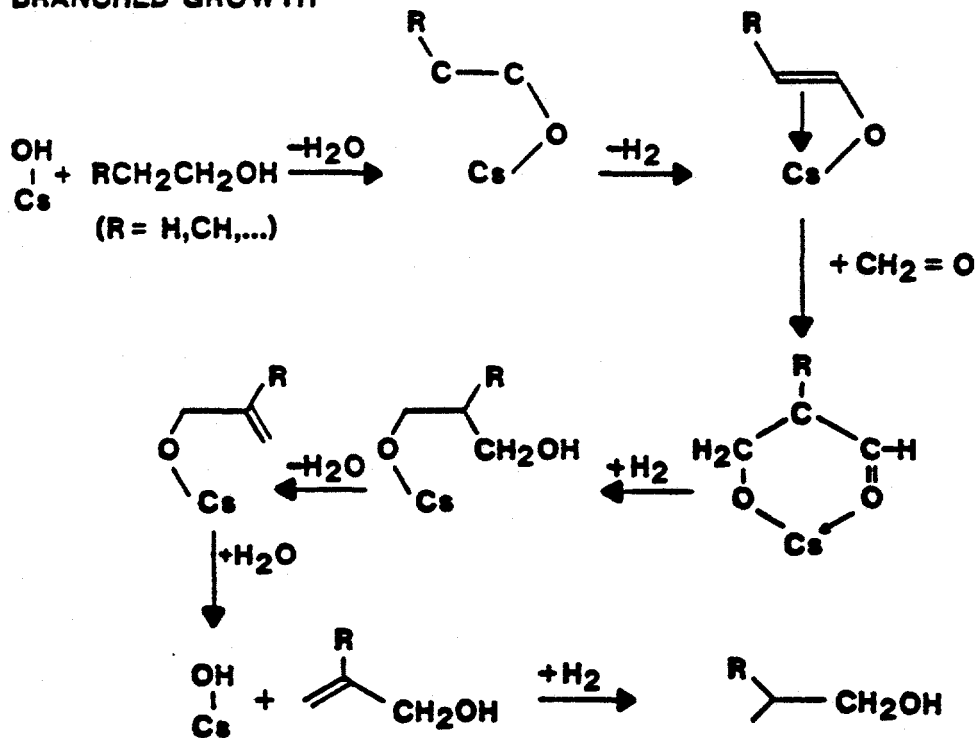
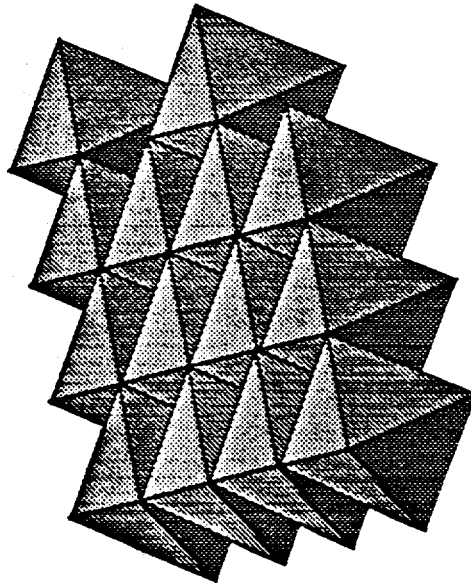
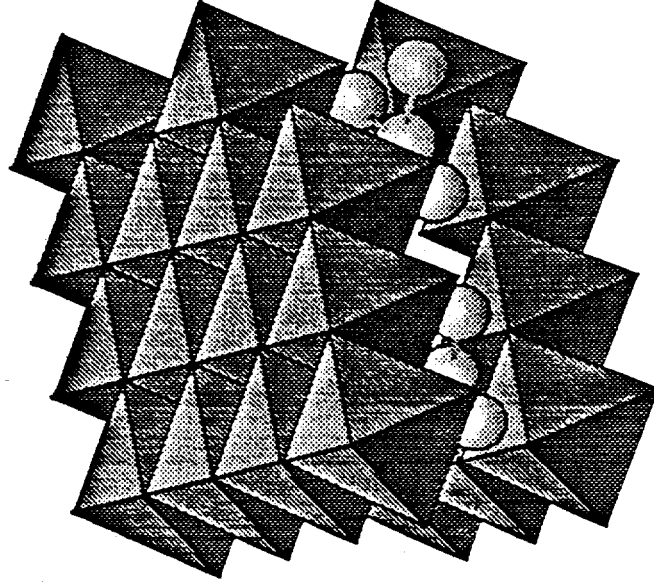


Figure 3.

COMPARISON OF BRUCITE AND HYDROTALCITE



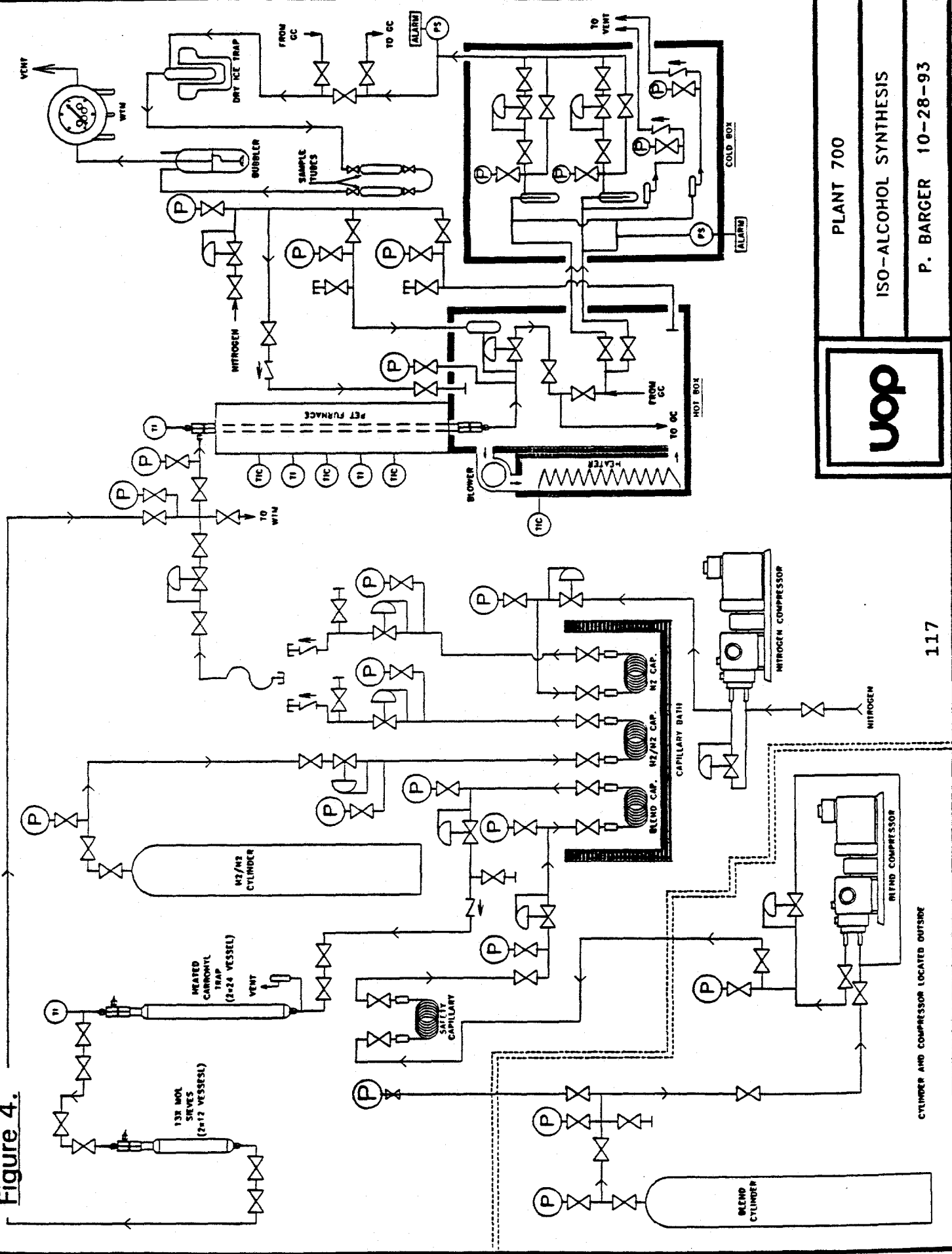
BRUCITE



HYDROTALCITE



Figure 4.



PLANT 700

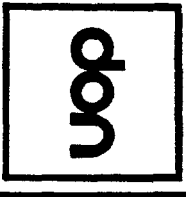
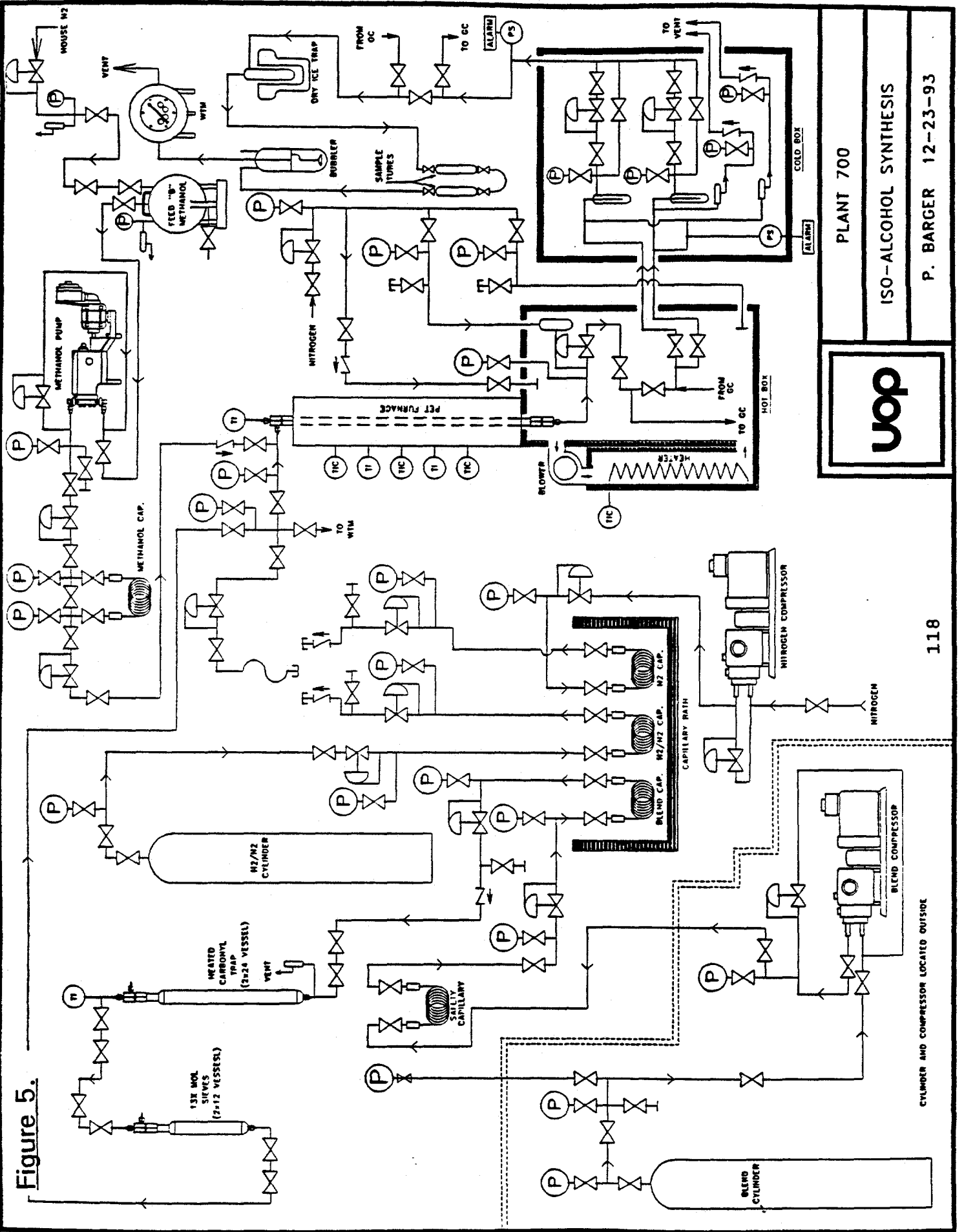
ISO-ALCOHOL SYNTHESIS

P. BARGER 10-28-93



CYLINDER AND COMPRESSOR LOCATED OUTSIDE

Figure 5.



PLANT 700

ISO-ALCOHOL SYNTHESIS

P. BARGER 12-23-93

CYLINDER AND COMPRESSOR LOCATED OUTSIDE

Figure 6.

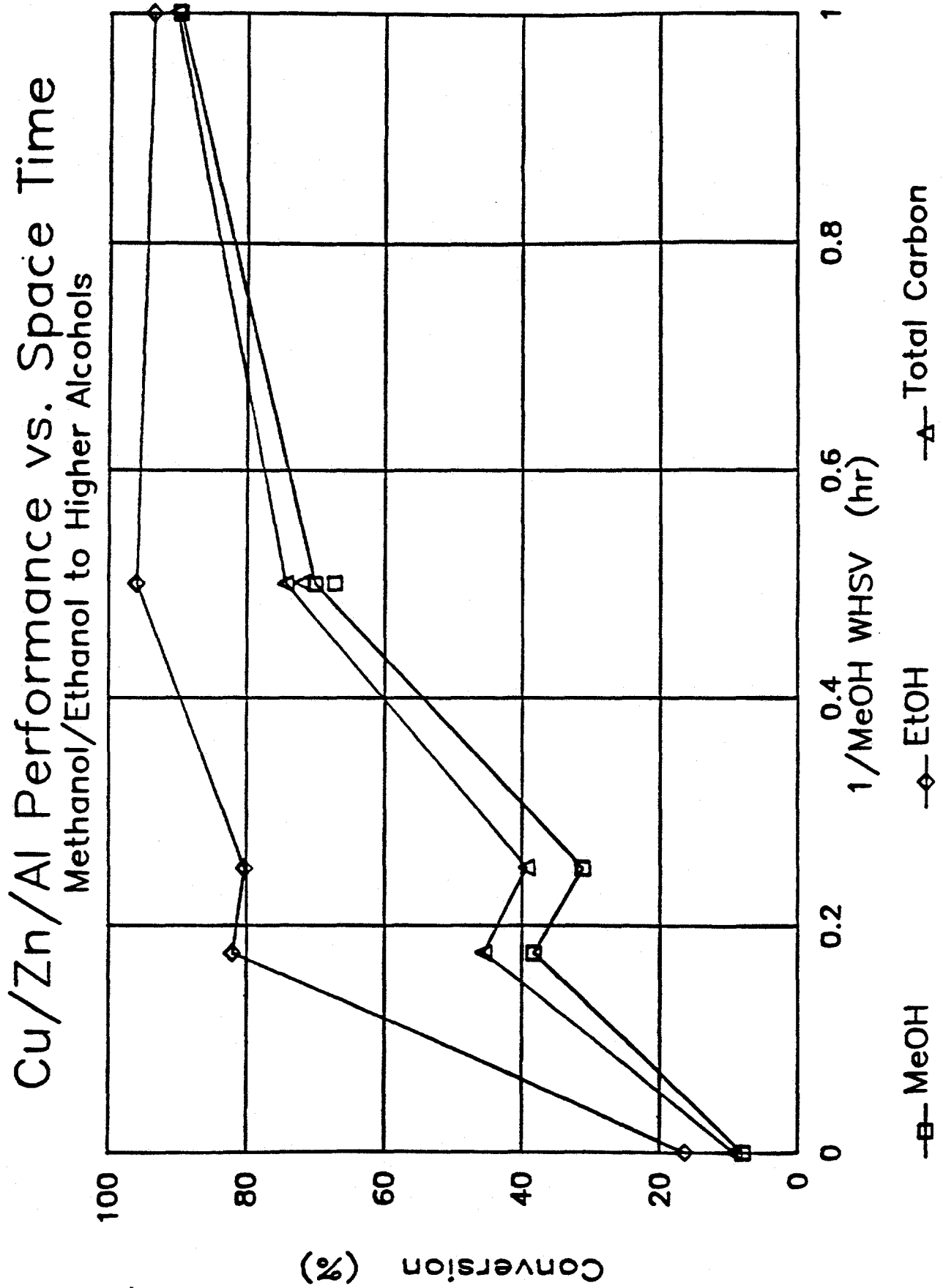


Figure 7.

Cu/Zn/Al Performance vs. Space Time Methanol/Ethanol to Higher Alcohols

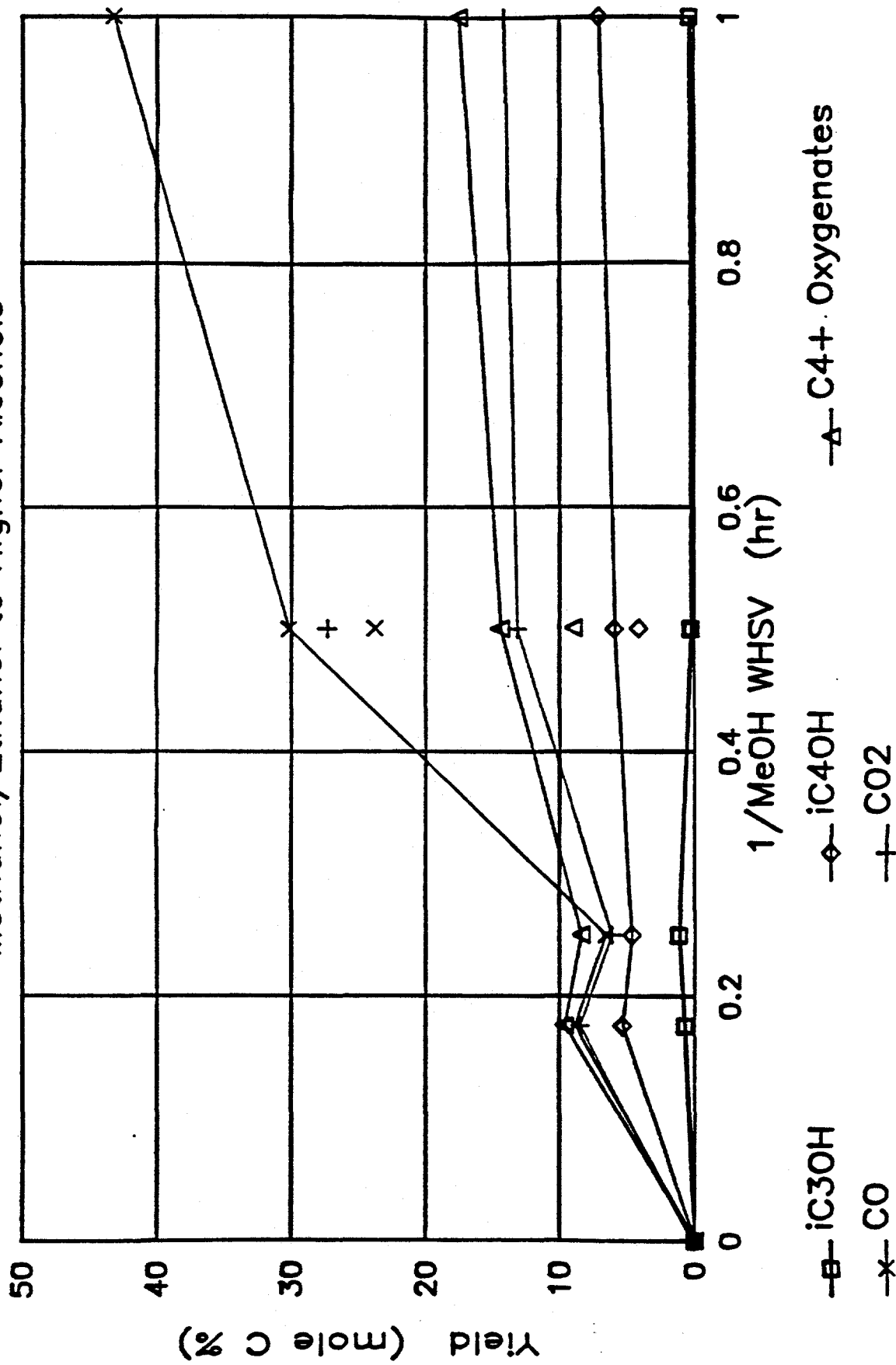


Figure 8.

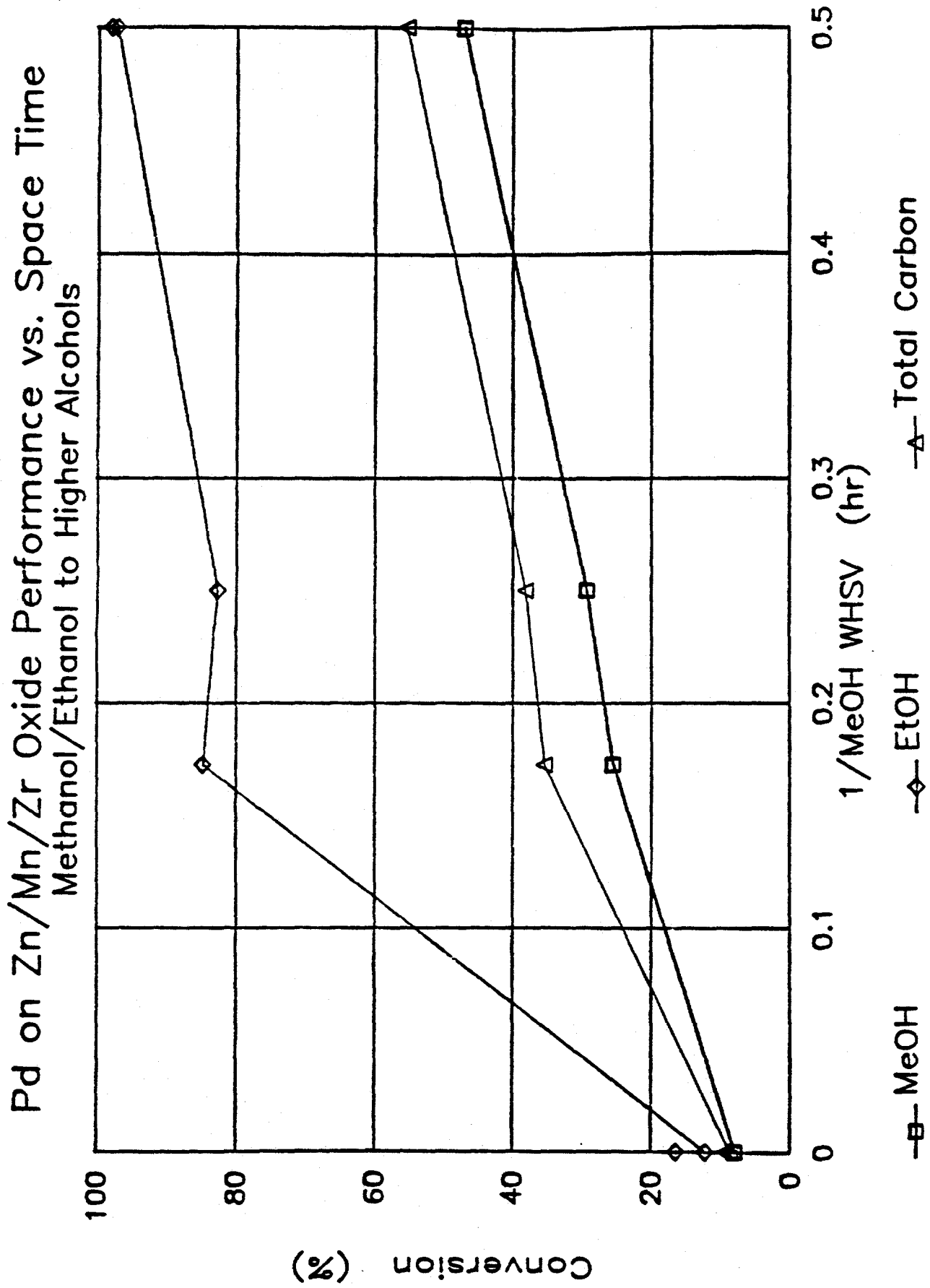


Figure 9.

Pd on Zn/Mn/Zr Oxide Performance vs. Space Time
Methanol/Ethanol to Higher Alcohols

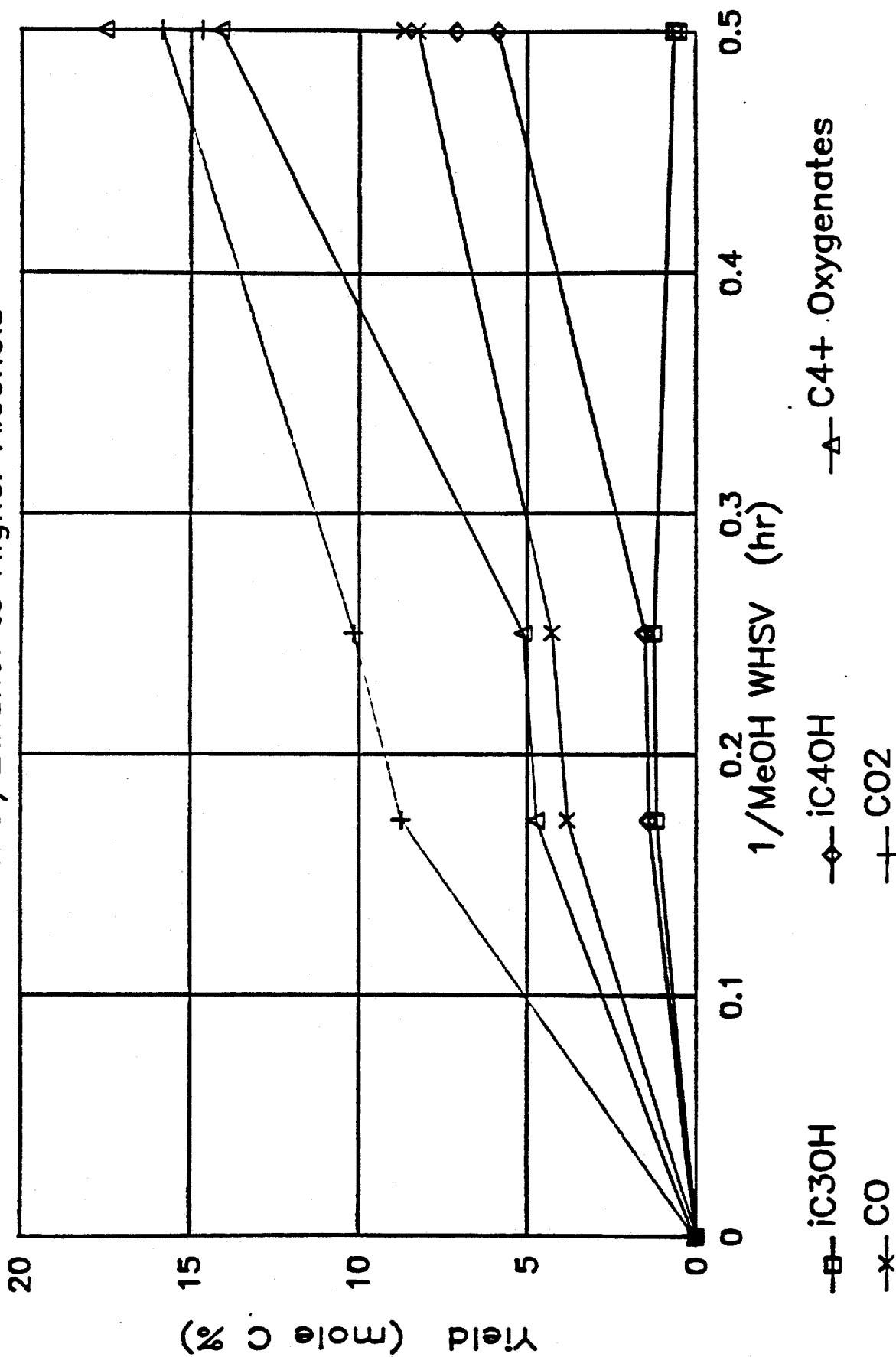


Figure 10.

Pt on Zn/Mn/Zr Oxide Performance vs. Space Time
Methanol/Ethanol to Higher Alcohols

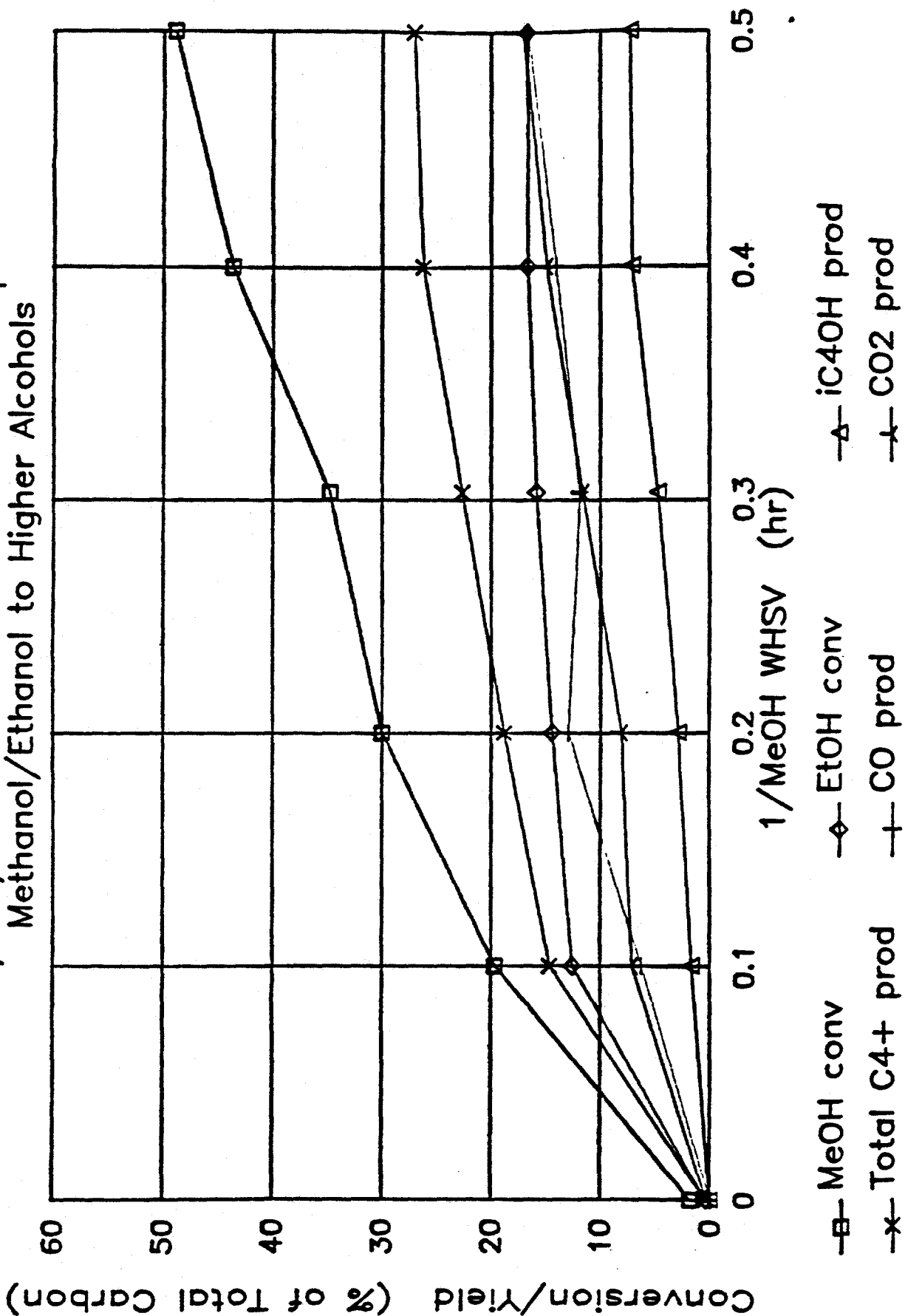


Figure 11.

Pt on Zn/Mn/Zr Oxide Performance vs. Space Time
Methanol/Ethanol to Higher Alcohols

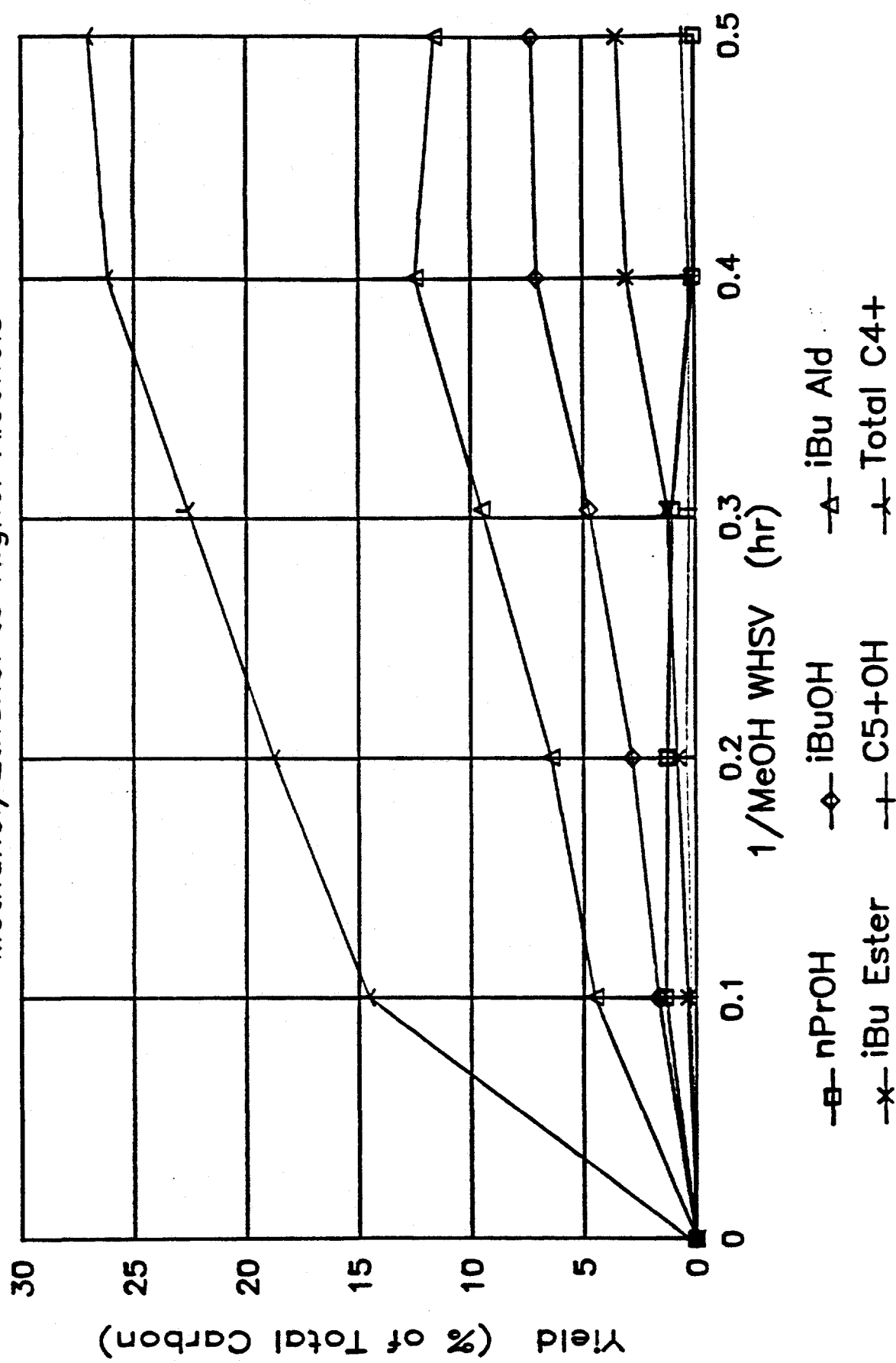


Figure 12.

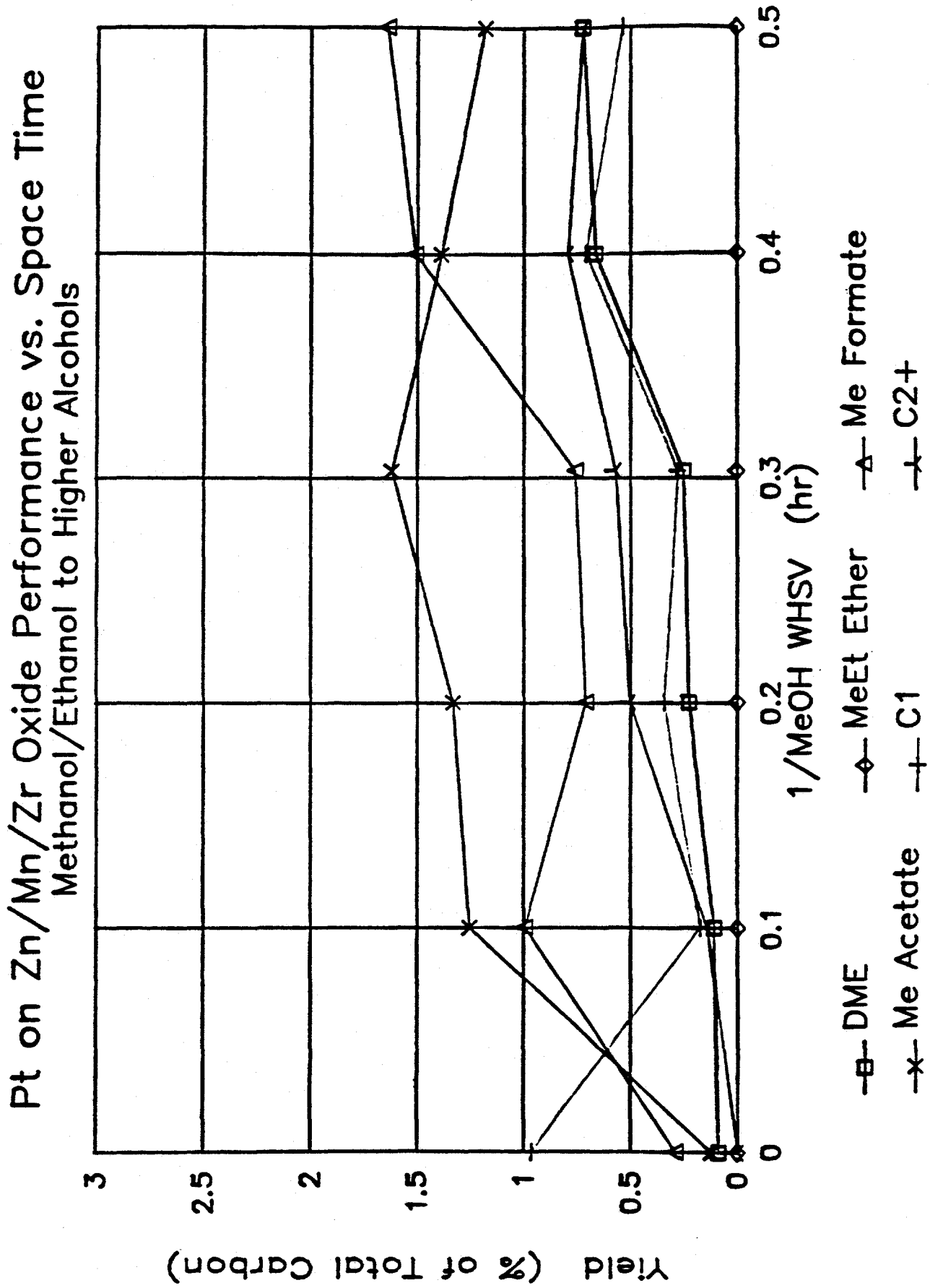


Figure 13.

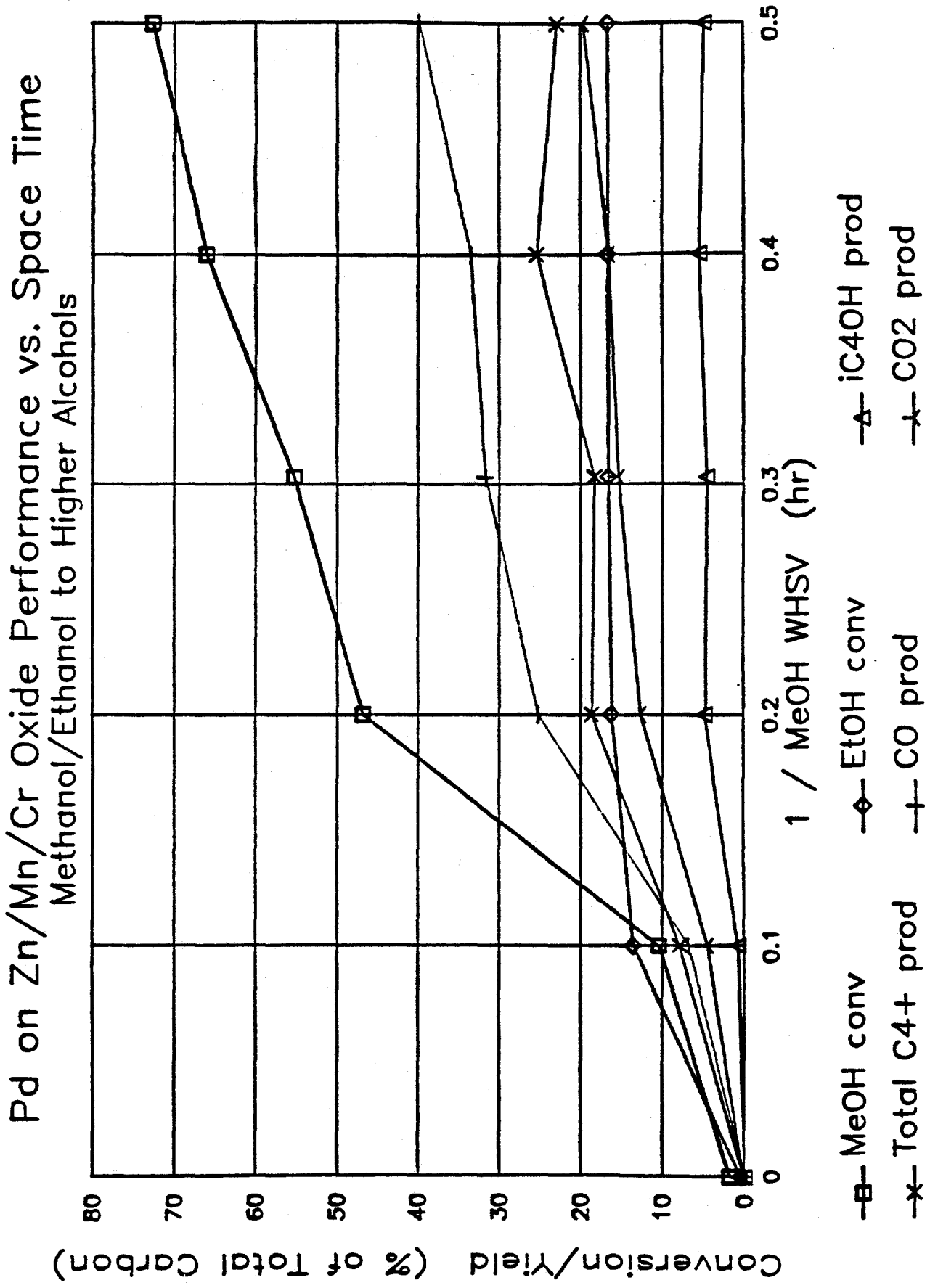
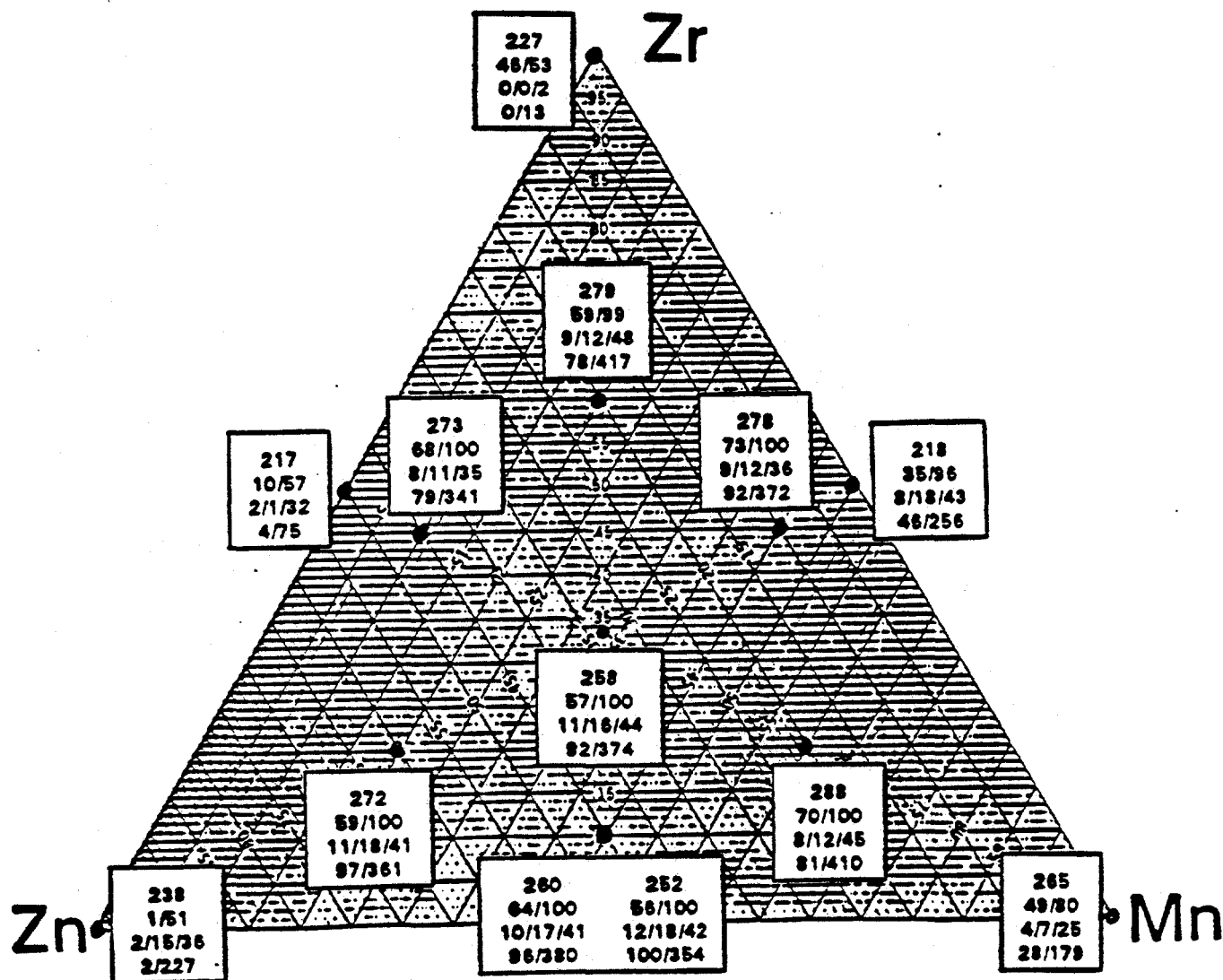


Figure 14.

2% Pt on Zn/Mn/Zr Oxide Catalysts Effect of Support Composition

Testing Conditions: 350 °C, 30 psig, 2 hr⁻¹ MeOH WHSV,
1/0.1/2 MeOH/EtOH/N₂ (molar)

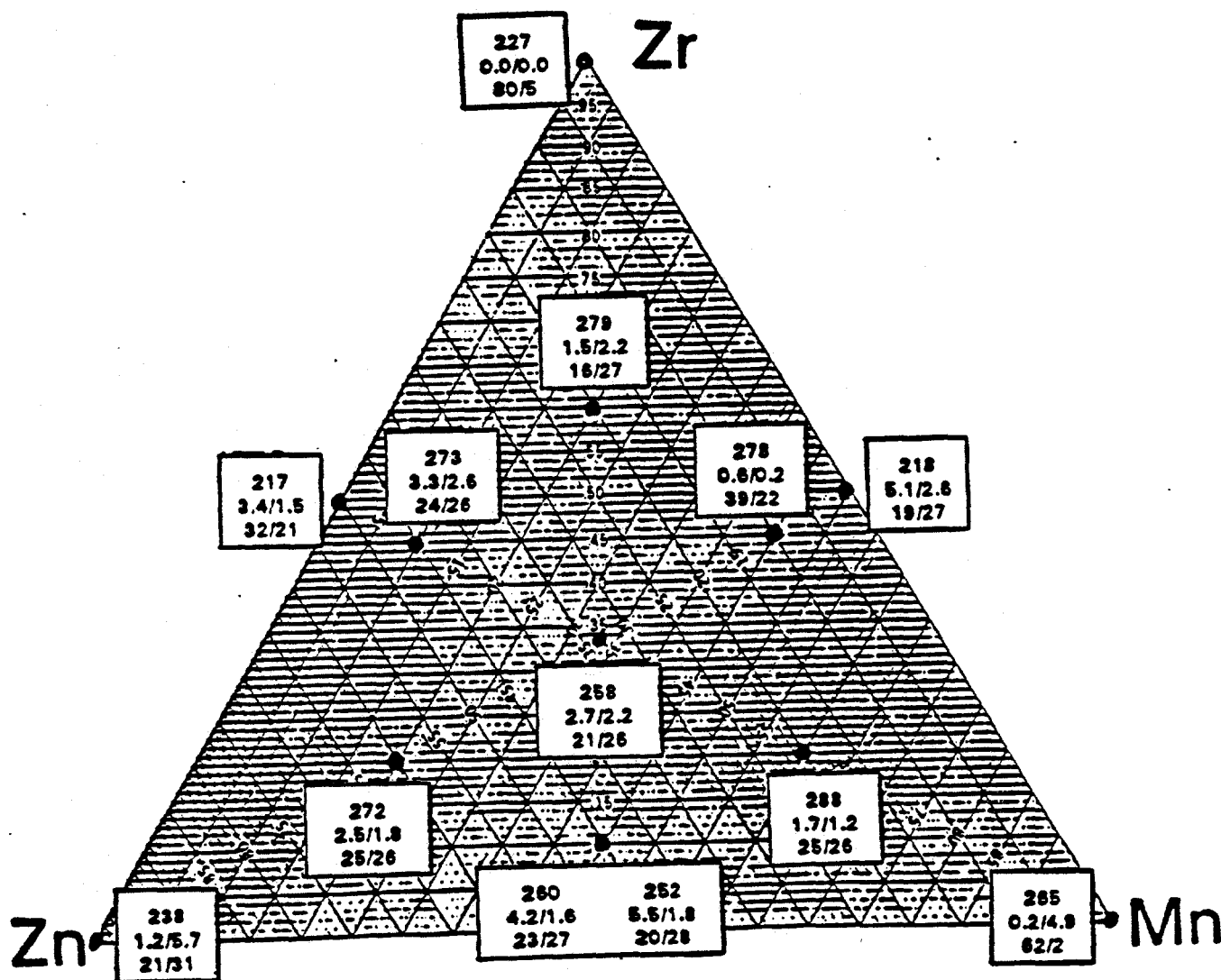


Run Number
MeOH/EtOH Conversions (%)
iC₄OH/iC₄ Ald/Sum C₄₊ Selectivities (mole %)
iC₄OH/Sum C₄₊ Productivities (g/kg cat/hr)

Figure 15.

2% Pt on Zn/Mn/Zr Oxide Catalysts Effect of Support Composition

Testing Conditions: 350 °C, 30 psig, 2 hr⁻¹ MeOH WHSV,
1/0.1/2 MeOH/EtOH/N₂ (molar)

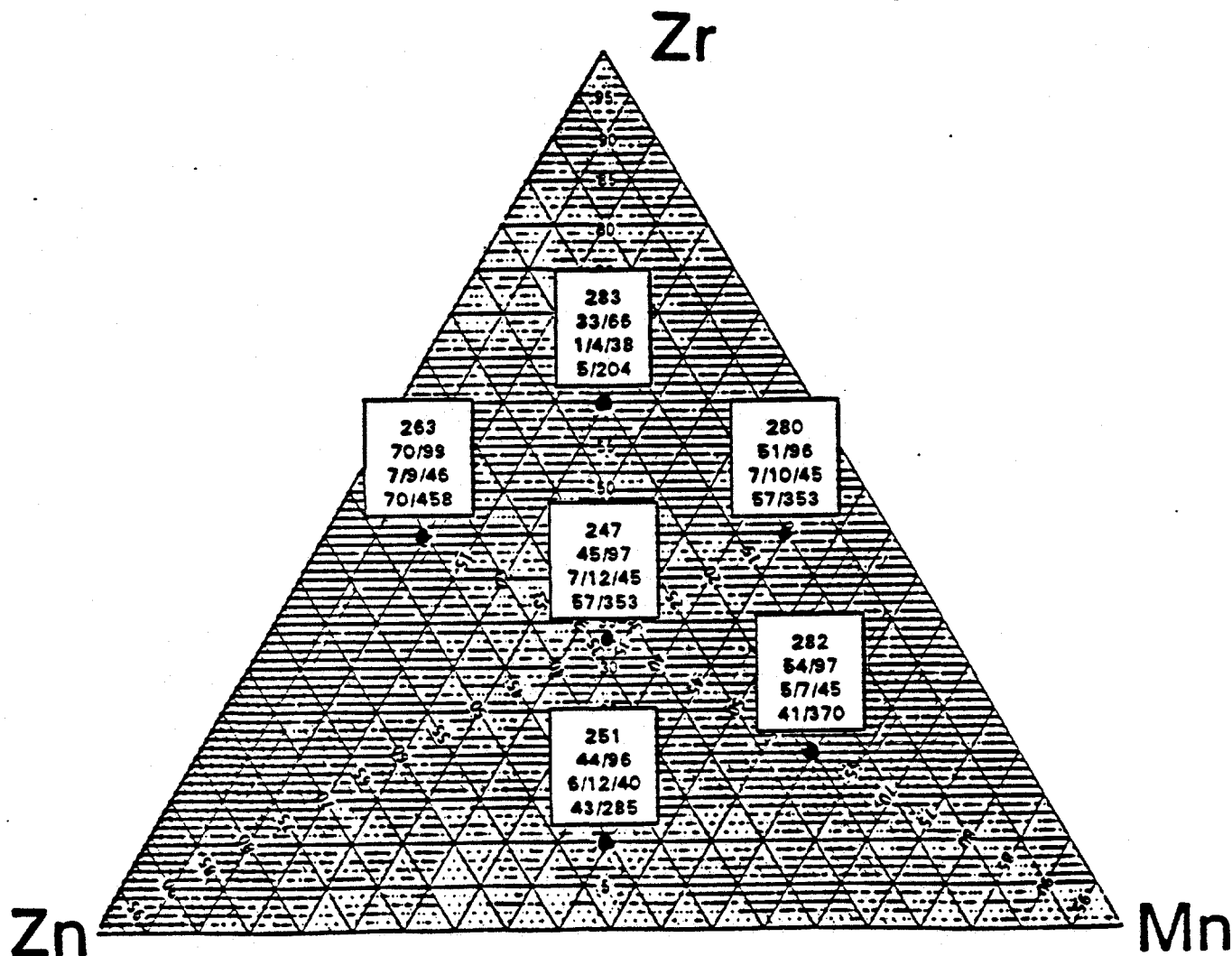


Run Number
Me Formate/Me Acetate Selectivities (mole %)
CO/CO₂ Selectivities (mole %)

Figure 16.

2% Pd on Zn/Mn/Zr Oxide Catalysts Effect of Support Composition

Testing Conditions: 350 °C, 30 psig, 2 hr⁻¹ MeOH WHSV,
1/0.1/2 MeOH/EtOH/N₂ (molar)

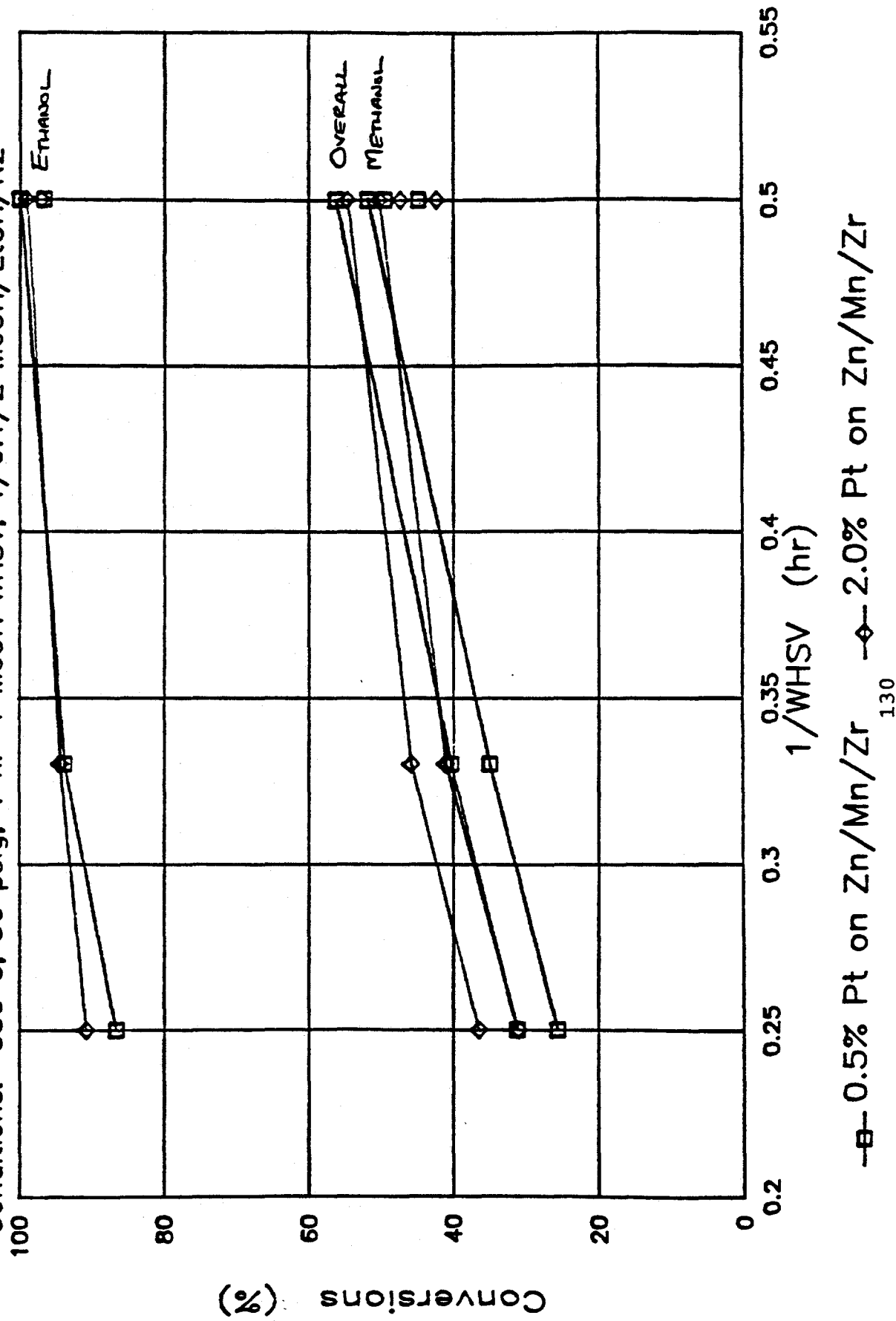


Run Number
MeOH/EtOH Conversions (%)
iC₄OH/iC₄ Ald/Sum C₄₊ Selectivities (mole %)
iC₄OH/Sum C₄₊ Productivities (g/kg cat/hr)

Figure 17.

Effect of Pt Loading on Catalyst Performance

Conditions: 350 C, 30 psig, 1 hr-1 MeOH WHSV, 1/0.1/2 MeOH/EtOH/N₂



—□— 0.5% Pt on Zn/Mn/Zr —◇— 2.0% Pt on Zn/Mn/Zr

Figure 18.

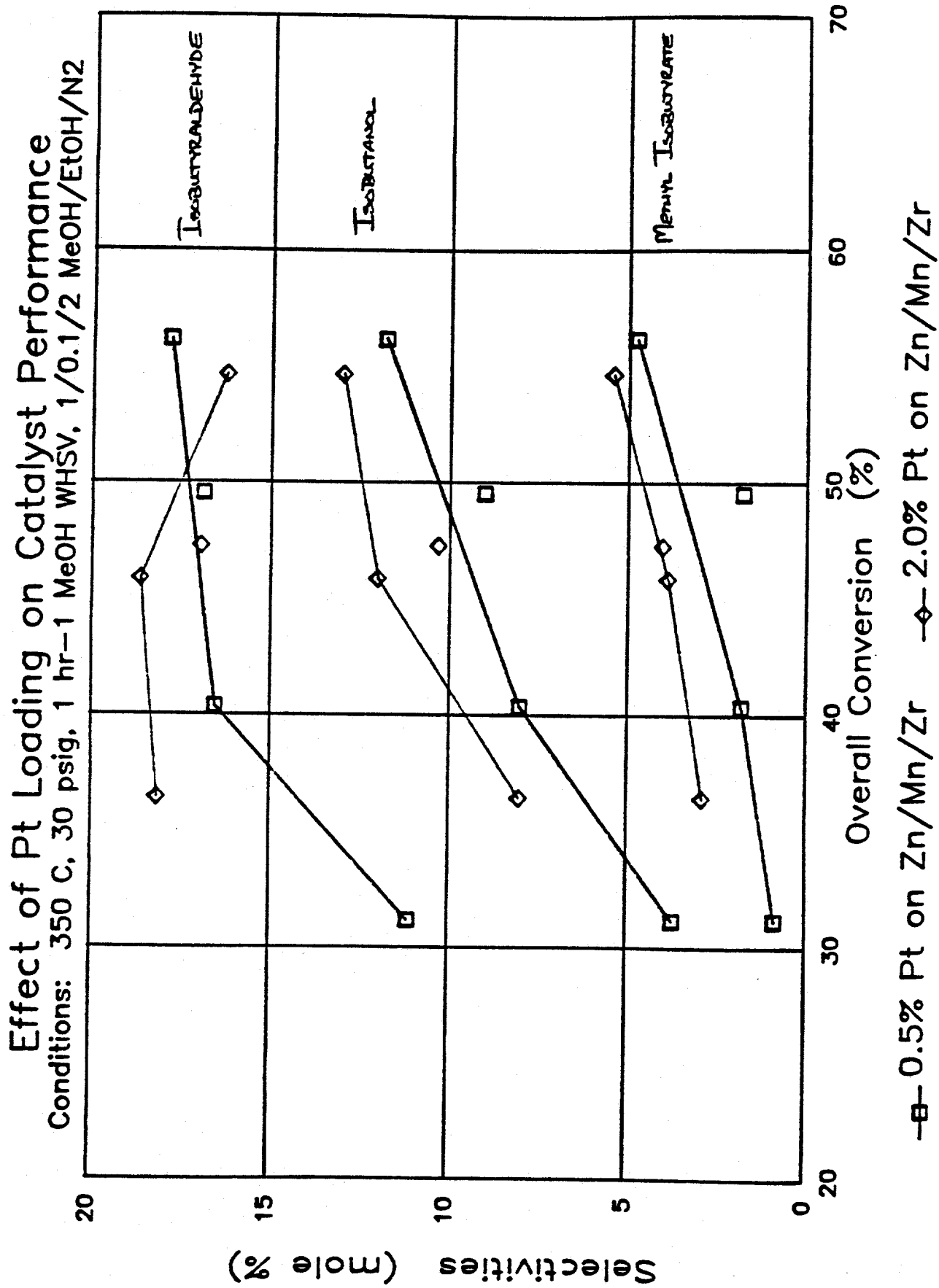


Figure 19.

Comparison of MeOH/EtOH and MeOH-only Feeds

Conditions: 350 C. 30 psig. 2 hr-1 MeOH WHSV. 1/0.1/2 or 1/0/2 MeOH/EtOH/N₂ (molar)

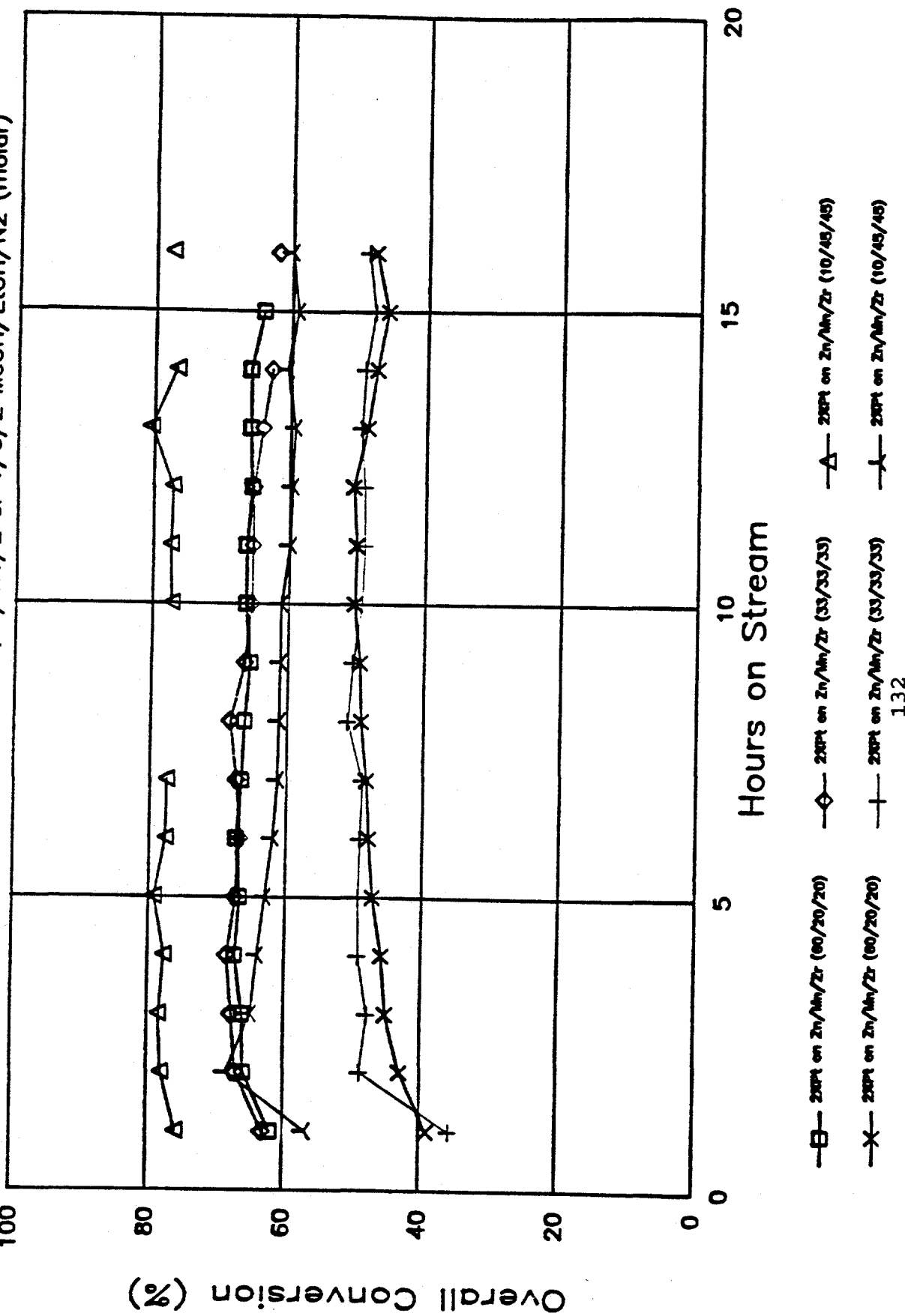


Figure 20.

Comparison of MeOH/EtOH and MeOH-only Feeds
 Conditions: 350 C. 30 psig. 2 hr--1 MeOH WHSV. 1/0.1/2 or 1/0/2 MeOH/EtOH/N₂ (molar)

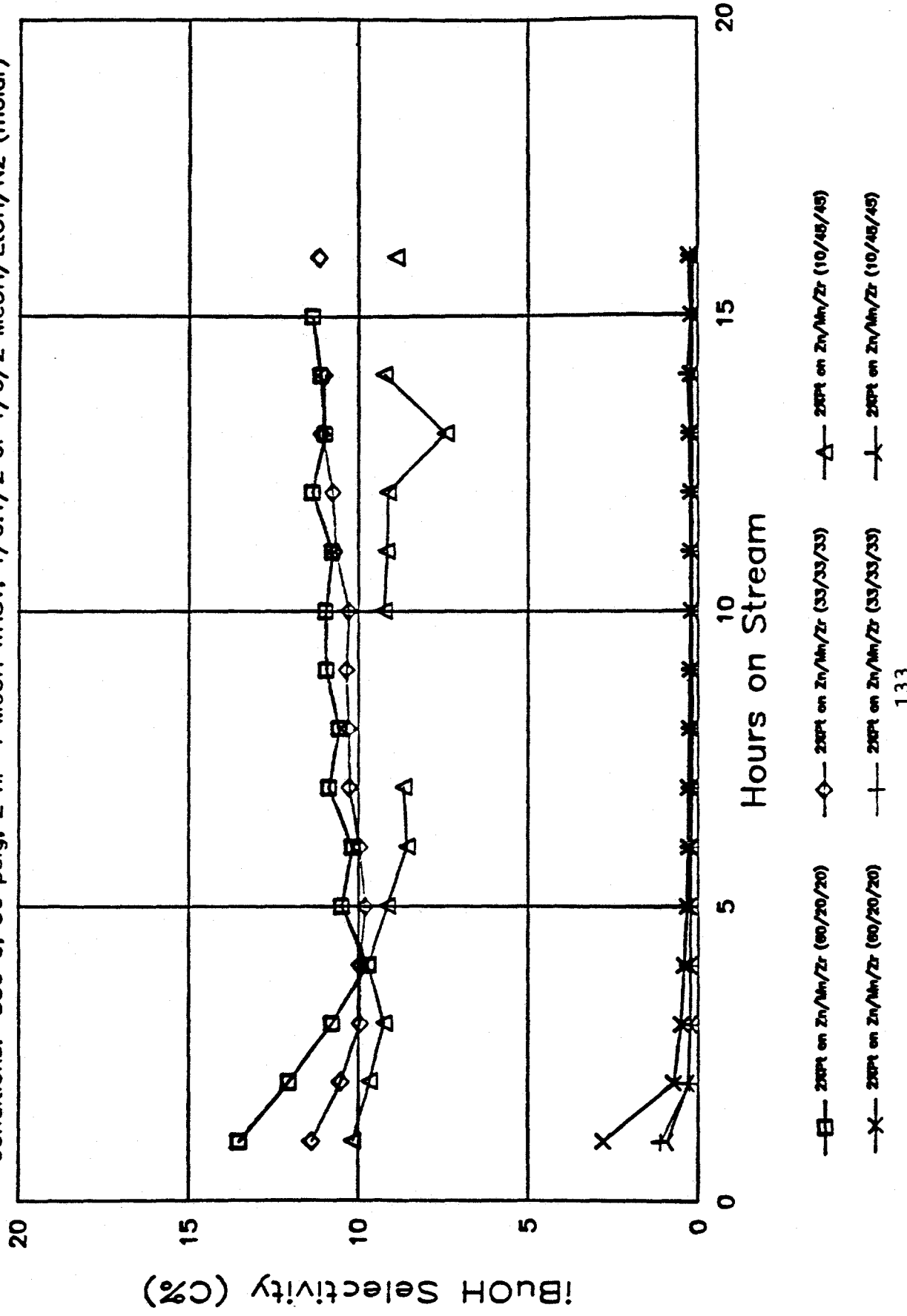
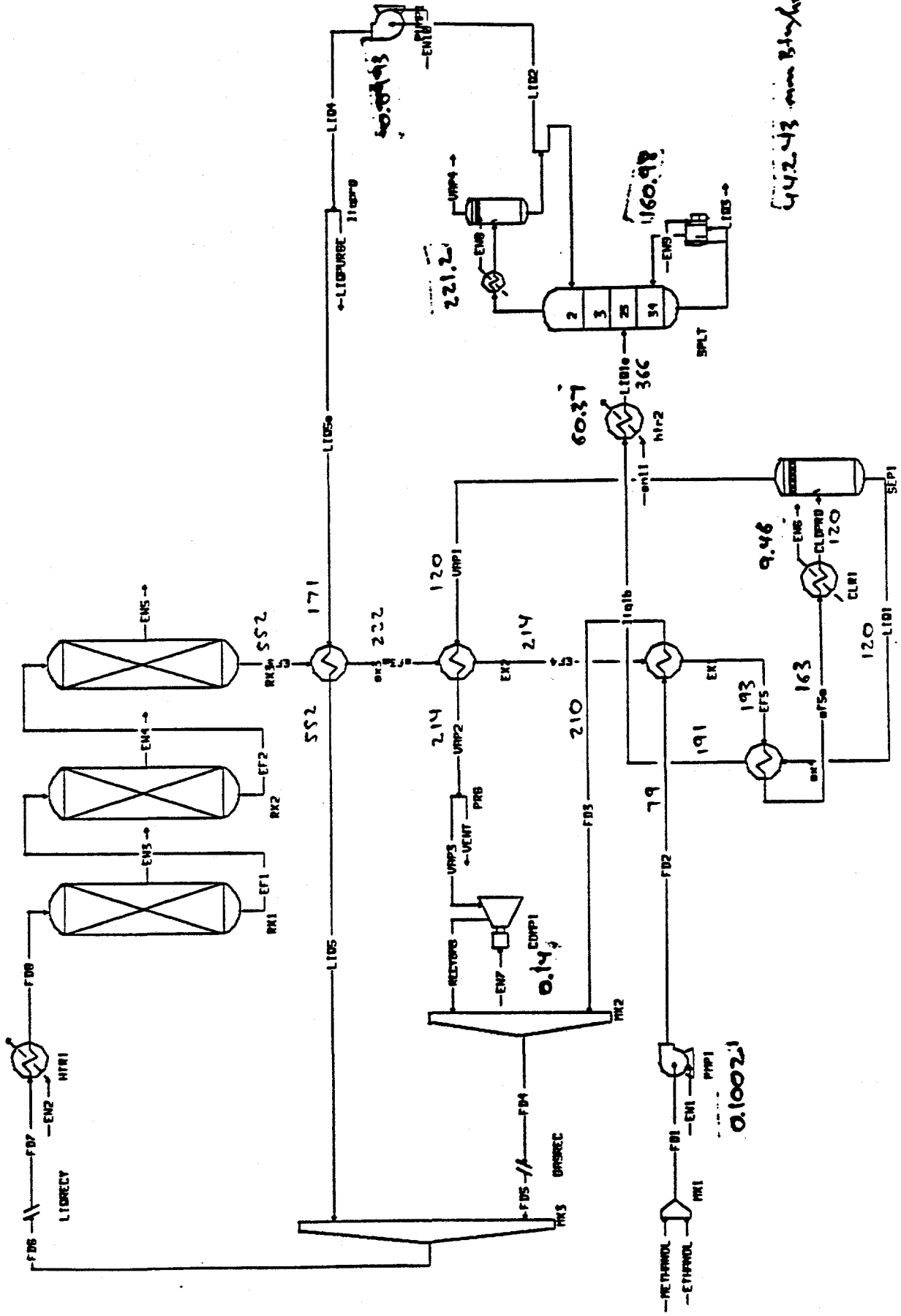


Figure 21.

44.08

DOE120 #H. SIM

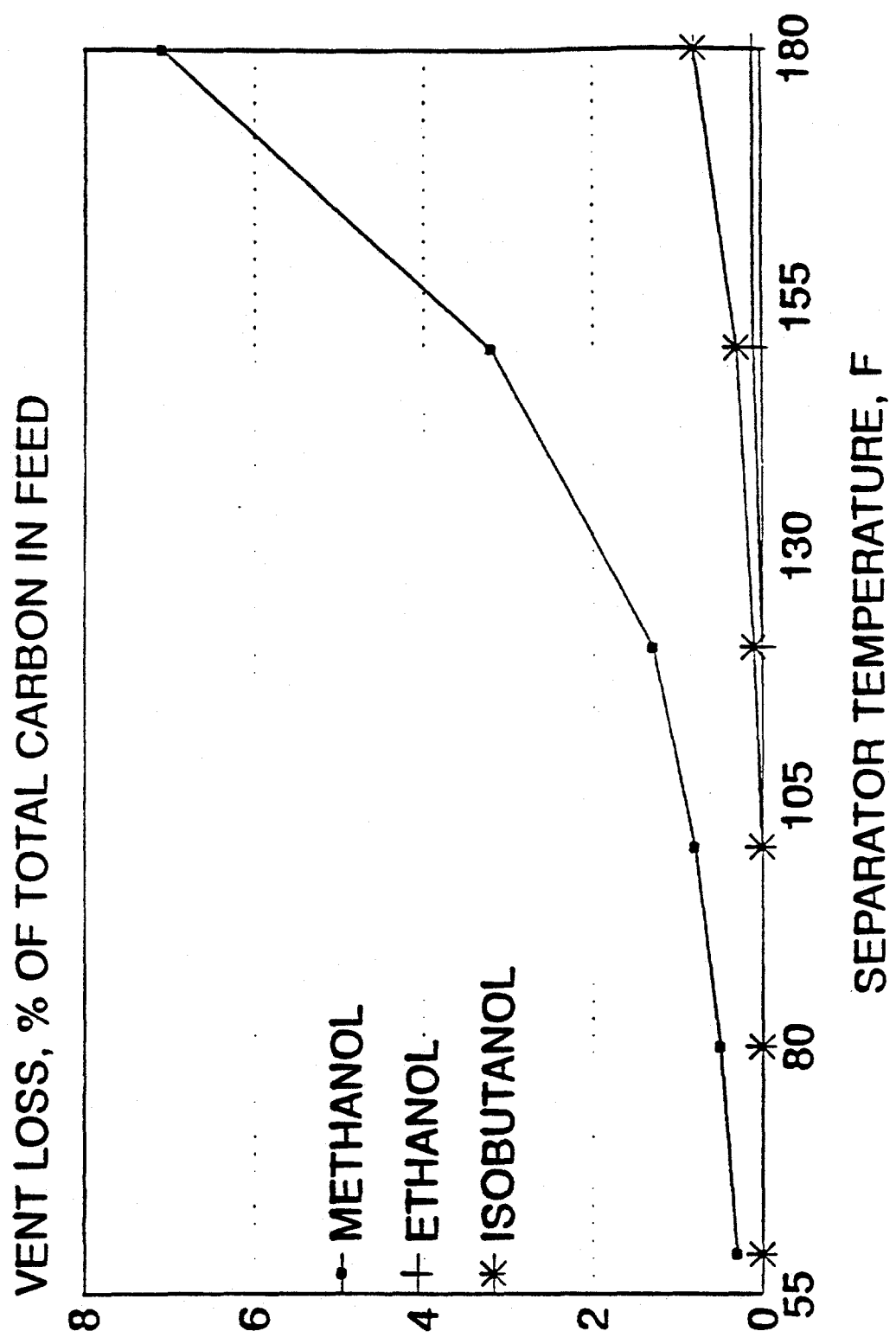


44243 min Blyker

Figure 22.

VENT LOSSES VS SEPARATOR TEMPERATURE

DOE ISOBUTANOL SYNTHESIS SIMULATION

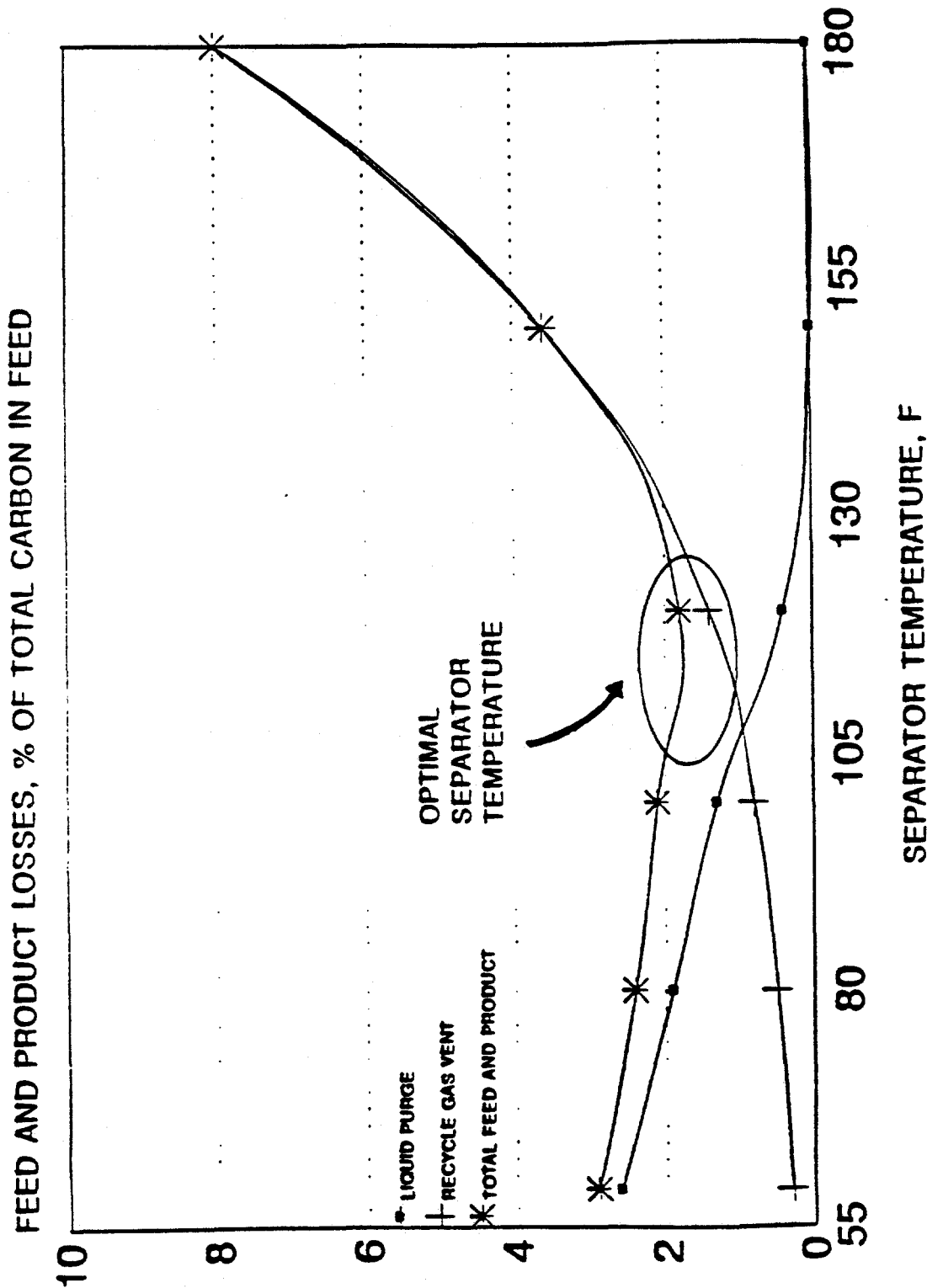


250 psig separator pressure, 7/1 MeOH/EtOH and 1/25 psia H₂ partial pressure in combined feed

Figure 23.

LIQUID PURGE, VENT, AND TOTAL FEED & PROD LOSSES vs SEPARATOR TEMPERATURE

DOE ISOBUTANOL SYNTHESIS SIMULATION

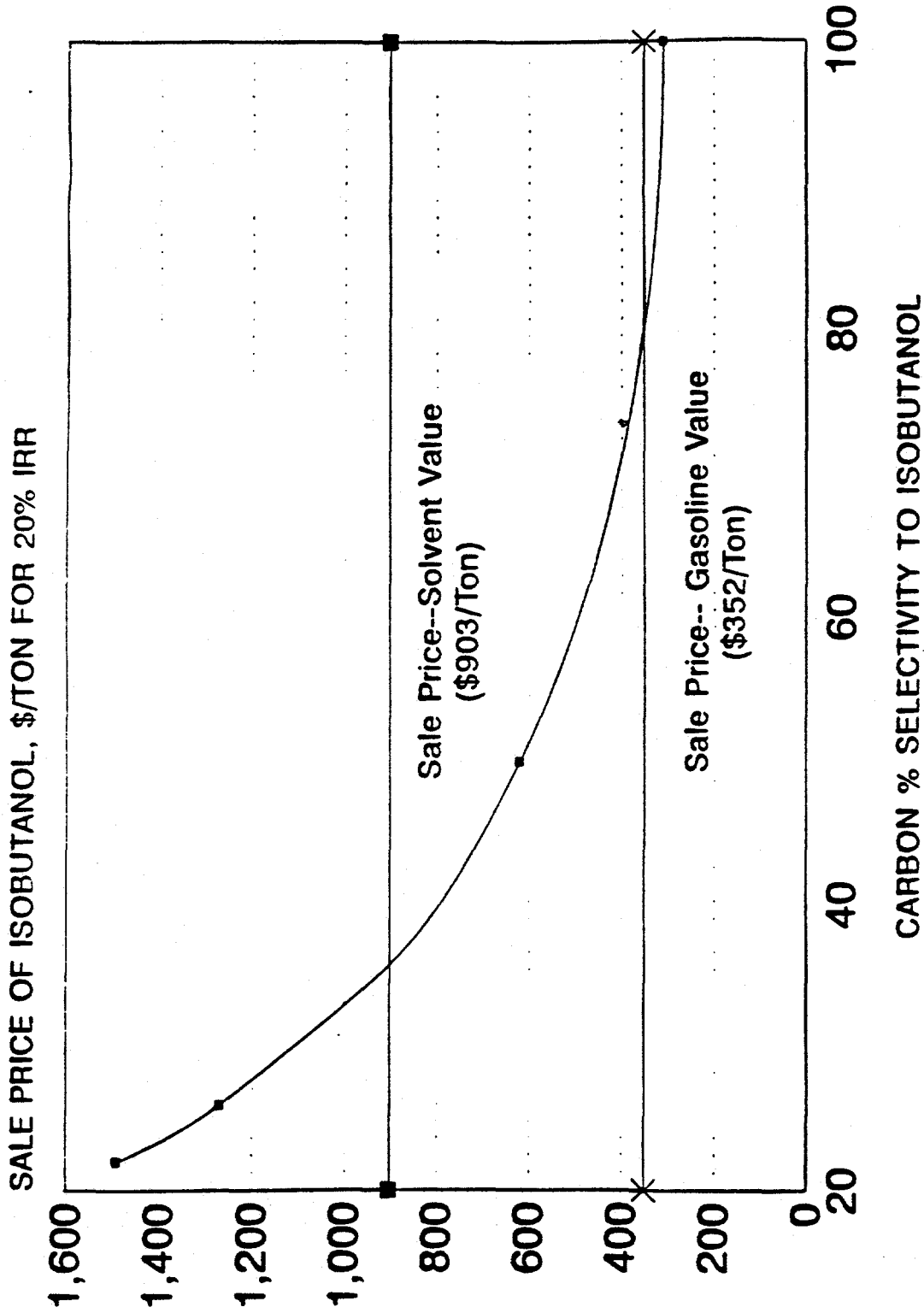


250 psig separator pressure, 7/1 MeOH/EtOH and 25 psia H₂ partial pressure in combined feed

Figure 24.

PRODUCT PRICE NEEDED FOR 20% INTERNAL RATE OF RETURN vs SELECTIVITY

DOE ISOBUTANOL SYNTHESIS ECONOMICS



Base Case = 22.1% Carbon Selectivity to Isobutanol from Pilot Plant Studies