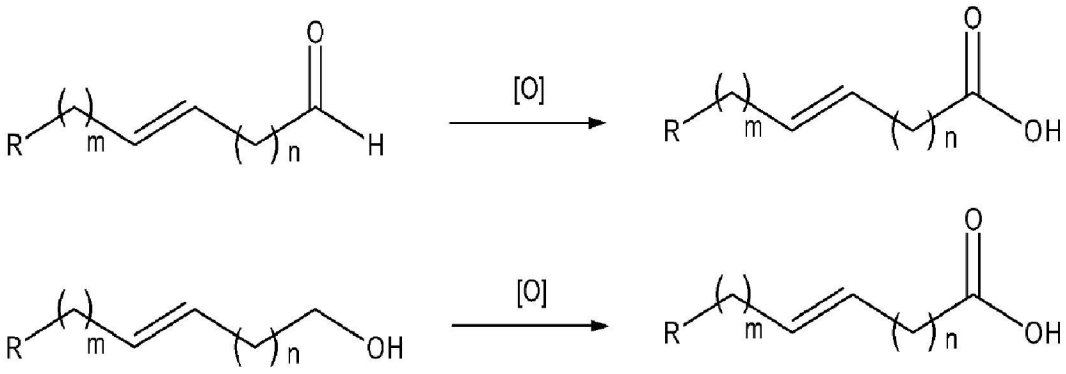
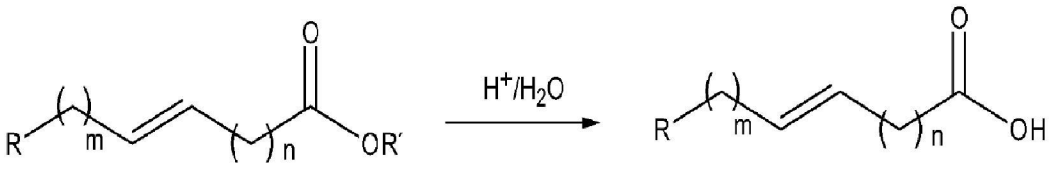


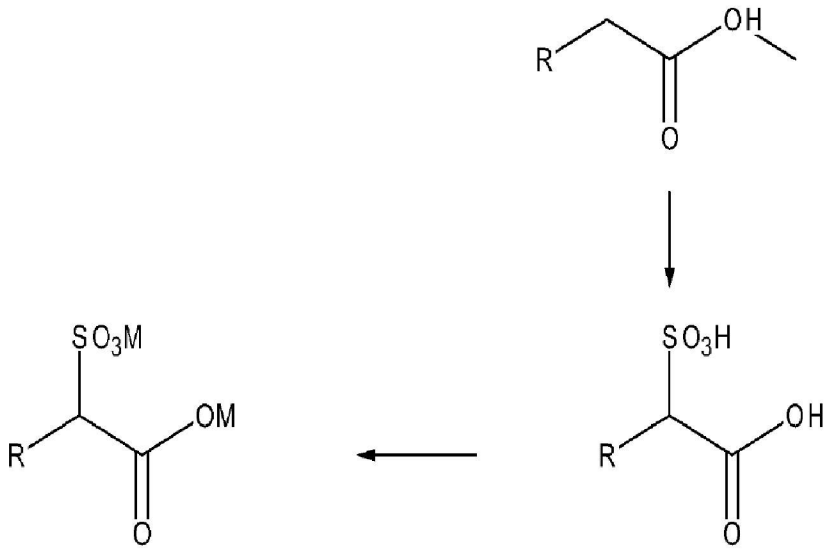
n= 1, 2, 3, ...
m= 0, 1, 2, 3, ...
R= UNBRANCHED/ BRANCHED, SATURATED/ UNSATURATED

FIG. 1



n= 1, 2, 3, ...
m= 0, 1, 2, 3, ...
R= UNBRANCHED/ BRANCHED, SATURATED/ UNSATURATED

FIG. 2



R= UNBRANCHED/ BRANCHED. SATURATED/ UNSATURATED

FIG. 3

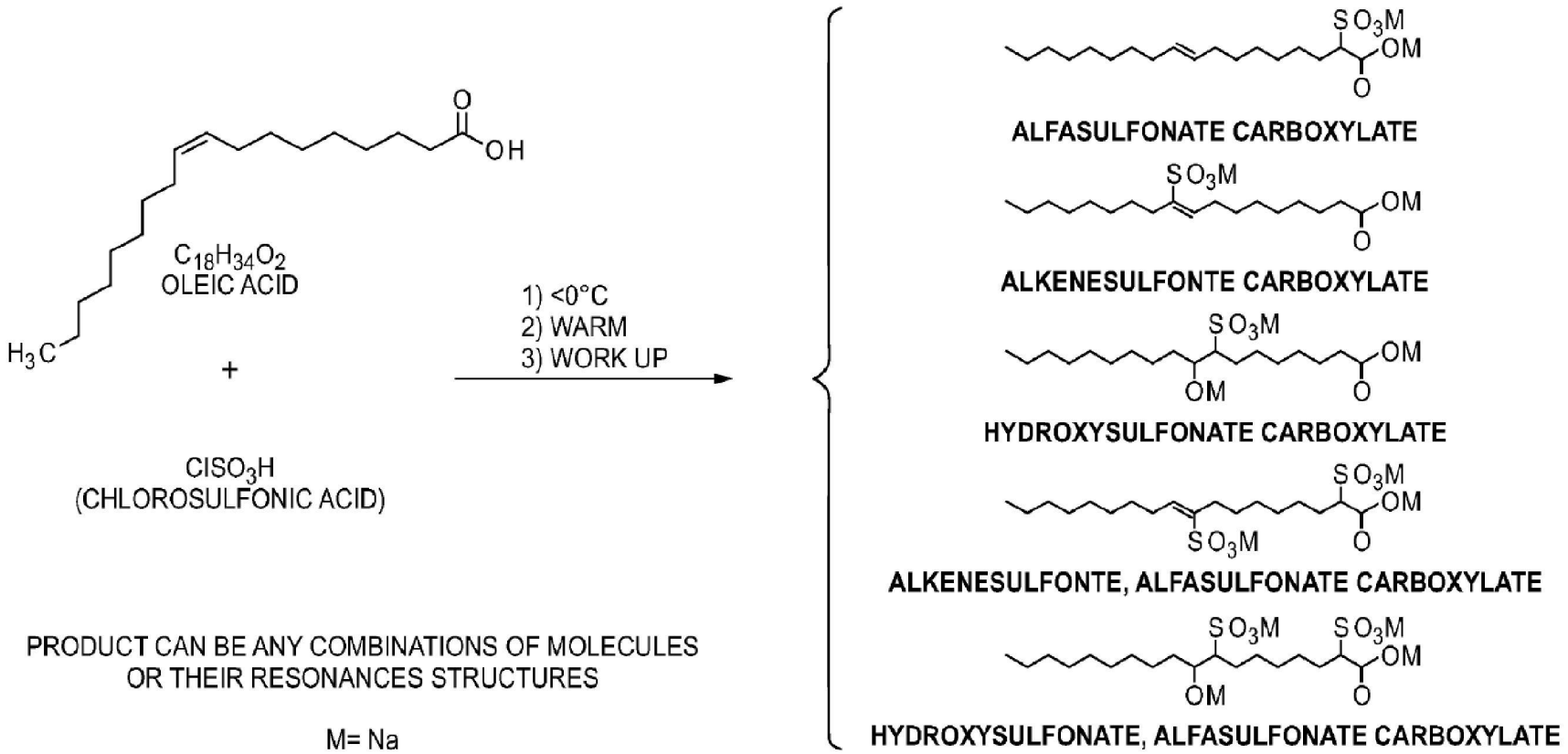

C18H34O2
OLEIC ACID
H3C
O
OH
+
ClSO3H
(CHLOROSULFONIC ACID)
1) <0°C
2) WARM
3) WORK UP
PRODUCT CAN BE ANY COMBINATIONS OF MOLECULES
OR THEIR RESONANCES STRUCTURES
M= Na
SO3M
OM
O
ALFASULFONATE CARBOXYLATE
ALKENESULFONTE CARBOXYLATE
HYDROXYSULFONATE CARBOXYLATE
ALKENESULFONTE, ALFASULFONATE CARBOXYLATE
HYDROXYSULFONATE, ALFASULFONATE CARBOXYLATE

FIG. 4

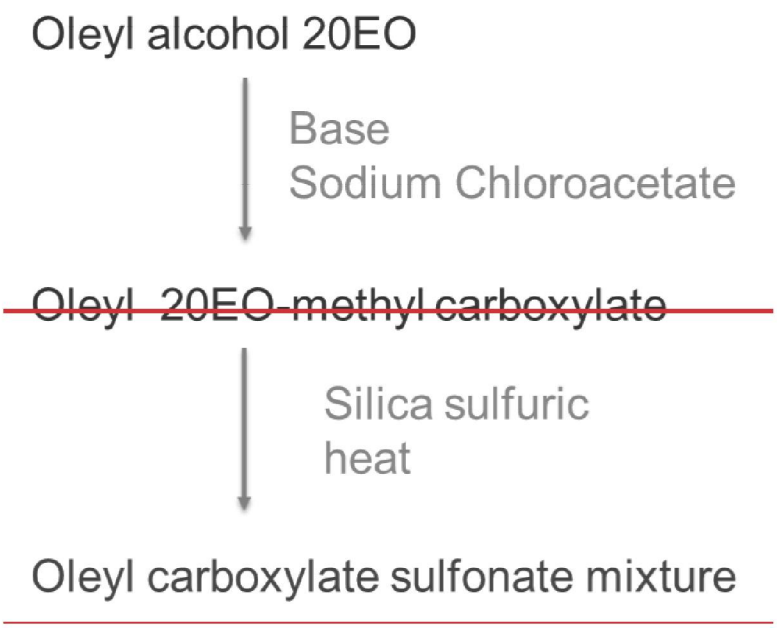


FIGURE 5

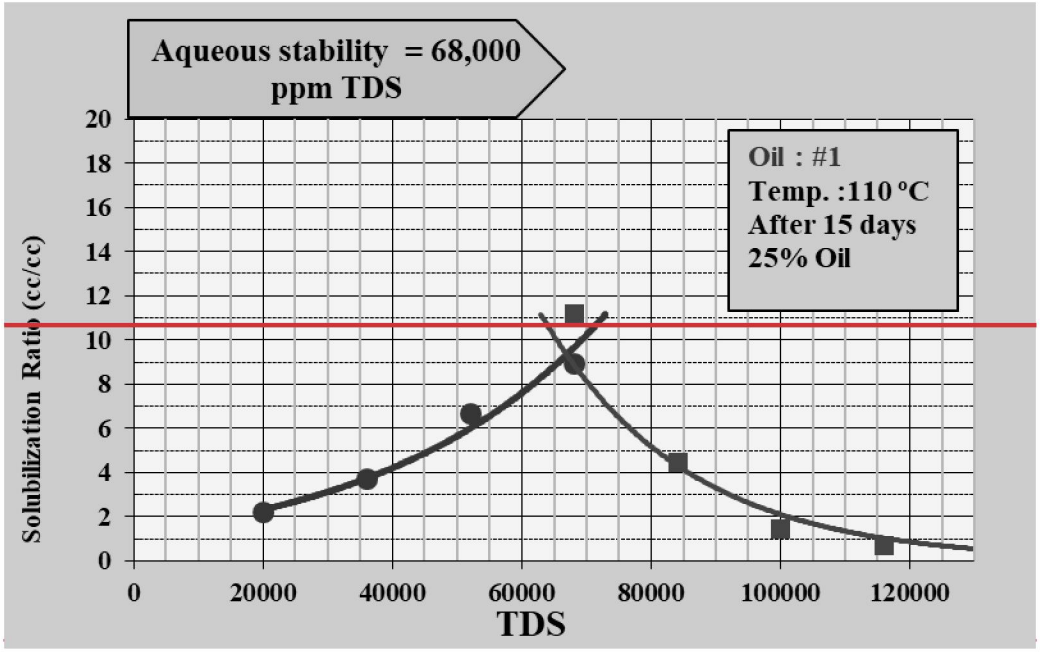


FIGURE 6

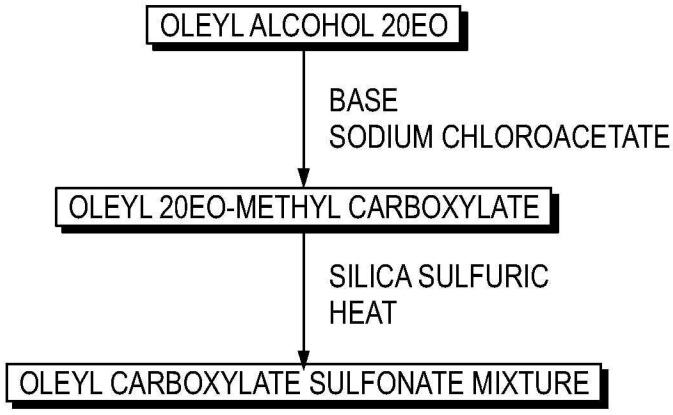

OLEYL ALCOHOL 20EO
BASE
SODIUM CHLOROACETATE
OLEYL 20EO-METHYL CARBOXYLATE
SILICA SULFURIC
HEAT
OLEYL CARBOXYLATE SULFONATE MIXTURE

FIG. 5

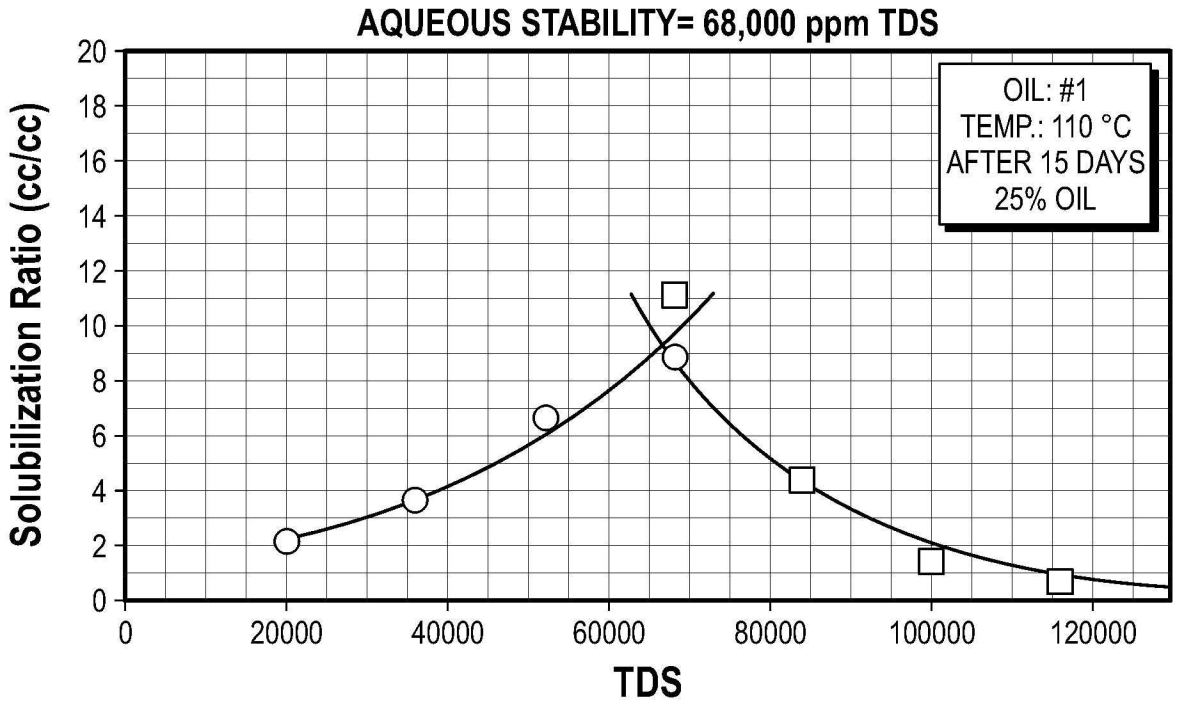

AQUEOUS STABILITY= 68,000 ppm TDS
Solubilization Ratio (cc/cc)
TDS
OIL: #1
TEMP.: 110 °C
AFTER 15 DAYS
25% OIL
0
2
4
6
8
10
12
14
16
18
20
0
20000
40000
60000
80000
100000
120000

FIG. 6

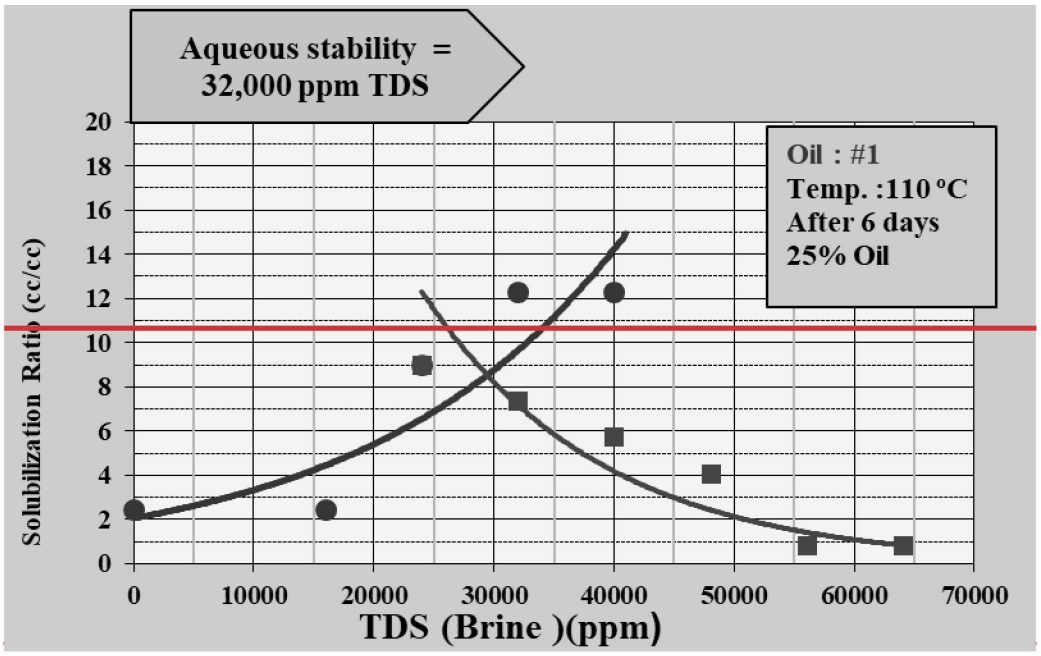


FIGURE 7

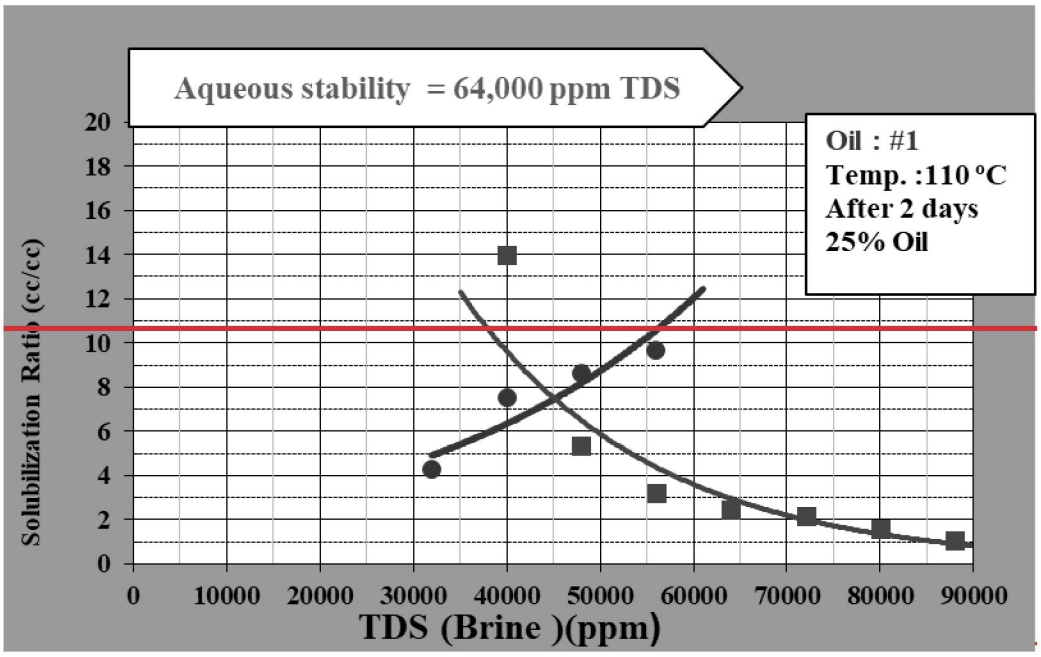


FIGURE 8

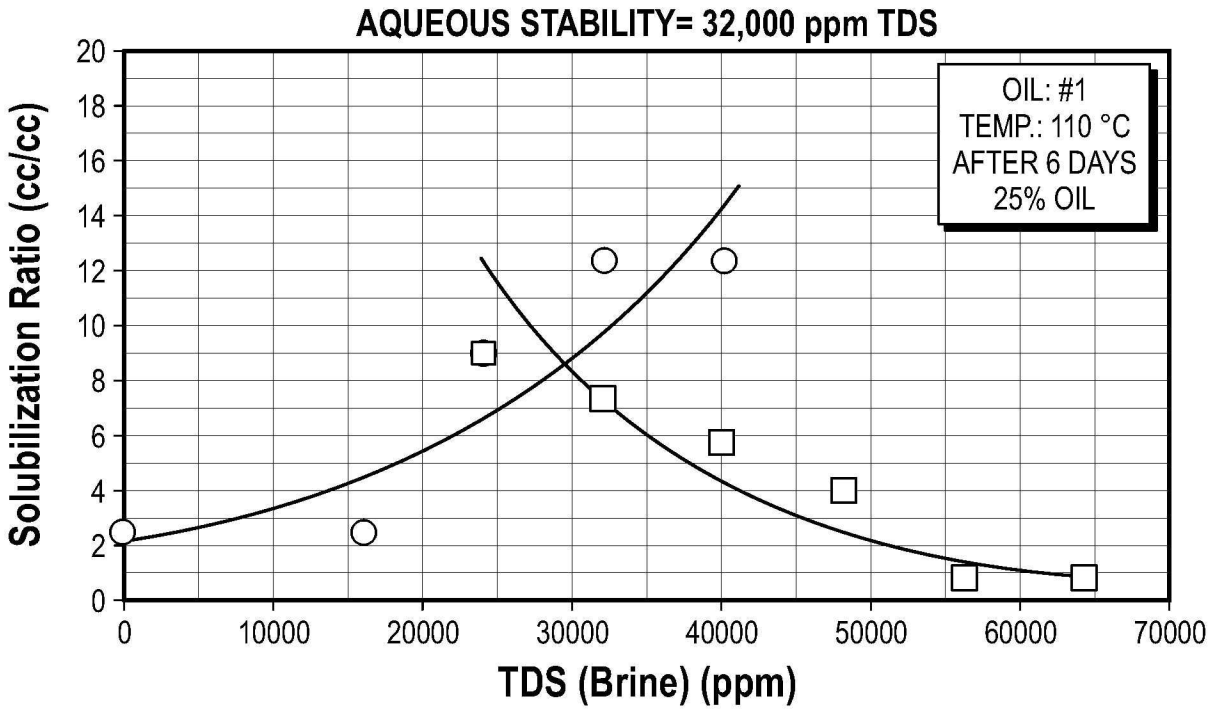

AQUEOUS STABILITY= 32,000 ppm TDS
Solubilization Ratio (cc/cc)
TDS (Brine) (ppm)
OIL: #1
TEMP.: 110 °C
AFTER 6 DAYS
25% OIL
0
2
4
6
8
10
12
14
16
18
20
0
10000
20000
30000
40000
50000
60000
70000

FIG. 7

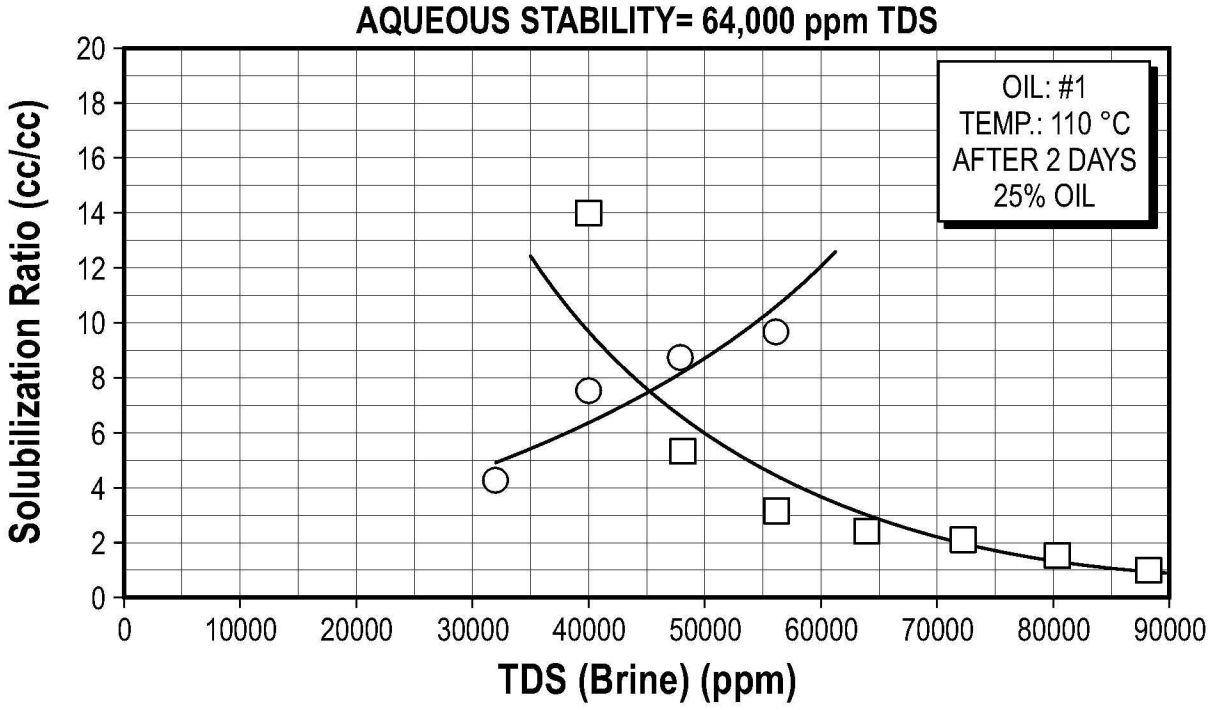

AQUEOUS STABILITY= 64,000 ppm TDS
Solubilization Ratio (cc/cc)
TDS (Brine) (ppm)
OIL: #1
TEMP.: 110 °C
AFTER 2 DAYS
25% OIL
0
2
4
6
8
10
12
14
16
18
20
0
10000
20000
30000
40000
50000
60000
70000
80000
90000

FIG. 8

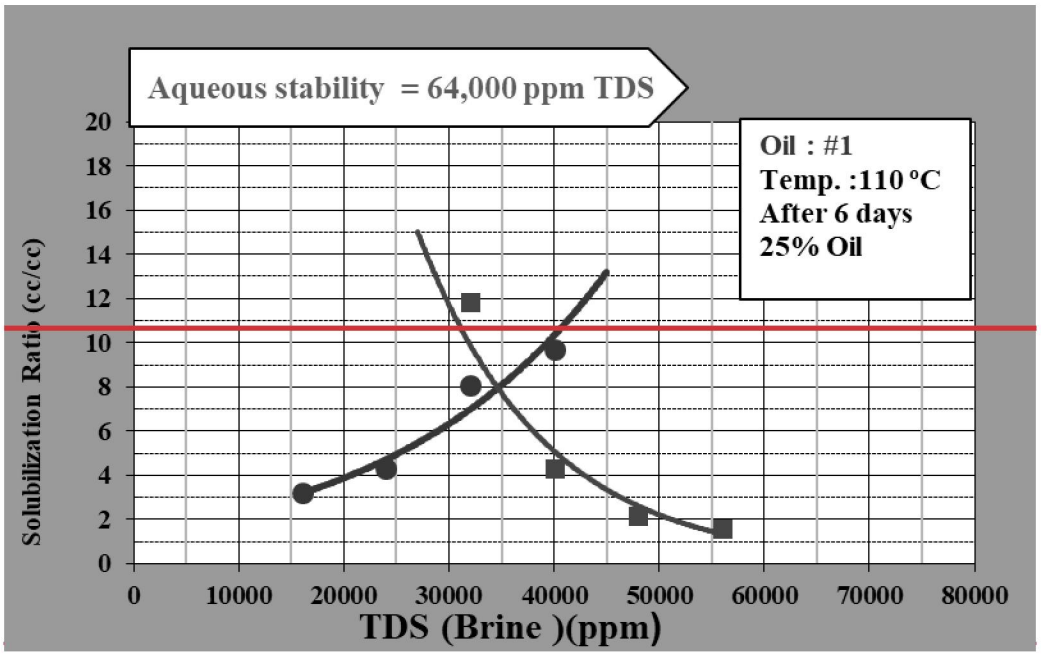


FIGURE 9

Unsaturated ester

1) Sulfonation

2) Base hydrolysis

Surfactant including both sulfonate/s and carboxylate

FIGURE 10

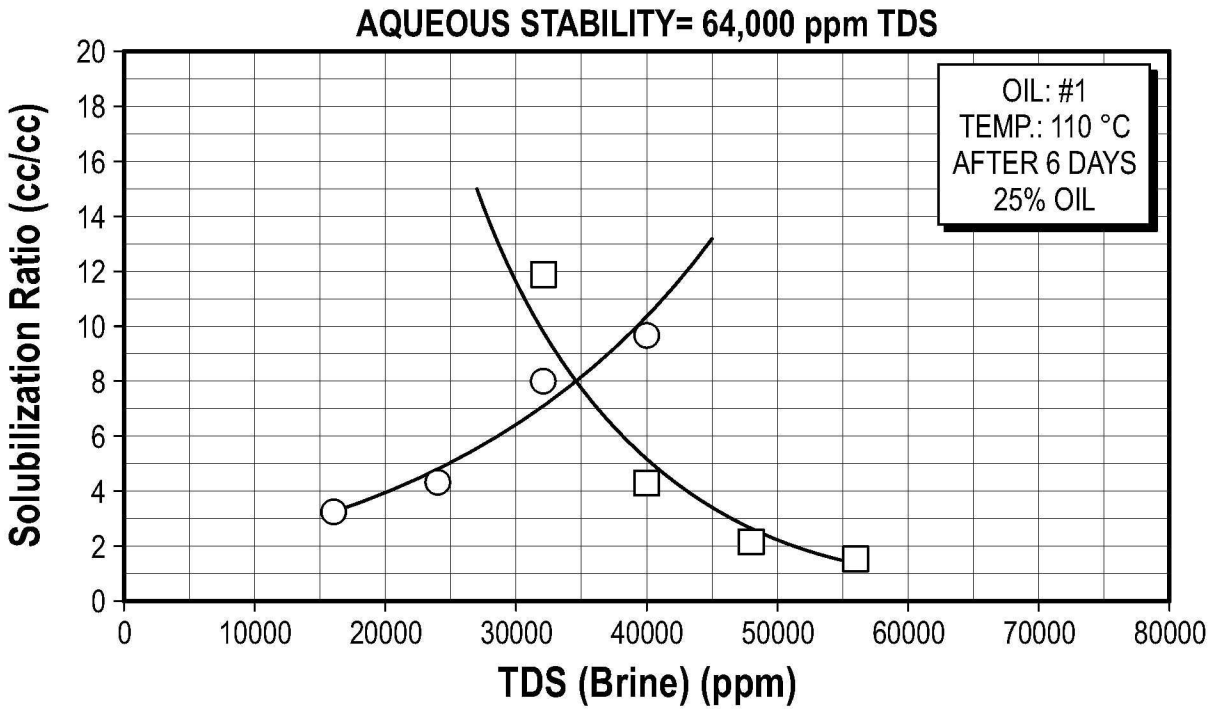

AQUEOUS STABILITY= 64,000 ppm TDS
Solubilization Ratio (cc/cc)
TDS (Brine) (ppm)
OIL: #1
TEMP.: 110 °C
AFTER 6 DAYS
25% OIL
0
2
4
6
8
10
12
14
16
18
20
0
10000
20000
30000
40000
50000
60000
70000
80000

FIG. 9

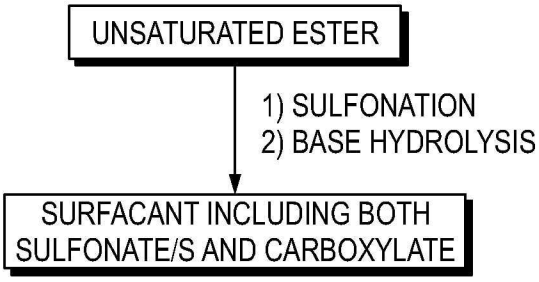

UNSATURATED ESTER
1) SULFONATION
2) BASE HYDROLYSIS
SURFACANT INCLUDING BOTH
SULFONATE/S AND CARBOXYLATE

FIG. 10

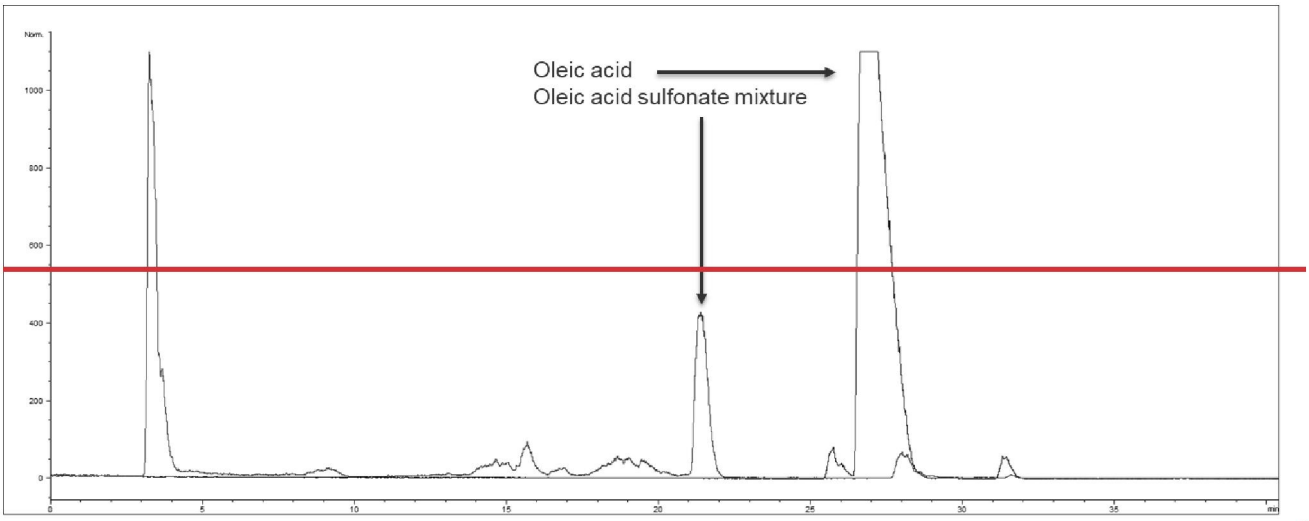


FIGURE 11

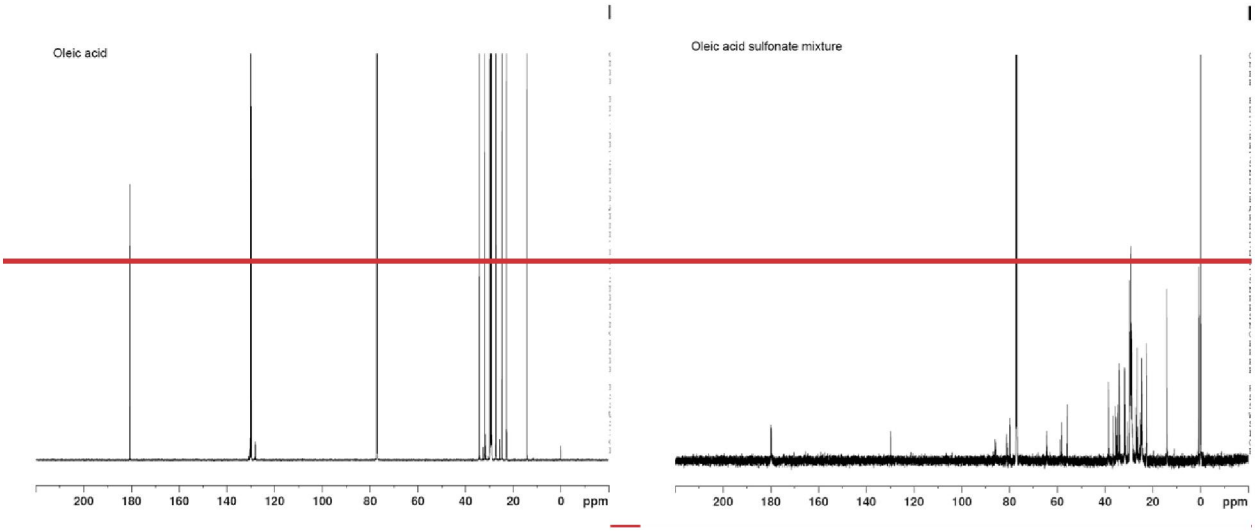


FIGURE 12

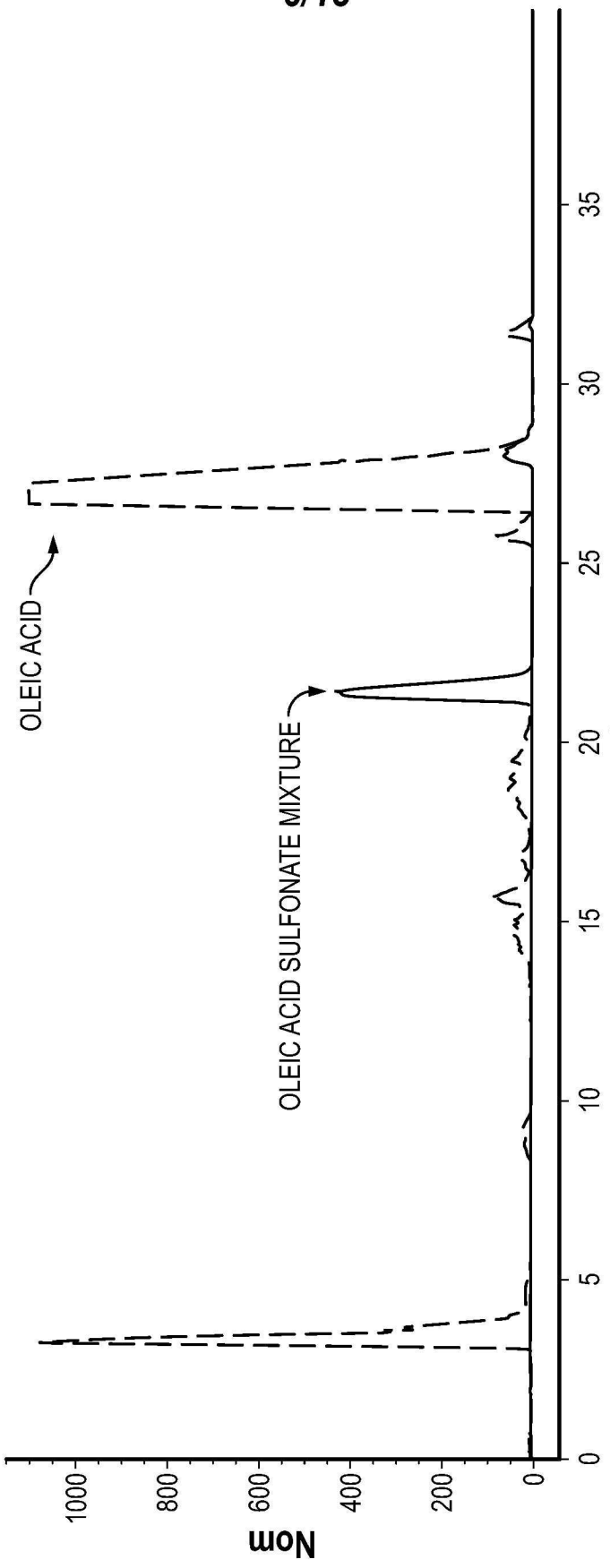

OLEIC ACID
OLEIC ACID SULFONATE MIXTURE
Nom
1000
800
600
400
200
0
0
5
10
15
20
25
30
35
min

FIG. 11

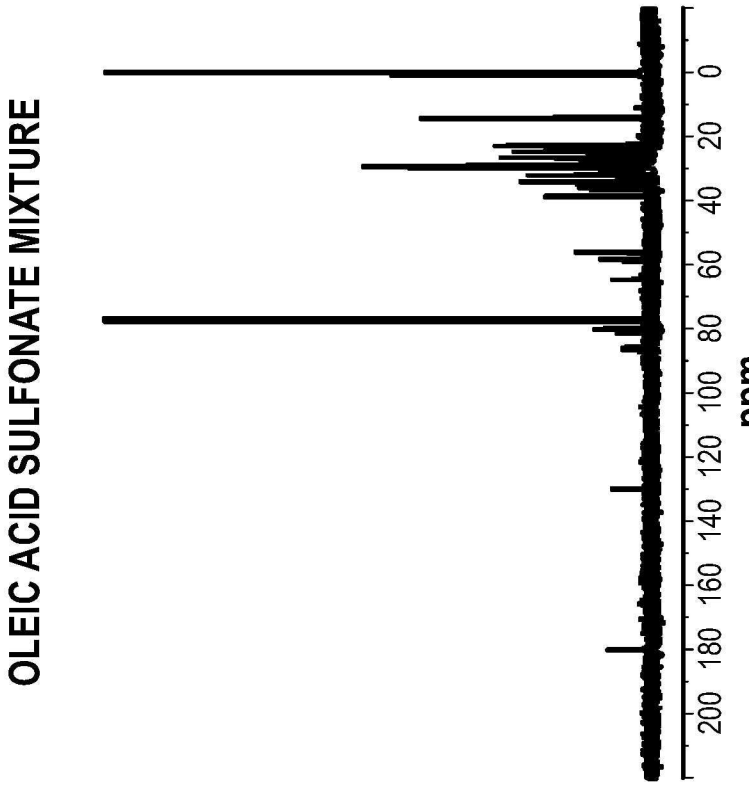


FIG. 12B

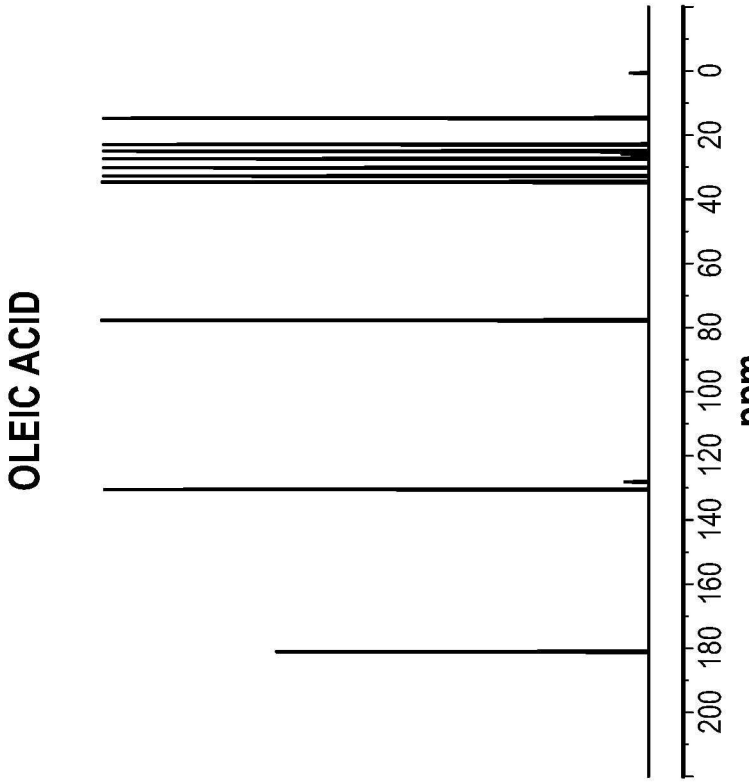


FIG. 12A

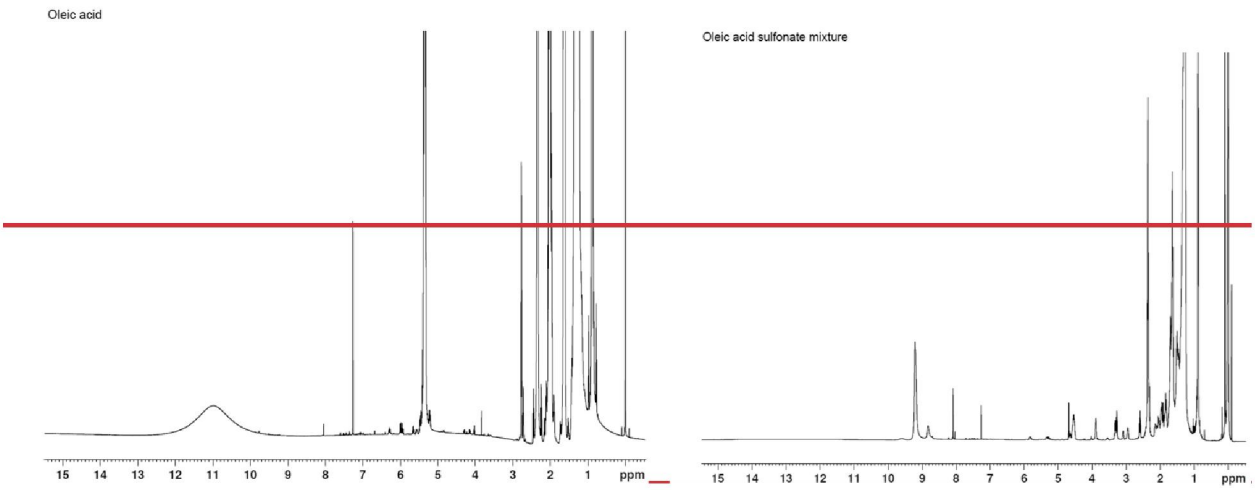


FIGURE 13

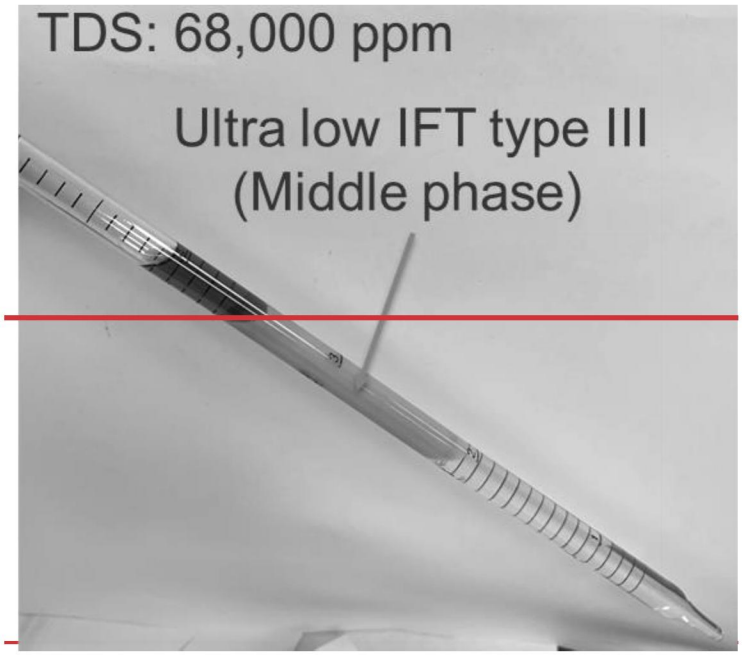


FIGURE 14

OLEIC ACID

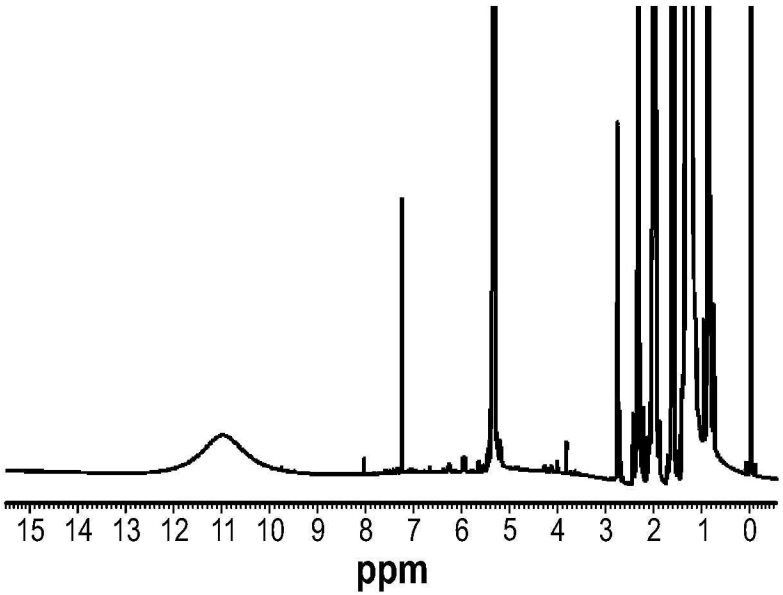


FIG. 13A

OLEIC ACID SULFONATE MIXTURE

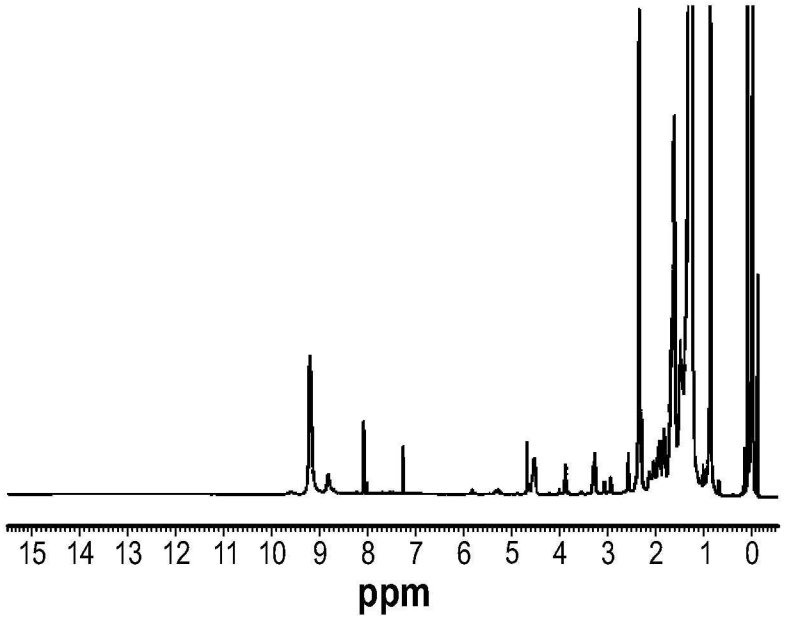


FIG. 13B

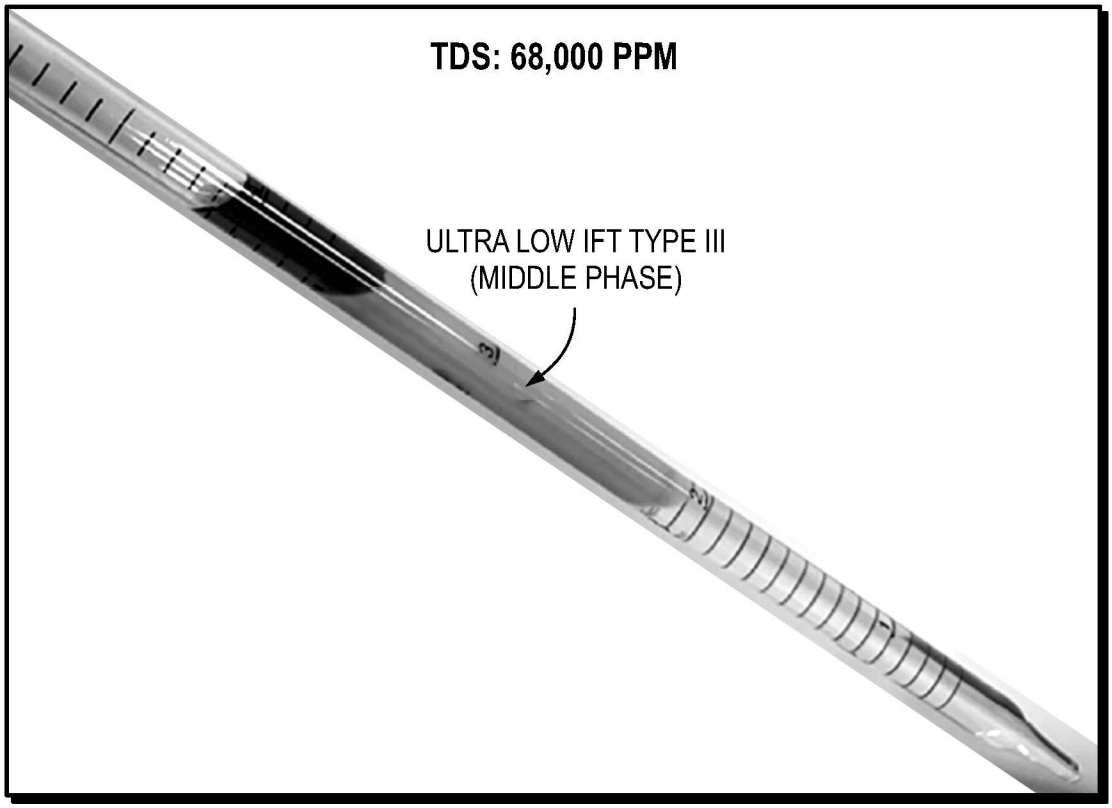


FIG. 14

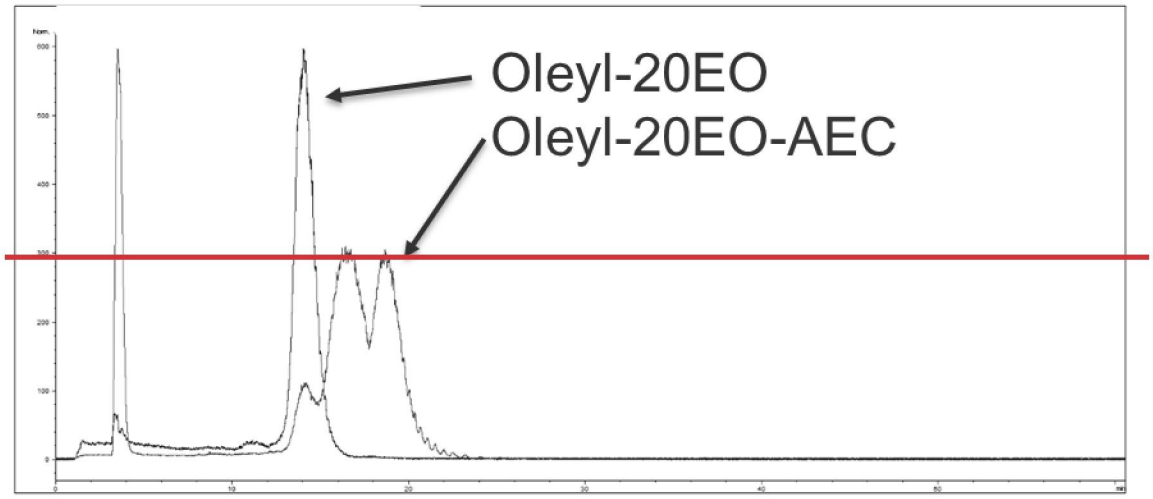


FIGURE 15

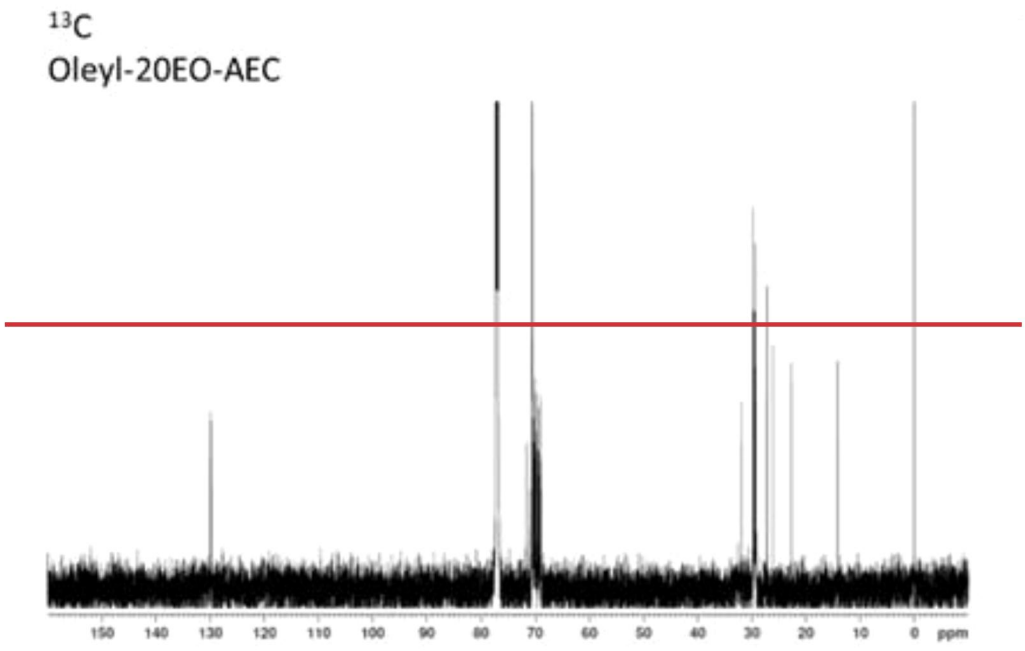


FIGURE 16

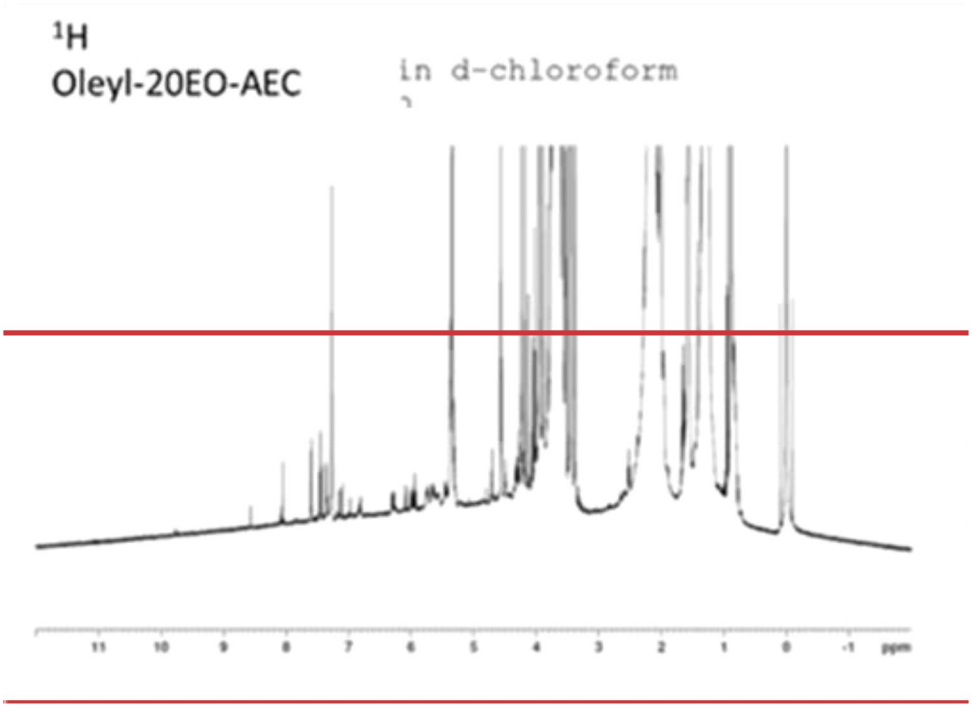


FIGURE 17

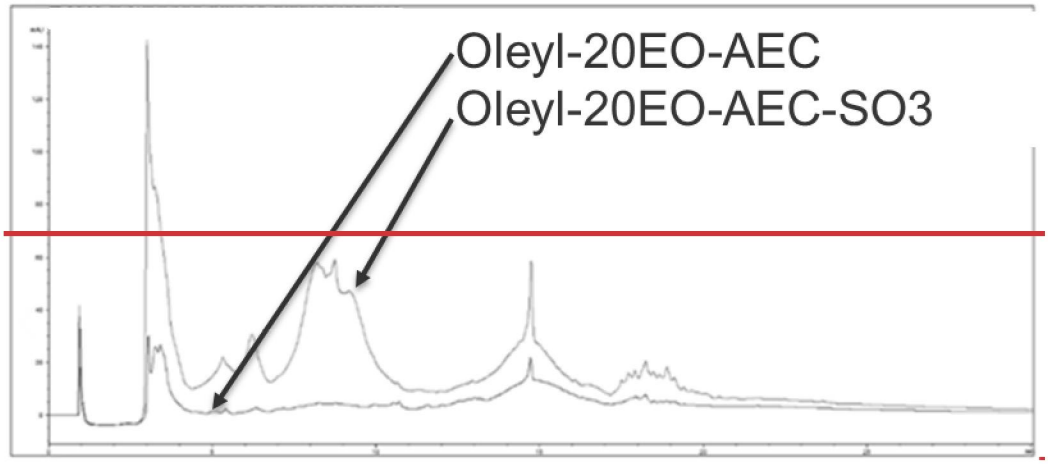


FIGURE 18

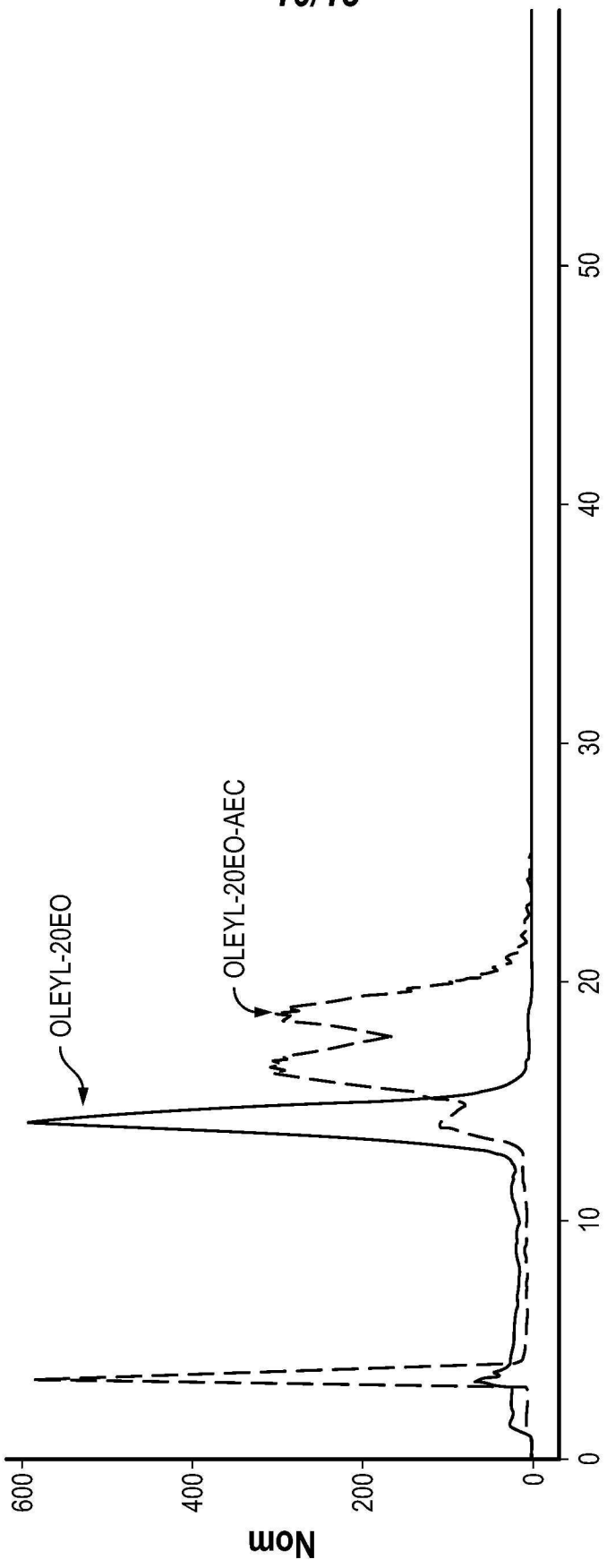


FIG. 15

^{13}C OLEYL-20EO-AEC

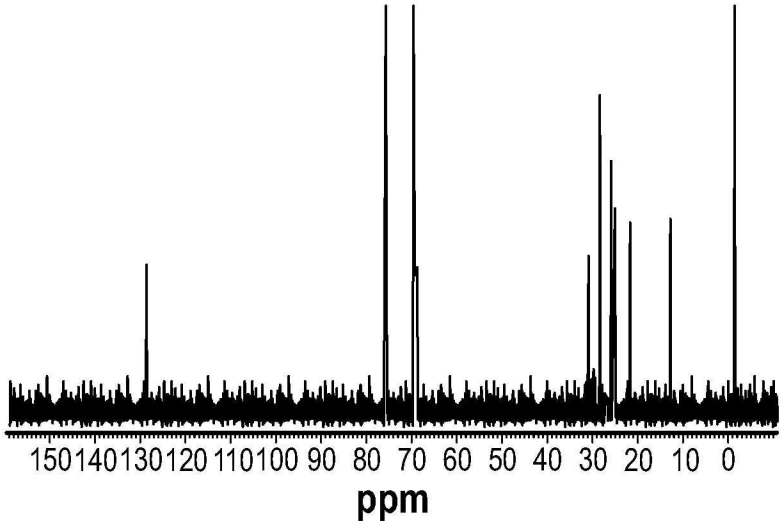


FIG. 16

^{1}H OLEYL-20EO-AEC IN D-CLOROFORM

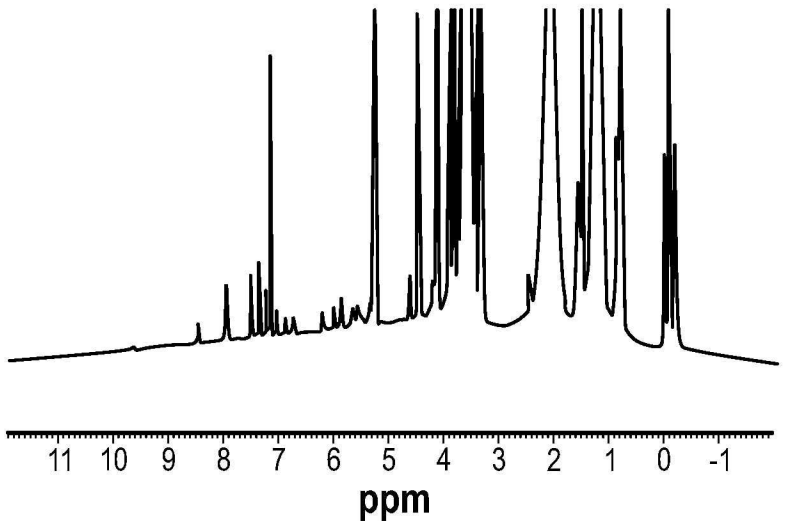
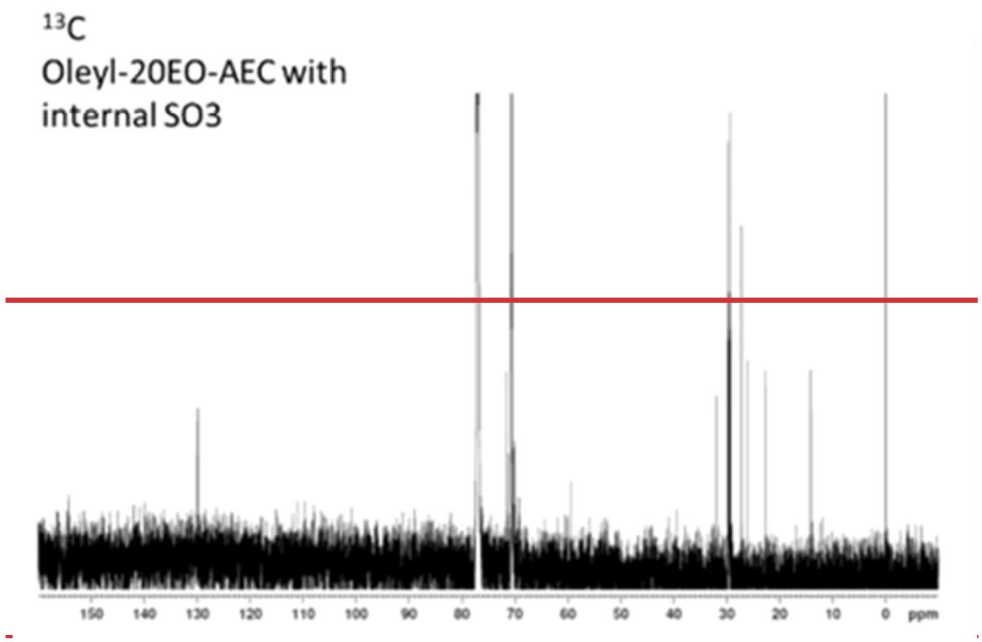


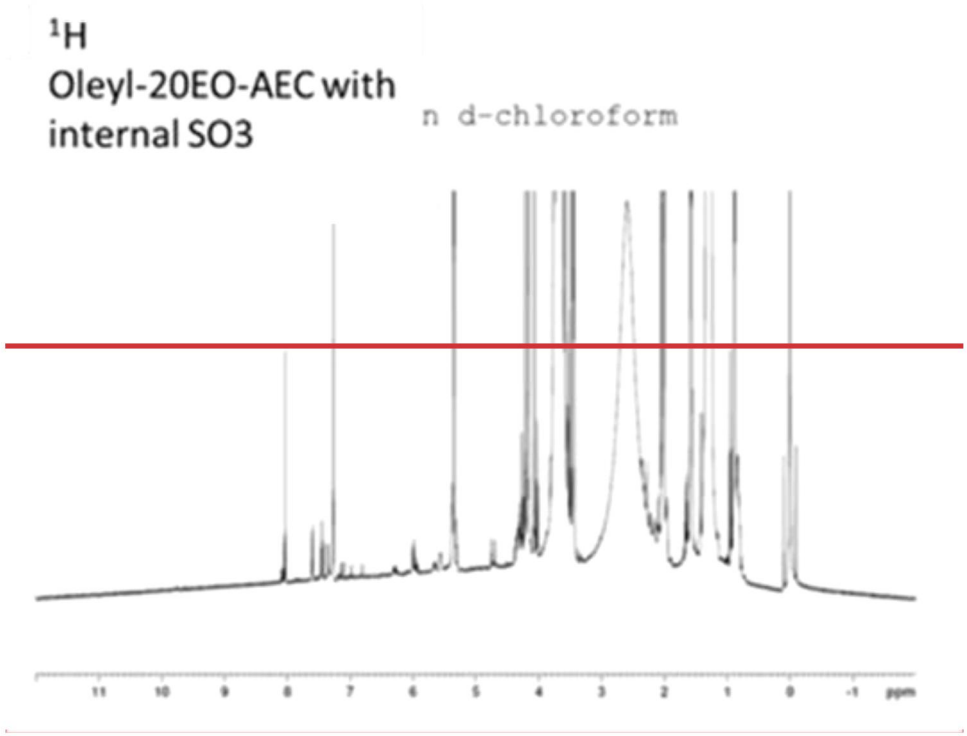
FIG. 17


Nom
140
120
100
80
60
40
20
0
0
10
20
30
40
50
min
OLEYL-20EO-AEC-SO3
OLEYL-20EO-AEC

FIG. 18



~~FIGURE 19~~



~~FIGURE 20~~

^{13}C OLEYL-20EO-AEC
WITH INTERNAL SO3

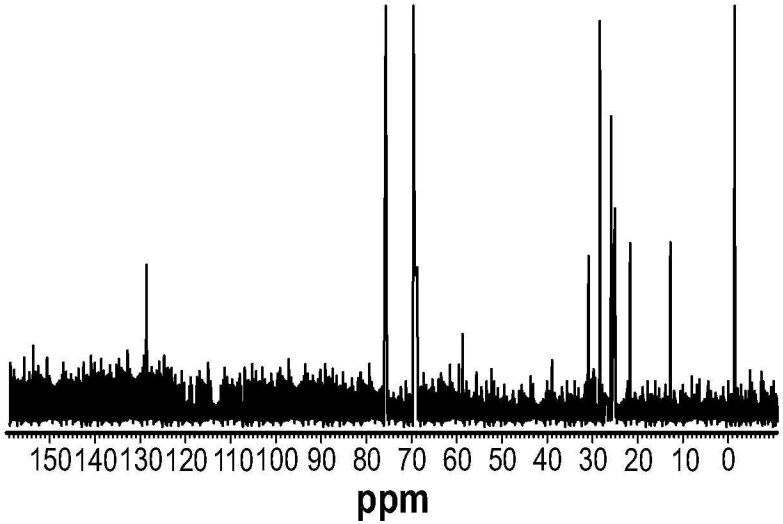


FIG. 19

^{1}H OLEYL-20EO-AEC WITH
INTERNAL SO3 IN D-CLOROFORM

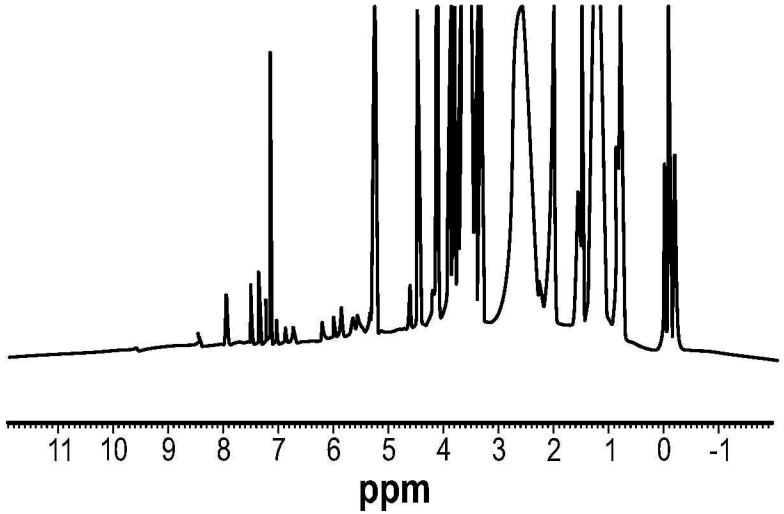


FIG. 20