

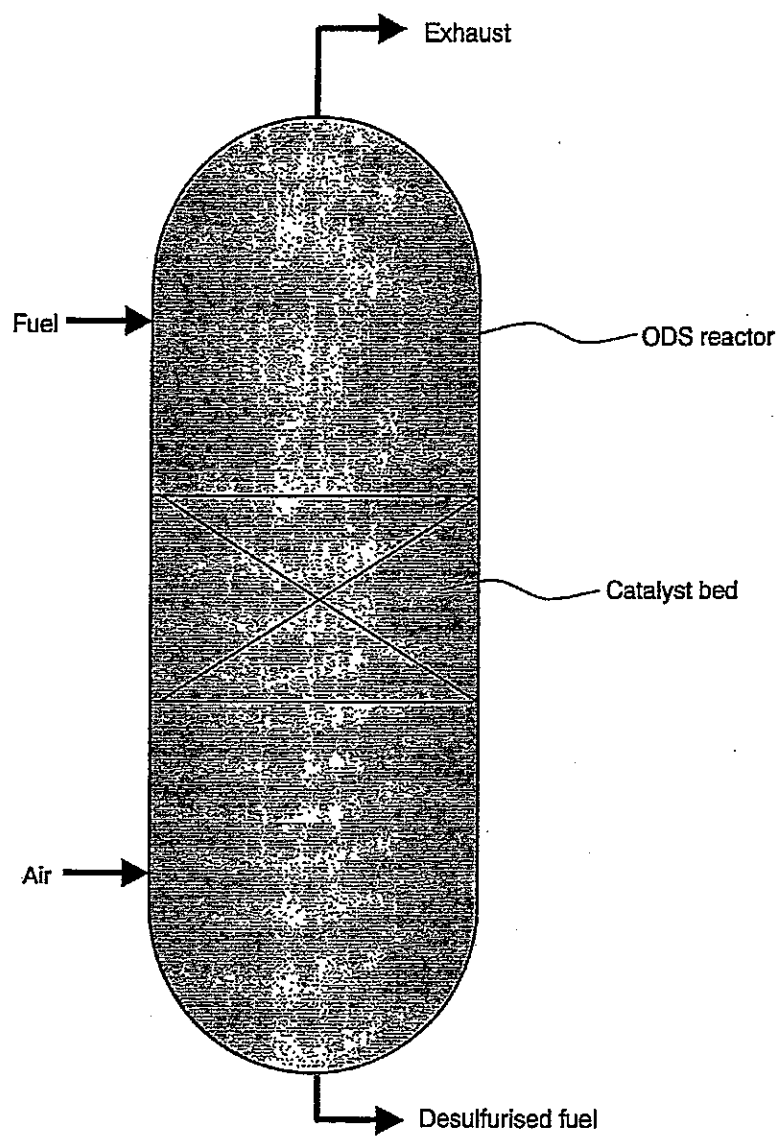


FIGURE 1

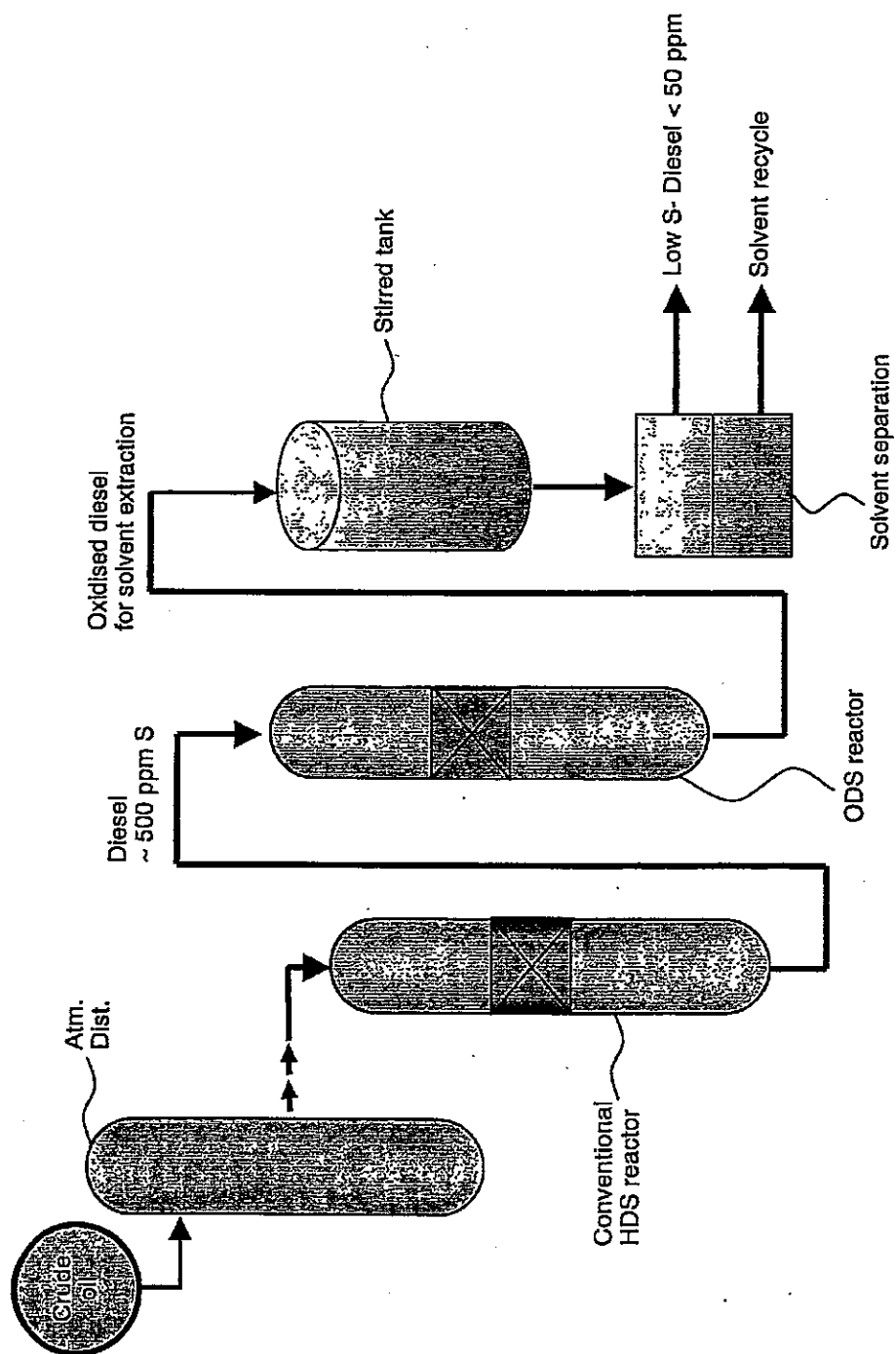


FIGURE 2

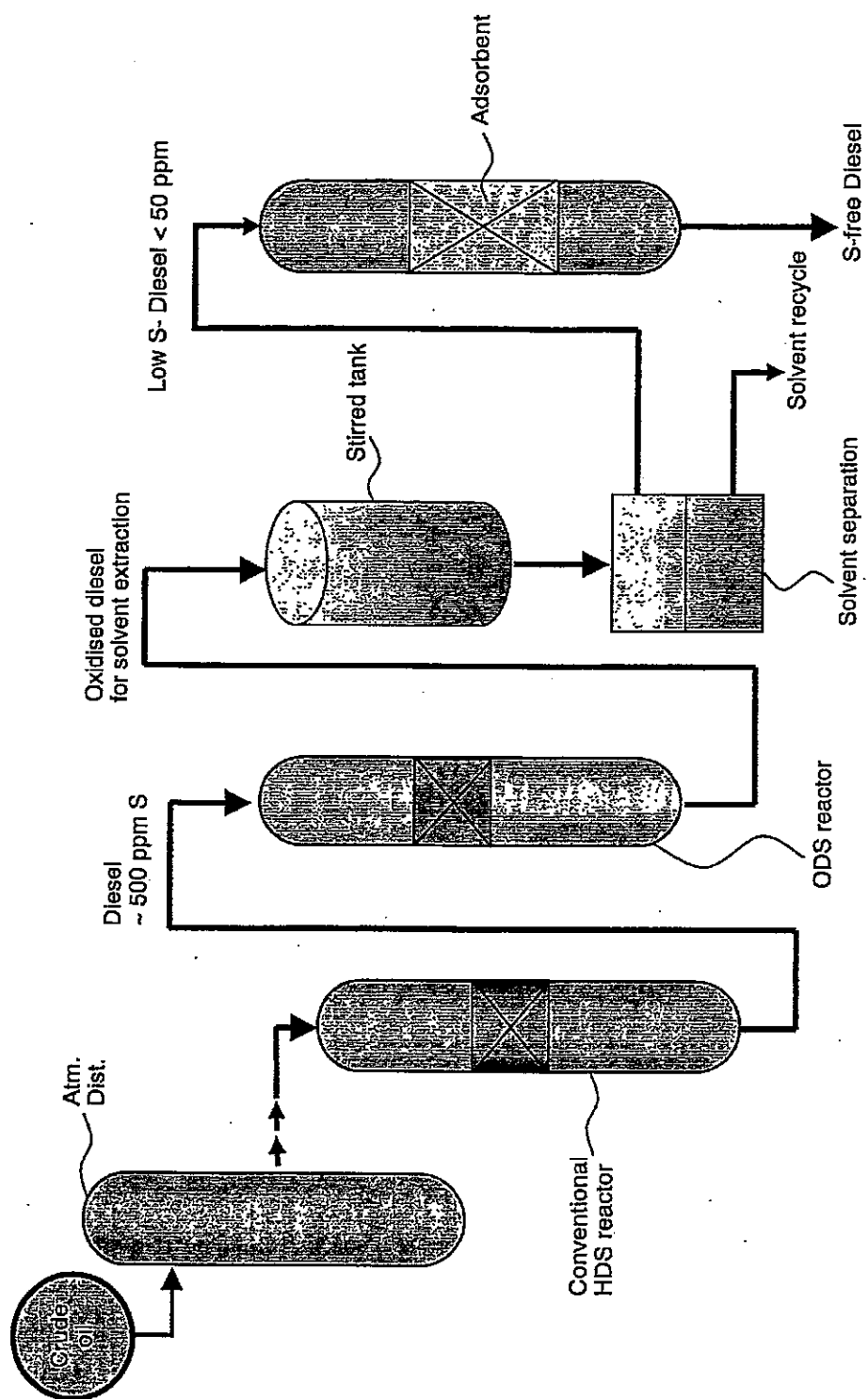
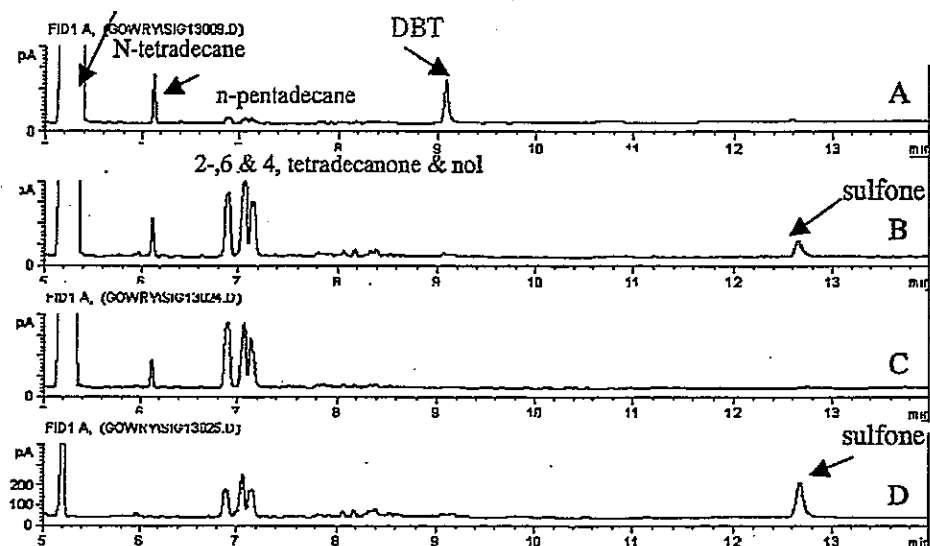


FIGURE 3

Sample code	Surface area (m ² /g)	TPV (ml)	APS (nm)
Gamma-Al ₂ O ₃	377	0.87	9.3
Al ₂ O ₃ /2%MnO ₂ (uncalcined)	378	0.84	5.3
Al ₂ O ₃ /2%MnO ₂ (calcined at 550 C)	341	0.86	2.4
Al ₂ O ₃ /5%MnO ₂ (uncalcined)	360	0.72	
Al ₂ O ₃ /5%MnO ₂ (calcined at 550 C)	350	0.86	5.8
Al ₂ O ₃ /8%MnO ₂ (uncalcined)	273	0.67	
Al ₂ O ₃ /5%MnO ₂ (calcined at 550 C)	311	0.78	3.4
Al ₂ O ₃ /11%MnO ₂ (uncalcined)	316		
Al ₂ O ₃ /13%MnO ₂ (calcined at 550 C)	305		
Al ₂ O ₃ /2%Co ₃ O ₄ (calcined at 550 C))	320		
Al ₂ O ₃ /2%Co ₃ O ₄ (calcined at 550 C)	353	0.87	
Al ₂ O ₃ /5%Co ₃ O ₄ (uncalcined)	302		
Al ₂ O ₃ /5%Co ₃ O ₄ (calcined at 550 C)	351	0.85	
Al ₂ O ₃ /8%Co ₃ O ₄ (uncalcined)	275		
Al ₂ O ₃ /8%Co ₃ O ₄ (calcined at 550 C)	323		

FIGURE 4



GC results of the model diesel before oxidation (A), after oxidation (B) and after extraction by NMP, the n-tetradecane layer (C) and the NMP layer (D).

FIGURE 5

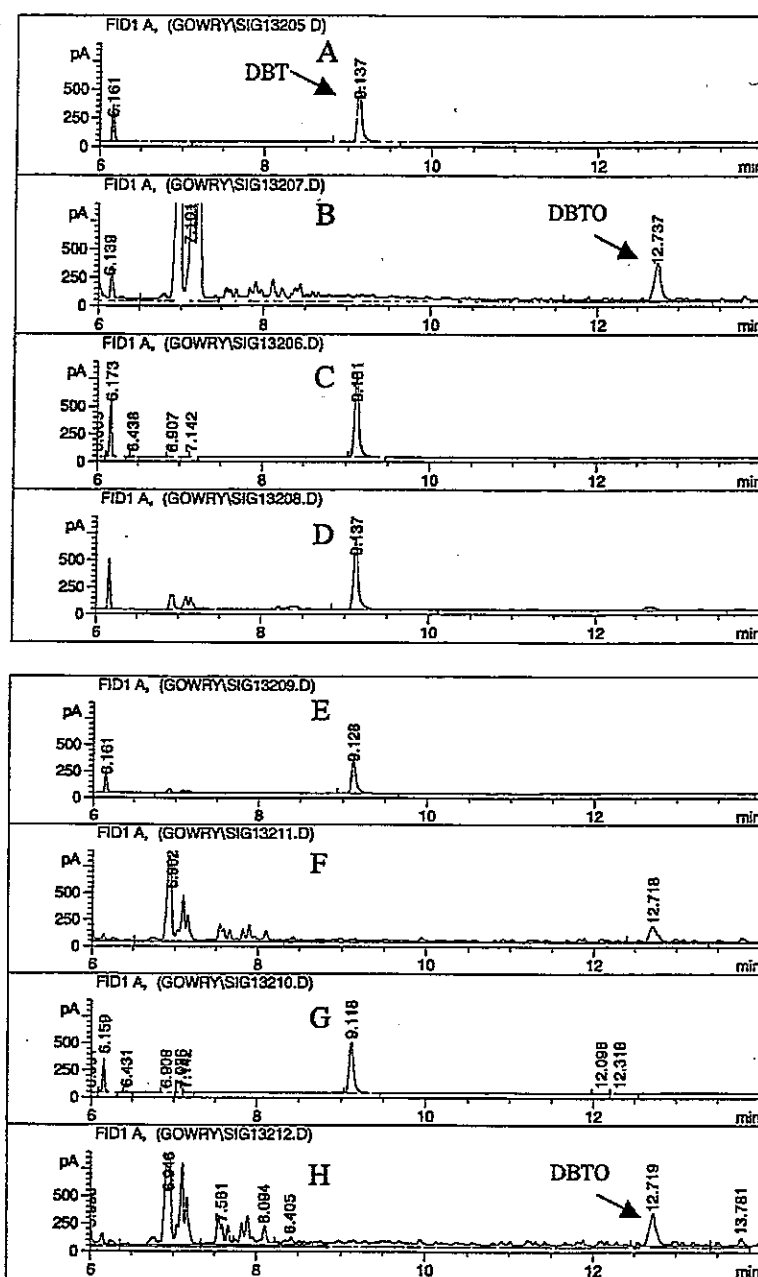
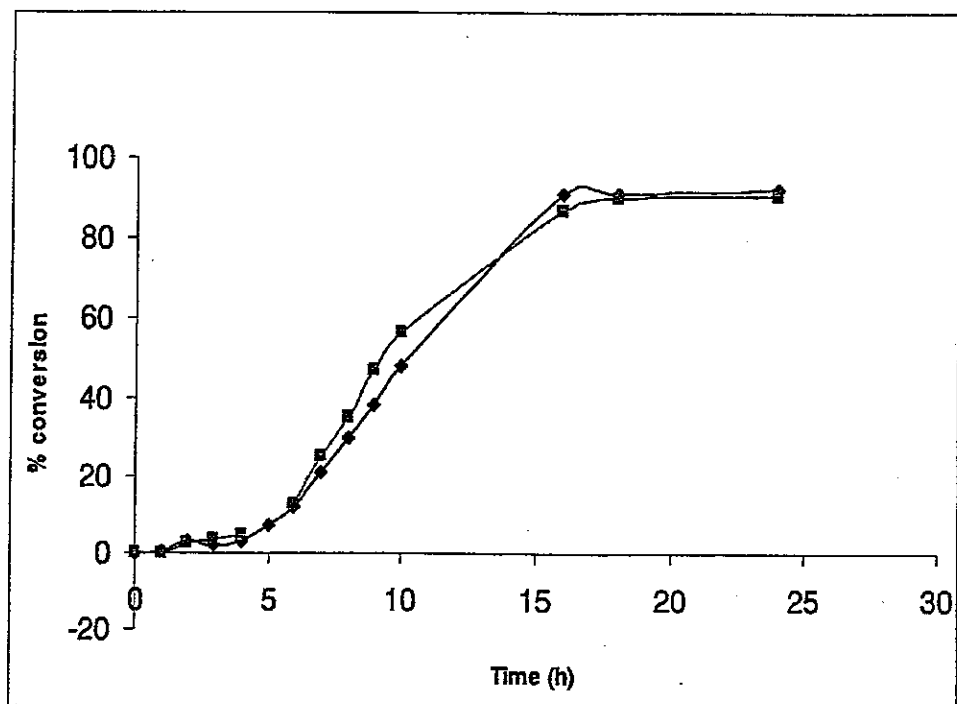


FIGURE 6



Conversion of DBT vs. time in model diesel at 130°C for manganese (■)- and cobalt (◆)-containing catalysts

FIGURE 7

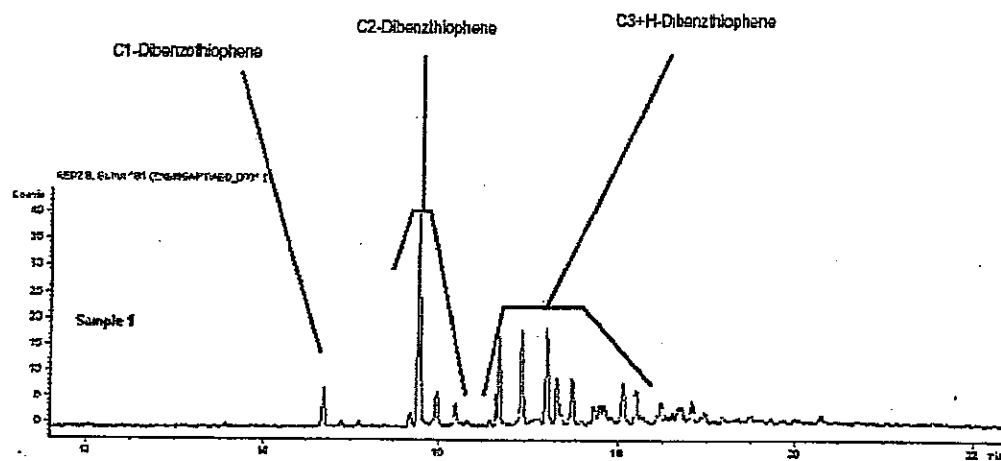


FIGURE 8A

Sample	S (ppm)
Diesel (25 ml) extracted with AcN (10ml)	337
Diesel (25 ml) extracted with DMF (10ml)	246
Diesel (25 ml) extracted with NMP (10ml)	239
Diesel (25 ml) extracted with MeOH (25ml)	342

FIGURE 8B

Catalyst	Extraction solvent	S (ppm)
~2% Co ₃ O ₄ /γ-alumina	AcN (10ml)	258
~2% Co ₃ O ₄ /γ-alumina	DMF (10ml)	160
~2% Co ₃ O ₄ /γ-alumina	NMP (10ml)	144
~2% Co ₃ O ₄ /γ-alumina	MeOH (25 ml)	239
~5% Co ₃ O ₄ /γ-alumina	AcN (10ml)	262
~5% Co ₃ O ₄ /γ-alumina	DMF (10ml)	162
~5% Co ₃ O ₄ /γ-alumina	NMP (10ml)	149
~5% Co ₃ O ₄ /γ-alumina	MeOH (25 ml)	239
~8% MnO ₂ /γ-alumina	AcN (10ml)	220
~8% MnO ₂ /γ-alumina	DMF (10ml)	130
~8% MnO ₂ /γ-alumina	NMP (10ml)	121
~8% MnO ₂ /γ-alumina	MeOH (25 ml)	192

FIGURE 9

Catalyst	R ⁿ Temp.	Extraction solvent	S (ppm) [#]
~2% MnO ₂ /γ-alumina	130 deg C	NMP (10ml x 3)	71 (72)
~2% MnO ₂ /γ-alumina	130 deg C	NMP (10ml)	209
~2% MnO ₂ /γ-alumina	130 deg C	NMP (20ml)	140
~2% MnO ₂ /γ-alumina ^{3Ci}	130 deg C	NMP (30 ml)	107
~2% MnO ₂ /γ-alumina	130 deg C	DMF (10ml)	126 (115)
~5% MnO ₂ /γ-alumina ^{3Cii}	130 deg C	NMP(10ml x 3)	58 (57)
~5% MnO ₂ /γ-alumina ^{3Ciii}	130 deg C	NMP (10ml)	187
~5% MnO ₂ /γ-alumina	130 deg C	DMF (10ml)	208
~5% MnO ₂ /γ-alumina	130 deg C	DMF (20ml)	161
~5% MnO ₂ /γ-alumina	130 deg C	DMF (30ml)	128
~8% MnO ₂ /γ-alumina	150 deg C	NMP (10 ml)	159
~8% MnO ₂ /γ-alumina	150 deg C	NMP (20 ml)	133
~8% MnO ₂ /γ-alumina	150 deg C	NMP (30 ml)	115
~8% MnO ₂ /γ-alumina	150 deg C	NMP (40 ml)	75 (68)

FIGURE 10

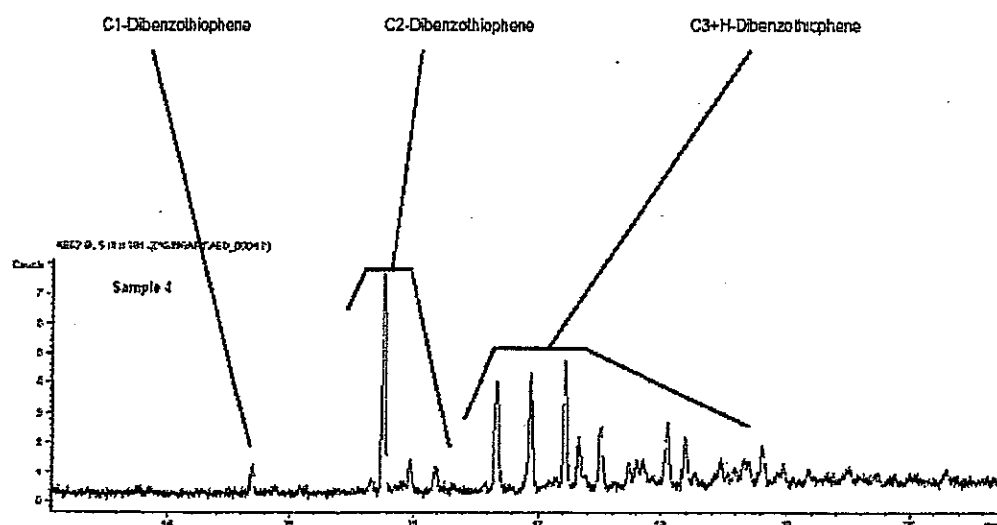


FIGURE 11A

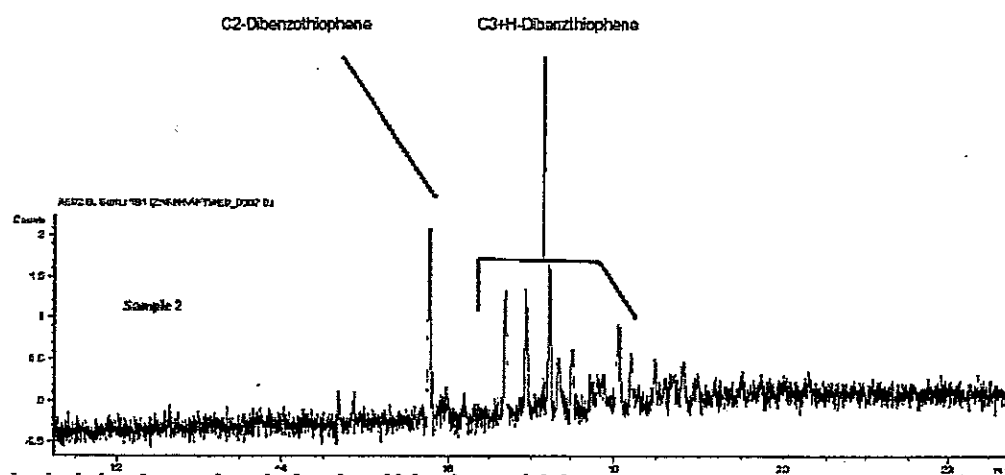


FIGURE 11B

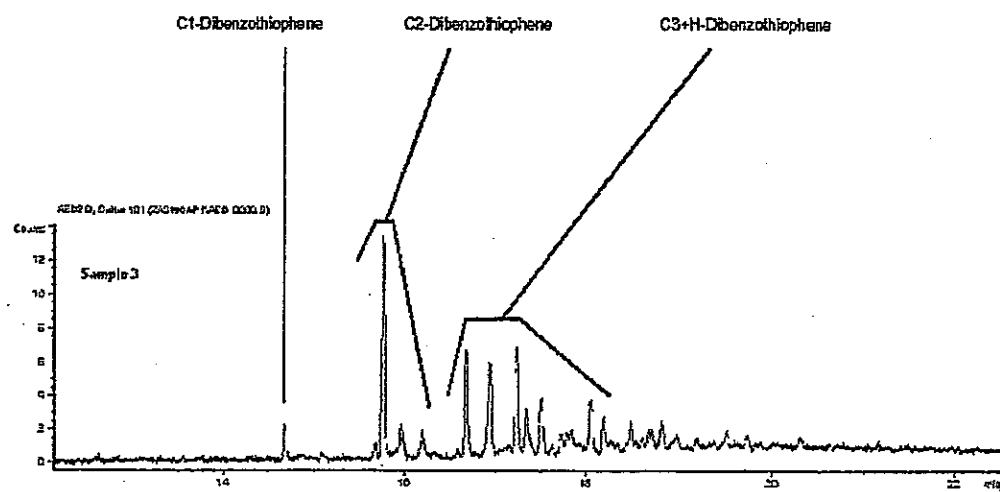


FIGURE 11C

Catalyst	Catalyst amount (X mg)	Extraction solvent	S (ppm)
~5% MnO ₂ /γ-alumina	~150 mg	-	347
~5% MnO ₂ /γ-alumina	~150 mg	NMP (50ml)	32
~8% MnO ₂ /γ-alumina	~150 mg	-	319
~8% MnO ₂ /γ-alumina	~150 mg	NMP (50 ml)	31
~8% MnO ₂ /γ-alumina	~1 g	-	324
~8% MnO ₂ /γ-alumina	~1 g	NMP(50ml)	16
~11% MnO ₂ /γ-alumina	~150 mg	-	353
~11% MnO ₂ /γ-alumina	~150 mg	NMP (50ml)	31
~13% MnO ₂ /γ-alumina	~150 mg	-	353
~13% MnO ₂ /γ-alumina	~150 mg	NMP (50ml)	39

FIGURE 12

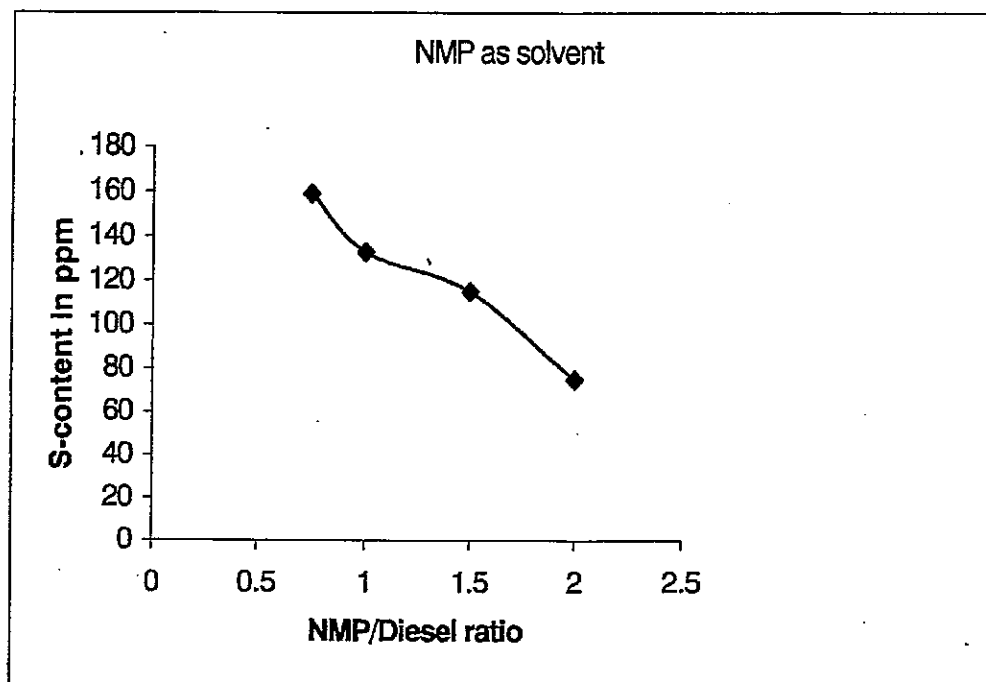


FIGURE 13