international journal of pharmaceutics

I J P 235 (2002) 247 265

P

(SNEDDS) :

S. N , I.I. S , O.D. L , M A. K *

Department of Pharmaceutical Sciences, School of Pharmacy, Texas Tech University Health Science Center, 1300 Coulter, Suite 400, Amarillo, TX 79106, USA

Chemical Physics Interdisciplinary Program and Liquid Crystal Institute, Kent State University, Kent, OH 44242, USA

R 29 O 2001; 20 D 2001; 21 D 2001

Abstract

T (SNEDDS) (C Q_{10}); . B C Q_{10} . P . R . T : . L . P . L 100 . E . S . F (FT-IR) (ATR) . T 2002 E S B.V. A .

Keywords: C Q_{10}; E ; S - ; SNEDDS; T ; D

1. Introduction

U C Q_{10} (C Q_{10}) (F . 1),

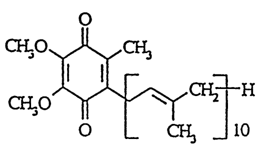
* C . T .: + 1-806-356-4000 285; : + 1-806-356-4034.

E-mail address: @ (M.A. K).

PII: S0378-5173(02)00003-0

(G ., 1992).

D



2.2. Methods

2.2.1. Differential scanning calorimetry (DSC) of CoQ_{10}-menthol and CoQ_{10}-essential oil binary systems.

C Q10 L- 90:10 10:90 (/). A 5 (DSC 7, P E , N , CT). T 25 60 C 10 C $^{-1}$. S , C Q10 80:20 20:80 (/) 37 C. R 4 C 24 - C Q10. T , 10 DSC DSC . F C Q10- 80:20 60 40 (/), 25 55 C. S 10 40 C. H 10 C $^{-1}$. L - (I 2, P E).

2.2.2. Determination of CoQ_{10} melting time

C Q10 50 60% / , , - . M 37 C (I R -G, T S , T , C). C EL 20, 40 60% / (M , G I ., M , WI) . V . A 24 37 C. S .

2.2.3. Formulation of the self-emulsified systems

A - - (37.5 60%), EL (0 62.5%), - MCM-C8 (0 62.5%). T C Q10 50:50. C Q10 - 37 C. C EL MCM-C8 - . W - , - , C Q10 30 , 4 HPMC . F .

2.2.4. Visual observations

T - , - (50) - 37 C - 100 E 25 C . T ', J J (C ., 1995; K ., 2001). P - . A .

2.2.5. Emulsion droplet size analysis and turbidity measurements

F (50) 37 C - , - 37 C, 100 E . T .

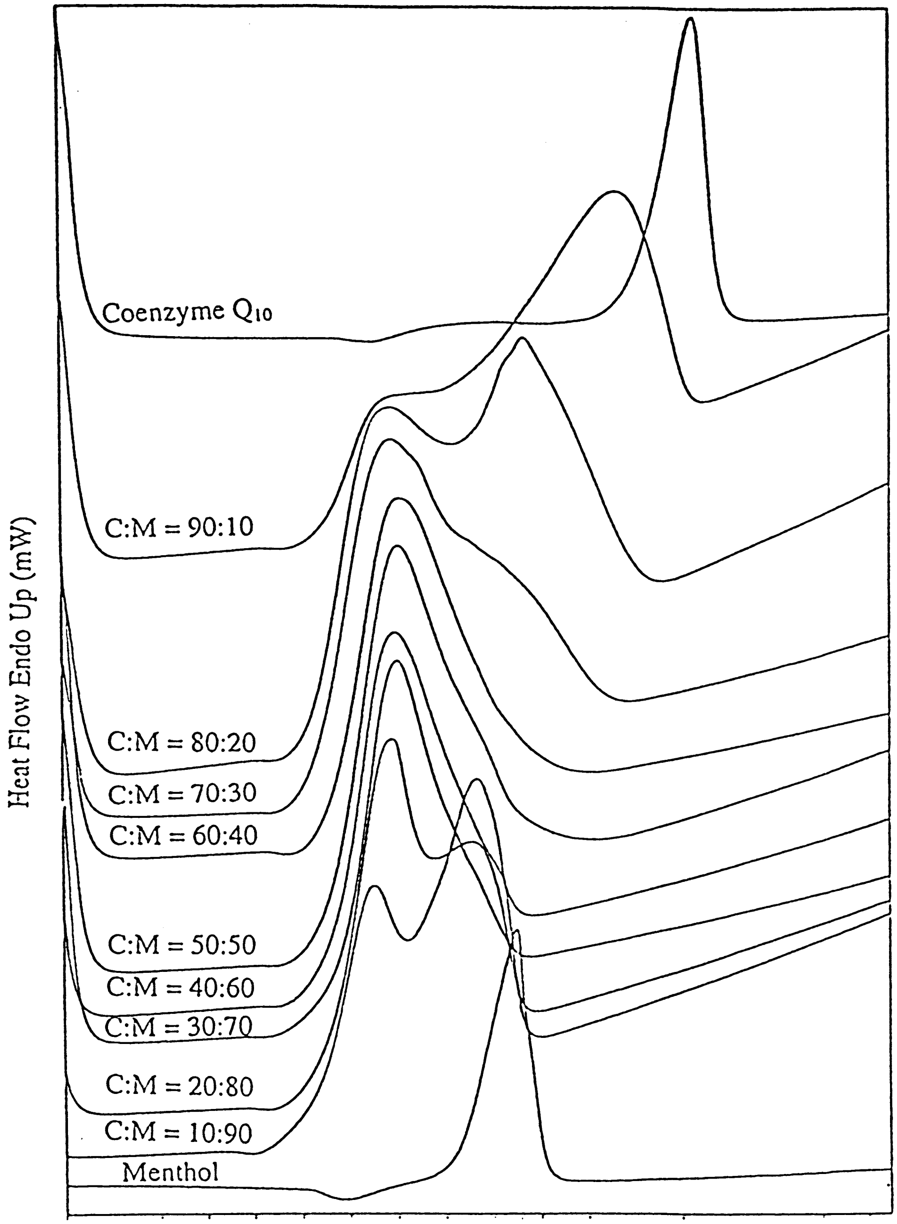
2.2.5.1. Droplet size analysis.

T - C (M LS230, M , FL), 0.04 2000 μ . T . S

6 (U(286. (6 .U(286.P)087.)-7( )-286.)-286.9 7) T0 -1.2 0 TD

(N E
E600 P , N I C ., J.)
CCD (H HV-C20, H
A , L ., S. D , CA). T
-
. T
-
(C
MP4R, I E C ,
N H , MA) 0.5 1 3000
(RCF 500 × g). U
16 MΩ H 4 . T
(
100 μ 1 , 5).
B .

2.2.

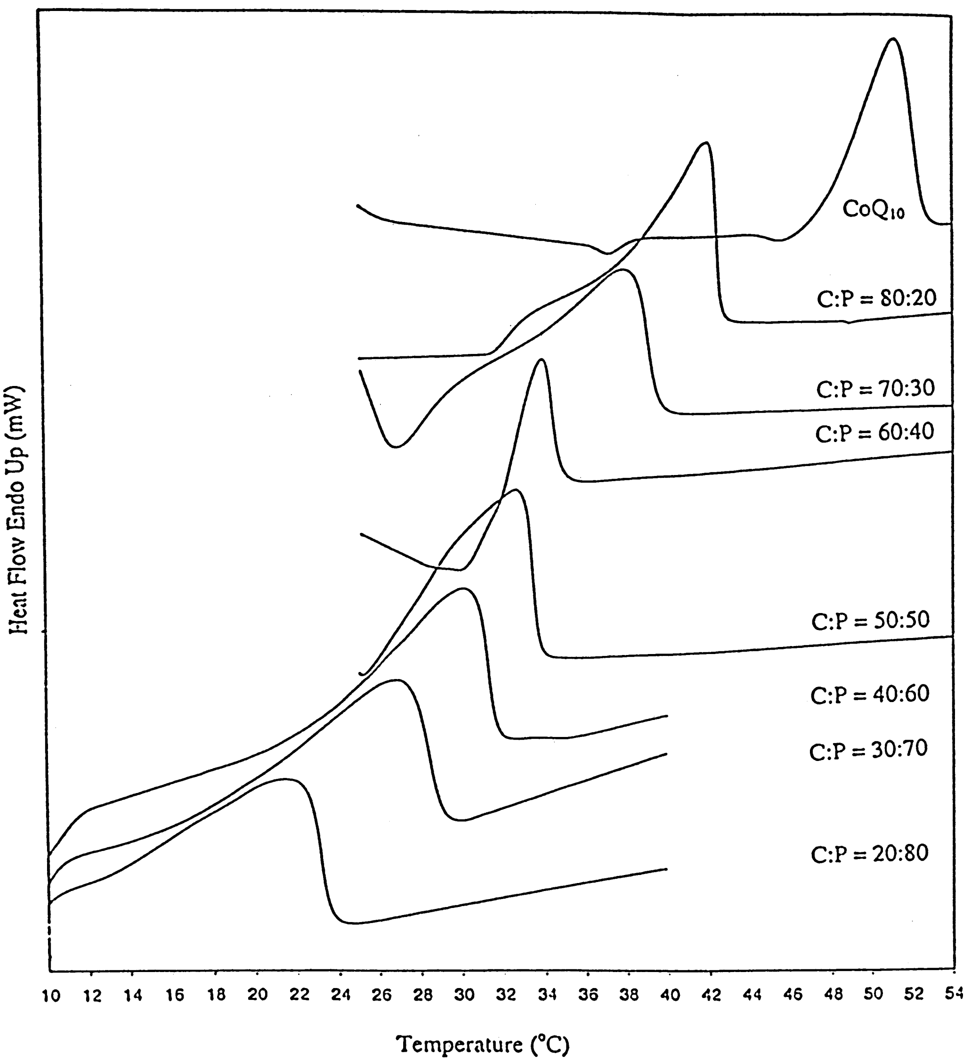


[redacted]

F . 2. DSC C Q_{10}, L- , . . R .

P450 (B ., 1998). A
- C Q_{10} 37 C.
E , ,
, C Q_{10}

. T 1 . F , , , , , . D C Q_{10} (K- ., 2001) EL C Q_{10} - . T C Q_{10}, EL 37 C . W 60% / EL , 50 60% / C Q_{10} 5.3 1.8 , . P- C Q_{10} EL - , . T . A 50% / C Q_{10}, 5 . I , C Q_{10}

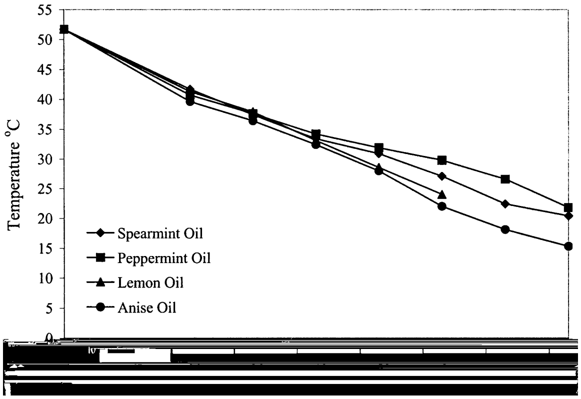


F . 4. DSC C Q_{10}, . R .

. W . T (R , 1975). F (C S , 1997). C

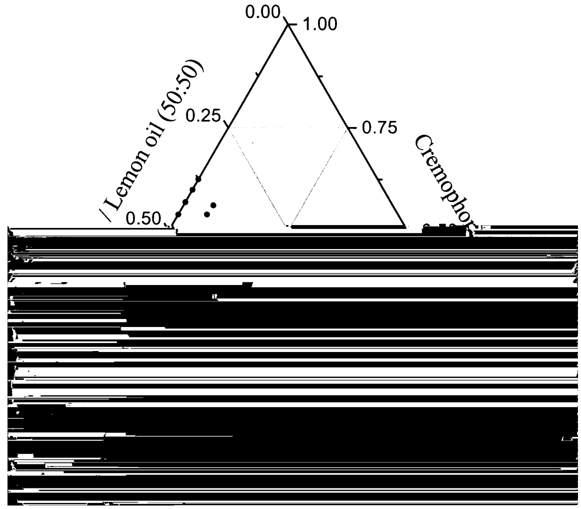
37.5% T 1, 63% C Q_{10} .

3.4. Droplet size analysis and turbidity measurements



F . 5. T / C Q10 DSC.

T - F . 7. A 0.5, 100 - . I 0.5 EL MCM-C8



F . 6. P - - - (, ;).

. G . (1998) - -355, EL, - - 2:1. I , - (C - S , 1997; G ., 1998). C -

T. 2
E SNEDDS

F.	SNEDDS (% /)					SNEDDS (μ)					
	C. Q10	L	C.	C	M	S	$D(0.1)$	$D(0.25)$	$D(0.5)$	$D(0.75)$	$D(0.9)$
1	18.8	18.8	56.3	6.3	2.817	0.270	3.179	3.014	2.806	2.619	2.468
2	18.8	18.8	50.0	12.5	0.402	0.277	0.845	0.572	0.323	0.117	0.110
3	18.8	18.8	43.8	18.8	0.121	0.015	0.142	0.130	0.119	0.100	0.101
4	18.8	18.8	37.5	25.0	0.112	0.037	0.165	0.135	0.106	0.084	0.070
5	18.8	18.8	31.3	31.3	0.090	0.012	0.107	0.099	0.089	0.081	0.045
6	18.8	18.8	25.0	37.5	0.113	0.017	0.137	0.125	0.112	0.100	0.092
7	18.8	18.8	18.8	43.8	<0.040						
8	20.0	20.0	53.3	6.7	0.845	0.308	1.287	1.027	0.786	0.607	0.499
9	20.0	20.0	46.7	13.3	0.725	0.213	1.031	0.862	0.693	0.558	0.472
10	20.0	20.0	40.0	20.0	0.121	0.048	0.170	0.141	0.110	0.083	0.067
11	20.0	20.0	33.3	26.7	0.089	0.026	0.107	0.098	0.089	0.081	0.074
12	20.0	20.0	26.7	33.3							
13						0.025	0.117	0.107	0.099	0.091	

0.06781735 0 TD20.037.5 0.02.995 0 TD20.0

0.10158.8(3.179)-30002.8(0.862)-3292.4(0.119)-3101.3(0.084) T10-5.024 0 TD 7130.1125

(G M , 1974). L R , τ

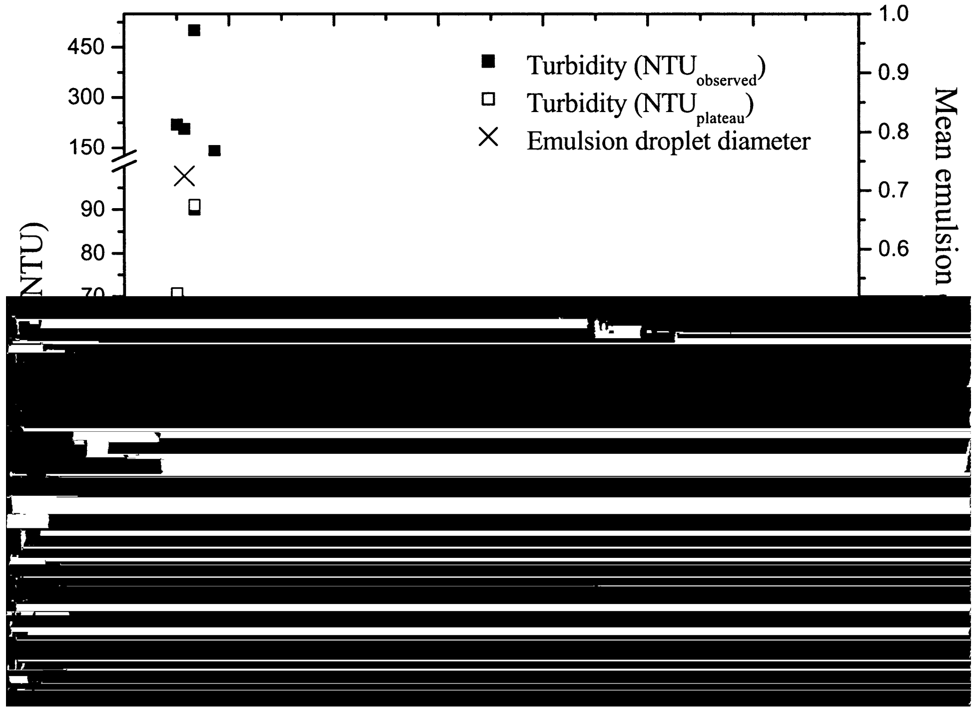
$$\tau = Knv^2$$

K , v n (G M , 1974; P , 1985). T - NTU NTU F . 7. A , . P (1985) . H , NTU - . T

, 0 1 NTU (H A , 1998).

3.5. Fourier transform-infrared spectroscopy (FT-IR)

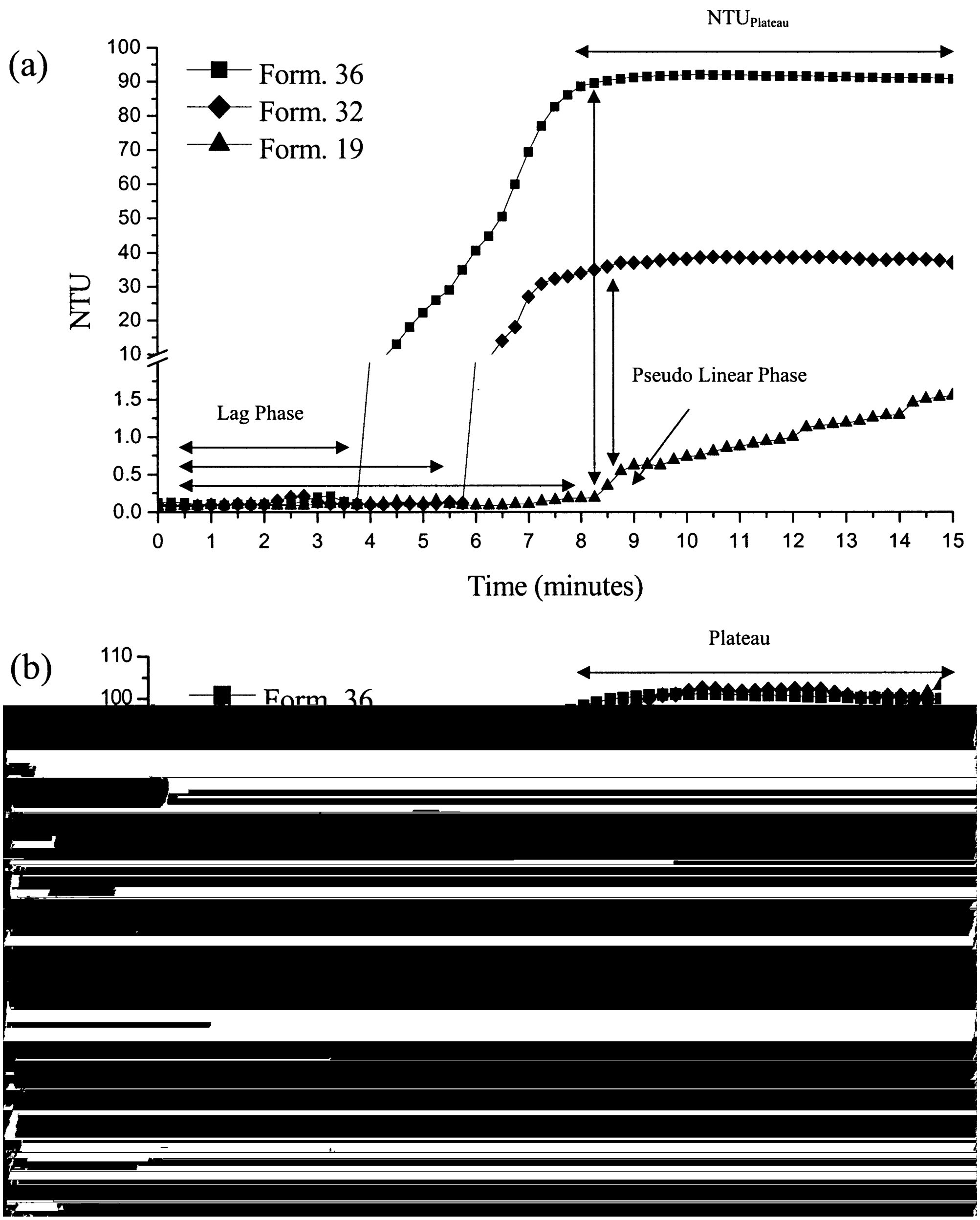
T - ATR FT-IR (H , 1999). C Q_{10} - - - FT-IR. A C Q_{10} F . 8. C Q_{10} - (29) . T 50:50 C Q_{10} , F . 8, C Q_{10} . L C Q_{10} -



F . 7. E (EL) - (MCM-C8) , NTU NTU .

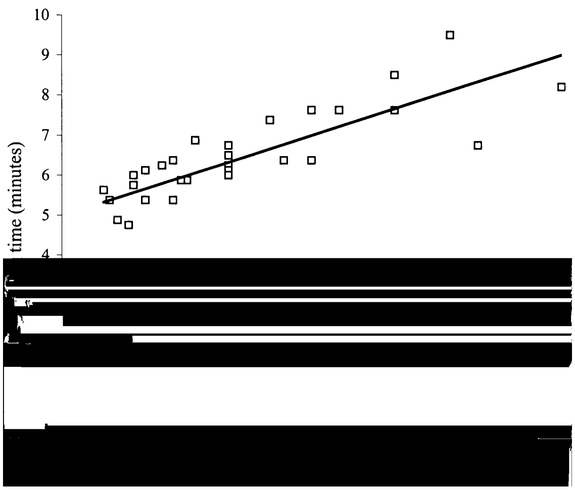
T. 3
E SNEDDS C Q10 15

F	SNEDDS (% /)				SNEDDS			C Q10 (15)	
	C Q10	L	C.	C	NTU	NTU	NTU	P	STD
1	18.8	18.8	56.3	6.3	605.5				
2	18.8	18.8	50.0	12.5	220.0	78.2	70.7	94.0	2.18
3	18.8	18.8	43.8	18.8	25.1	8.9	19.5	90.3	7.87
4	18.8	18.8	37.5	25.0	9.0	3.2	6.0	92.8	2.52
5	18.8	18.8	31.3	31.3	6.9	2.5	4.8	88.8	2.52
6	18.8	18.8	25.0	37.5	5.3	1.9	4.1	88.0	2.84
7	18.8	18.8	18.8	43.8	2.4	0.8	3.1	87.4	4.42
8	20.0	20.0	53.3	6.7	513.0				
9	20.0	20.0	46.7	13.3	207.0	69.0	51.7	85.0	1.14
10	20.0	20.0	40.0	20.0	32.7	10.9	13.8	87.3	1.14
11	20.0	20.0	33.3	26.7	12.0	4.0	5.7	91.0	5.35
12	20.0	20.0	26.7	33.3	7.0	2.3	3.5	96.3	1.28
13	20.0	20.0	20.0	40.0	4.5	1.5	3.0	99.5	0.64
14	21.4	21.4	50.0	7.1	510.5				
15	21.4	21.4	42.9	14.3	90.1	28.0	52.0	89.8	3.98
16	21.4	21.4	35.7	21.4	20.1	6.2	10.3	94.7	0.05
17	21.4	21.4	28.6	28.6	10.6	3.3	4.1	94.7	1.12
18		21.4	21.4	35.7	5.9	1.8	2.7		


(a)
NTU
Form. 36
Form. 32
Form. 19
NTU_Plateau
Lag Phase
Pseudo Linear Phase
Time (minutes)
(b)
Plateau
110
100

F . 9. ( ) T

A 1:1:3 F. 11 . F. 11 1:1:3 - ( ) (K , 1983). F. 11 : - - , (B ., 1991). F. 11 . T . P , , (K L , 1983). H , - (G G , 1976). A



F. 10. E (EL) -

$^{t}_{NTU} \times 100/$ NTU , NTU 100%

C Q10 (F. 9). $^{t}_{NTU}$ t. G - - . A F. 9 , , , . T , (E) . T - . F. 12 - . M - 1 42.6%. T HLB . B - . (1997) HLB - - . H , (S ., 1994). A , - (H ., 1996). T , - - .

4. Conclusion

T - SNEDDS. P SNEDDS C Q10. R - HPMC . T -

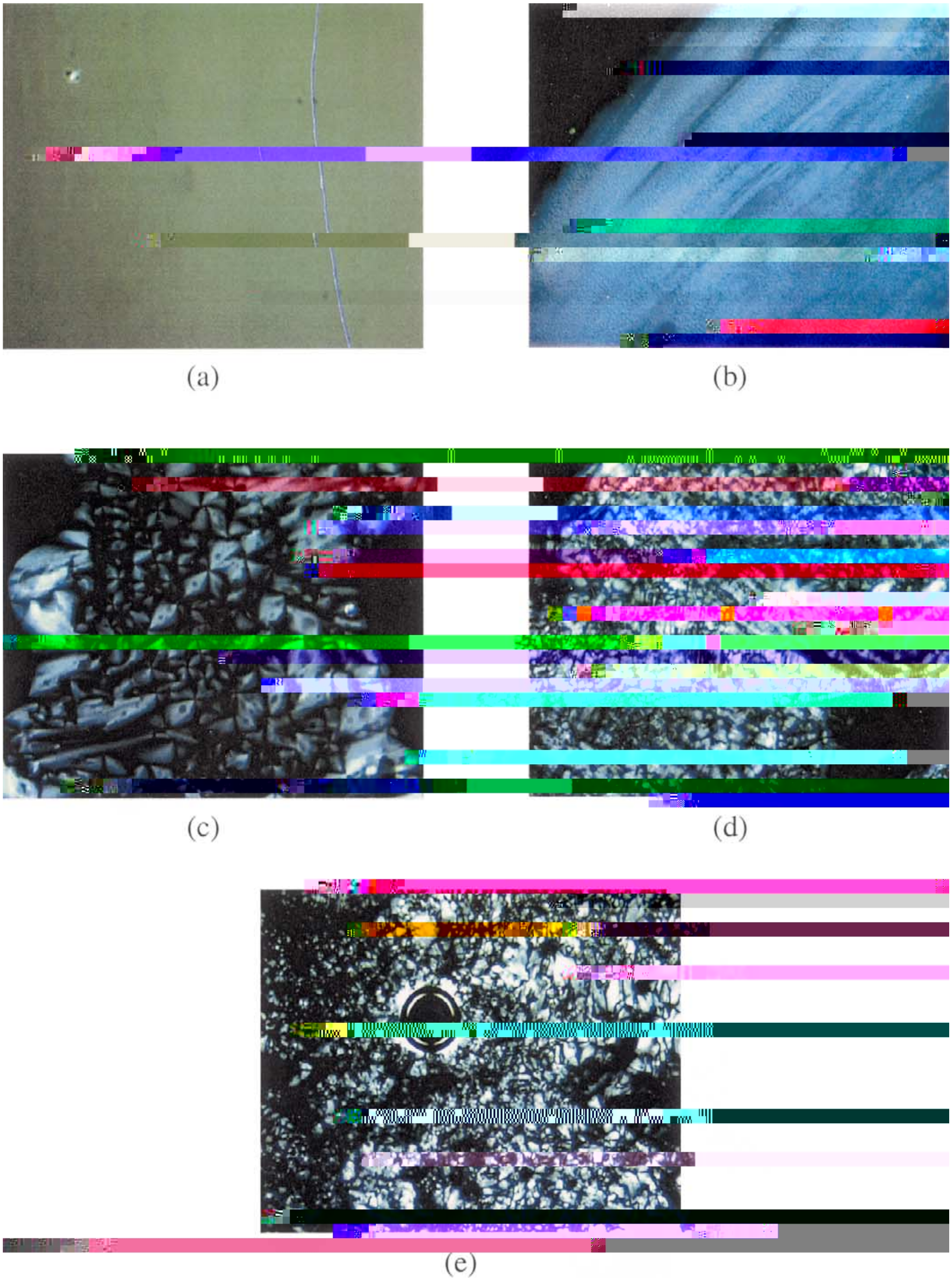


Fig. 11. ( ) O [illegible] P [illegible] ( ) [illegible] 1:3, ( ) [illegible] 1:1:3, ( ) [illegible] 1:1:3, ( ) [illegible] 1:1:3 [illegible].

J , G.H., 1952. O . I : K , H.R. (E .), C S . E , A - , . 90–114.
K , L., J , H.W., M C , J.W., 2000. P . I . J. P . 206, 35–42.
K , M., 1983. P , L W L C , M S , V O M . W , C , . 322.
K , T.R., A , M., K , M.A., R , I.K., 1999. S - Q10 . C . P . B . 47 (7), 1024–1028.
K , T.R., G , B., K , M.A., R , I.K., 2001. S - (SEDDS) - Q10: . I . J. P . 212, 233–246.
K , M.V., L , O.D., 1983. M C. . E . T . F . 85, 511–526 E : S . P . JETP, 58, 299–307.
L , J., 1995. T I E E O . B & N , . 120.
L , A., P , J., 1995. I Q10 . A . P . P . 52 (5), 379–386.
N , S., , A.A., R , I.K., K , M.A., 2001. A (C Q10) . D P 56 (5), 394–396.
N , S., G , N., R , I.K., K , M.A., 2002. P - Q10 E . D . D . I . P . 2.1(56) TJ G