Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total								
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio								
Elemental analyses, wt%:								
C		89.93	89.0	89.6				
H		8.84	9.44	9.34				
N		0.51	0.50	0.33				
S		0.07		0.04				
O								
Trace metal analyses, ppm:								
V								
Ni								
Na								
K								
Mg								
Ca								
Pb								
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								

[Data from ref. 23.]

Property	Test	Distillate categories						
		Heavy naphtha		Fuel oil				
		Raw liquid	Hydrotreated liquid	Raw liquid	Hydrotreated liquid			
Gravity, °API (specific)		----(0.87)	----(0.80)	----(1.08)	----(1.01)			
Boiling range:	Nominal	158 - 392	158 - 392	392 - 1000	392 - 1000			
Initial boiling point, °F								
5 %								
10 %		223	198	477	462			
20 %	15/5							
30 %	Distillation							
40 %	D-2892							
50 %		356	315	694	657			
60 %								
70 %								
80 %								
90 %		390	360	811	774			
95 %								
Final boiling point, °F								
Pour point, °F								
Flashpoint, °F								
Viscosity at °F								
at °F								
at °F								
Ash, wt%								
Ash: melt temperature, °F								
Heat of combustion, Btu/lb	Higher	18 300	19 300	17 100	18 100			
Carbon residue								
Carbon ramsbottom, wt%								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total								
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio								
Elemental analyses, wt%:								
C		85.60	86.80	89.40	90.80			
H		10.99	12.90	7.70	8.60			
N		0.21	0.06	0.66	0.24			
S		0.47	0.005	0.41	0.04			
O		2.82	0.23	1.83	0.32			
Trace metal analyses, ppm:								
V								
Ni								
Na								
K								
Mg								
Ca								
Pb								
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								

TABLE 12. - FUEL DATA FROM ZINC CHLORIDE PROCESS

[Data from ref. 24.]

Property	Test	Distillate categories						
		Total distillates			Run 25B data			
		Run 24	Run 26	Run 25B	18° - 392° F	392° F - 617° F	617° F - 887° F	
Gravity, °API (specific)								
Boiling range:								
Initial boiling point, °F				18P	18P	392	617	
5 %								
10 %								
20 %								
30 %								
40 %								
50 %								
60 %								
70 %								
80 %								
90 %								
95 %								
Final boiling point, °F				887	392	617	887	
Pour point, °F								
Flashpoint, °F								
Viscosity at °F								
at °F								
at °F								
Ash, wt %								
Ash: melt temperature, °F								
Heat of combustion, Btu/lb								
Carbon residue								
Carbon ramsbottom, wt %								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total								
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio								
Elemental analyses, wt%:								
C		91.37	90.17	89.74	90.58	89.09	89.40	
H		8.48	8.58	8.65	8.33	9.65	8.98	
N		0.0020	0.0194	0.0023	0.0018	0.0025	0.0060	
S		0.02	0.01	0.0	0.02	0.02	0.03	
O		0.11	1.22	1.61	1.06	1.23	1.58	
Trace metal analyses, ppm:								
V								
Ni								
Na								
K								
Mg								
Ca								
Pb								
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								
Cl		161.0	40.0	98.0				
Yields, wt%: C_3 - 329° F		34.0	34.55	43.93				
329° - 887° F		16.0	20.57	21.13				
>887° F		3.14	9.60	9.60				
H_2O		15.69	11.85	10.94				
Coke		8.86	10.85	7.14				

TABLE 13. - FUEL DATA FROM CO-STEAM PROCESS[a]

[Data from ref. 25.]

Property	Test	Distillate categories						
		11th run with 1% HCOOH	11th run with no additive	11th run with aged lignite and H_2O				
Gravity, °API (specific)								
Boiling range:								
Initial boiling point, °F								
5 %								
10 %								
20 %								
30 %								
40 %								
50 %								
60 %								
70 %								
80 %								
90 %								
95 %								
Final boiling point, °F								
Pour point, °F								
Flashpoint, °F								
Viscosity at 140°F, cS		190	598	12800				
at 180°F, cS		46.8	110	1030				
at °F								
Ash, wt%		0.05	0.03	0.01				
Ash: melt temperature, °F								
Heat of combustion, Btu/lb	Calculated	17 956	16 886	16 906				
Carbon residue								
Carbon ramabottom, wt%								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total								
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio								
Elemental analyses, wt%:								
C		88.6	89.8	89.5				
H		7.1	6.8	6.8				
N		1.1	1.1	1.1				
S		0.13	0.10	0.12				
O		3.0	3.2	2.8				
Trace metal analyses, ppm:								
V								
Ni								
Na								
K								
Mg								
Ca								
Pb								
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								

[a]Table 7 in reference. Operating conditions: 1 hr. at 430°C and 3000 psig; synthesis gas at 1:1 (H_2:CO); coal:oil, 9:30:70).

TABLE 34. - FUEL DATA FROM FLASH PYROLYSIS PROCESS

[Data from ref. 28; PDU run 120, 200 lb/hr.]

Property	Test	Distillate categories						
		#3912 (startup, 95.5% oil)	#4008 (end of run, 61.9% oil)					
Gravity, °API (specific)								
Boiling range:								
Initial boiling point, °F		406	411					
5 %								
10 %		495	540					
20 %		525	595					
30 %		556	660					
40 %		593	710					
50 %		620	745					
60 %								
70 %								
80 %								
90 %								
95 %								
Final boiling point, °F								
Pour point, °F								
Flashpoint, °F								
Viscosity at °F								
at °F								
at °F								
Ash, wt%		0.37	6.04					
Ash: melt temperature, °F								
Heat of combustion, Btu/lb								
Carbon residue								
Carbon ramsbottom, wt%								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total								
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio								
Elemental analyses, wt%:								
C		90.16	80.90					
H		6.15	6.18					
N		1.13	1.43					
S		0.56	0.54					
O	By difference	1.63	2.57					
Trace metal analyses, ppm:								
V								
Ni								
Na								
K								
Mg								
Ca								
Pb								
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								

TABLE 15. - FUEL DATA FROM CATALYTIC LIQUEFACTION OF PITTSBURGH SEAM BITUMINOUS AND WYOMING SUBBITUMINOUS COAL

[Data from ref. 22.]

Property	Test	Distillate categories						
		Pittsburgh seam	Wyoming Big Horn					
Gravity, °API (specific)								
Boiling range:								
Initial boiling point, °F		130	130					
5 %								
10 %								
20 % 25.2%		470						
30 % 28.3%			470					
40 %								
50 %								
60 %								
70 %								
80 %								
90 %								
95 %								
Final boiling point, °F								
Pour point, °F								
Flashpoint, °F								
Viscosity at °F								
at °F								
at °F								
Ash, wt %								
Ash: melt temperature, °F								
Heat of combustion, Btu/lb								
Carbon residue								
Carbon ramsbottom, wt %								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:[a]		<470	>470	<470	>470				
Saturates		14.2	1.8	14.0	3.6				
Olefins		0.2		0.1					
Aromatics, total		10.8	16.2	14.2	58.3				
Aromatics, polynuclear			30.3		49.3				
Luminometer number									
Aniline point, °F									
H/C atom ratio									
Elemental analyses, wt%:									
C		89.05		89.18					
H		8.18		8.97					
N		0.82		0.40					
S		0.17		0.04					
O		1.47		1.03					
Trace metal analyses, ppm:									
V									
Ni									
Na									
K									
Mg									
Ca									
Pb									
Cu									
Fe									
Si									
Zn									
Ba									
Mn									
Mo									
W									
Ti									

[a]More detailed analyses of various fractions contained in report.

[Data from ref. 13.]

Property	Test	Distillate categories						
		Sea Coal						
Gravity, °API (specific)		18.4						
Boiling range:								
Initial boiling point, °F		<300						
5 %								
10								
20 %		318						
30 %								
40 %		460						
50 %								
60 %								
70 %		572						
80 %								
90 %		760						
95 %								
Final boiling point, °F		875						
Pour point, °F		55						
Flashpoint, °F		145						
Viscosity at 100 °F, cS		9.78						
at °F								
at °F								
Ash, wt %		0.02						
Ash: melt temperature, °F								
Heat of combustion, Btu/lb	Lower	17 782						
Carbon residue		2.59						
Carbon ramsbottom, wt %								
Thermal stability								
Electrical conductivity								
Water								
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total		47.0						
Aromatics, polynuclear		12.0						
Luminometer number								
Aniline point, °F		Too dark						
H/C atom ratio		1.32						
Elemental analyses, wt%:								
C								
H								
N		0.403						
S		0.02						
O								
Trace metal analyses, ppm:								
V		<5.3						
Ni								
Na		342.0						
K		2.49						
Mg		2.36						
Ca		12.7						
Pb		<0.53						
Cu								
Fe								
Si								
Zn								
Ba								
Mn								
Mo								
W								
Ti								

TABLE 17. - PROPOSED SPECIFICATIONS FOR TYPICAL SYNCRUDE

(Data from ERDA RFP-EF-77-R-01-2674, June 6, 1977.)

Property	Test	Distillate categories						
Gravity, °API (specific)		17 - 25						
Boiling range:								
Initial boiling point, °F								
5 %								
10 %								
20 %								
30 %								
40 %								
50 %								
60 %								
70 %								
80 %								
90 %								
95 %								
Final boiling point, °F								
Pour point, °F		20 - 70						
Flashpoint, °F		140 - 160						
Viscosity at 100 °F, cS		10 - 20						
at °F								
at °F								
Ash, wt%		0.01 - 0.07						
Ash; melt temperature, °F		1800 - 1900						
Heat of combustion, Btu/lb		[b] 17 500 - 18 500						
Carbon residue		0.25 - 1.50						
Carbon ramsbottom, wt%								
Thermal stability								
Electrical conductivity								
Water		<0.1						
Sediment								
Neutrality								
Corrosion								

Hydrocarbon type:								
Saturates								
Olefins								
Aromatics, total		30 - 50						
Aromatics, polynuclear								
Luminometer number								
Aniline point, °F								
H/C atom ratio		1.6 - 1.9						
Elemental analyses, wt%:								
C								
H								
N		0.1 - 0.8						
S		<0.9						
O								
Trace metal analyses, ppm:								
V		0.1 - 0.2[b]						
Ni		0.2 - 0.3						
Na		1.3 - 2.5						
K		0.9 - 0.6						
Mg								
Ca		1 - 10						
Pb		0.1 - 2						
Cu		0.2 - 0.3						
Fe		3 - 5						
Si		0.50 - 0.60						
Zn		1 - 2						
Na								
Mn								
Mo								
W								
Ti								

[a]Range of properties assumed to be after water-wash cleanup.

[b]Inconsistent with gravity range.

TABLE 18. - FUEL DATA FROM LOW-Btu GAS

(a) Low-Btu coal gas; data from ref. 27, p. 6

Property	Typical ranges			
Composition, vol%:				
H_2	12 - 16			
CO	2 - 32			
CO_2	0.5 - 10			
H_2S				
NH_3				
CH_4	0.5 - 4.5			
Other hydrocarbons				
N_2	30 - 55			
COS				
Specific gravity	0.8 - 0.92			
Average molecular weight				
Heating value, Btu/ft^3:				
Gross	110 - 165			
Net				
Gross with CO_2, H_2S, and NH_3 removed				
Net with CO_2, H_2S, and NH_3 removed				
Sulfur, ppm				
Alkali metals and sulfur, ppm				
Water, vol. %				
Solids, ppm				
Solids: particle size, μm				
Flammability limit ratio				

TABLE 18. – Continued.

(b) Typical low-Btu gas, from air-blown gasifiers; data from ref. 28

Property				
Composition, vol%:				
H_2	17.0			
CO	28.3			
CO_2	4.5			
H_2S				
NH_3				
CH_4	3.0			
Other hydrocarbons				
N_2	47.2			
COS				
Specific gravity				
Average molecular weight				
Heating value, Btu/ft^3:				
Gross	175.0			
Net				
Gross with CO_2, H_2S, and NH_3 removed				
Net with CO_2, H_2S, and NH_3 removed				
Sulfur, ppm				
Alkali metals and sulfur, ppm				
Water, vol. %				
Solids, ppm				
Solids: particle size, μm				
Flammability limit ratio				

TABLE 16. - Continued.

(c) Typical fixed-bed gasifier composition (raw gas out of gasifier); data from ERDA RFP-EF-77-R-01-2674, June 6, 1977

Property				
Composition, vol %:				
H_2	19.93			
CO	12.56			
CO_2	13.75			
H_2S	0.57			
NH_3	0.23			
CH_4	4.58			
Other hydrocarbons	0.40			
N_2	37.63			
COS	0.06			
Specific gravity				
Average molecular weight				
Heating value, Btu/ft^3:				
Gross	163.8			
Net				
Gross with CO_2, H_2S, and NH_3 removed				
Net with CO_2, H_2S, and NH_3 removed				
Sulfur, ppm				
Alkali metals and sulfur, ppm				
Water, vol. %				
Solids, ppm lb dust/lb gas	~0.049			
Solids: particle size, μm	(a)			
Flammability limit ratio				
H_2O	10.19			

[a]Less than 5 percent of solids smaller than 2 μm.

TABLE 18. - Continued.

(d) Molten-salt gasification; data from ref. 29

Property	Raw fuel gas (p.42)	Hot-wall gasification (p.35)	Cold-wall gasification (p.35)	Study assumption (Illinois #6 coal) (p.17)
Composition, vol %:				
H_2	13.79	13.175-14.337	12.658-13.173	12.57
CO	28.33	27.77-29.413	26.279-27.989	26.398
CO_2	3.08	1.735-2.667	2.599-3.217	3.322
H_2S	0.10	0.007-0.016	0.014-0.028	0.009
NH_3				
CH_4	1.50	1.518-2.028	1.266-2.037	1.850
Other hydrocarbons				
N_2	50.85	50.848-51.905	51.991-52.868	53.01
COS		0.005-0.011	0.010-0.019	0.007
Specific gravity				
Average molecular weight				
Heating value, Btu/ft^3:				
Gross				
Net		143.9-149.7	129.6-144.7	
Gross with CO_2, H_2S, and NH_3 removed				
Net with CO_2, H_2S, and NH_3 removed				
Sulfur, ppm				
Alkali metals and sulfur, ppm				
Water, vol. %	2.35	2.041-2.44	2.164-3.130	2.837
Solids, ppm				
Solids: particle size, μm				
Flammability limit ratio				

TABLE 18. - Continued.

(e) Typical gaseous fuels; data from ref. 30

Property	Blast furnace gas	Producer gas (coke)	Producer gas (coal)	
Composition, vol%:				
H_2	2.0	11.0	12.0	
CO	27.0	29.0	29.0	
CO_2	11.0	5.0	4.0	
H_2S				
NH_3				
CH_4	—	0.5	2.6	
Other hydrocarbons	—	—	.4	
N_2	60.0	54.5	52.0	
COS				
Specific gravity				
Average molecular weight				
Heating value, Btu/ft^3:				
Gross	91.2	131.5	166.4	
Net				
Gross with CO_2, H_2S, and NH_3 removed				
Net with CO_2, H_2S, and NH_3 removed				
Sulfur, ppm				
Alkali metals and sulfur, ppm				
Water, vol. %				
Solids, ppm				
Solids: particle size, μm				
Flammability limit ratio				