Figure Index

CHAPTER – 3: THEORETICAL CONSIDERATIONS

Figure Number		Tittle	Tittle		
			. ·		
Fig 1	Slope of Equilibriur	n/Distribution Curve			35
Fig. 2	Right Angle Triang	ular Diagram			35
Fig. 3.	Determination of Pl	ait Point Composition	a.		36
	Graphical Techniqu	5.			

CHAPTER- 4: EXPERIMENTAL

Figure	Number Tittle	Page
Fig. I	Experimental Set up for Packed column.	140
Fig II	Schematic diagram of Liquid-liquid Extraction Unit.	141

XXX

Figure Index

CHAPTER - 5: RESULTS AND DISCUSSION FOR QUATERNARY LIQUID- LIQUID PHASE EQUILIBRIUM DATA

Figure Number	Tittle		Page
			· · · · · · · · · · · · · · · · · · ·
Mutual Solubility Data	a:[M]		2 2
Fig. M1 Mutual Solubility	data of antisolvent effect as par	ameters for	169
system B-H-100/9	00/80%Dmf-0/10/20% W at 20	°C	
Fig. M2 Mutual Solubility	data of antisolvent effect as par	ameters for	170
system B-H-100/9	00/80%Dmf-0/10/20% W at 30	°C	•
Fig. M3 Mutual Solubility	data of antisolvent effect as par	ameters for	171
system B-H-100/9	00/80%Dmf-0/10/20% W at 40	°C	
Fig. M-4 Mutual Solubility	v data of antisolvent effect as par	rameters for	174
system T-H-100/9	90/80%Dmf-0/10/20% W at 20	°C	•
Fig. M5 Mutual Solubility	data of antisolvent effect as para	ameters for	175
system T-H-100/9	0/80%Dmf-0/10/20% W at 30	° C	
Fig. M6 Mutual Solubility	data of antisolvent effect as para	ameters for	176
system T-H-100/9	0/80%Dmf-0/10/20% W at 40	°C	
Fig. M7 Mutual Solubility	data of antisolvent effect as para	ameters for	178
system X-H-100/9	90/80%Dmf-0/10/20% W at 20	°C	
Fig. M8 Mutual Solubility	data of antisolvent effect as para	ameters for	179
system X-H-100/9	90/80%Dmf-0/10/20% W at 30	°C	
Fig. M9 Mutual Solubility	data of antisolvent effect as para	ameters for	180
system X-H-100/9	0/80%Dmf-0/10/20% W at 40	°C	
Fig. M-10 Mutual Solubility	data of antisolvent effect as par	ameters for	182
system B-H'-100	/90/80%Dmf-0/10/20% W at 20	°C	
Fig. M-11 Mutual Solubility	data of antisolvent effect as par	ameters for	183
system B-H'-100/	'90/80%Dmf-0/10/20% W at 30	°C	
Fig. M-12 Mutual Solubility	data of antisolvent effect as par	ameters for	184
system B-H'-100/	'90/80%Dmf-0/10/20% W at 40	°C	

	Fig. M-13 Mutual Solubility data of antisolvent effect as parameters for	185
	system B-Oct-100/90/80%Dmf-0/10/20% W at 20 °C	
,	Fig. M-14 Mutual Solubility data of antisolvent effect as parameters for	186
	system B-Oct-100/90/80%Dmf-0/10/20% W at 30 °C	
	Fig. M-15 Mutual Solubility data of antisolvent effect as parameters for	187
	system B-Oct-100/90/80%Dmf-0/10/20% W at 40 °C	· . ·
•	Fig. M-16 Mutual Solubility data of antisolvent effect as parameters for	189
•	system B-H-100/90/80%Dmso-0/10/20% W at 20 °C	
	Fig. M-17 Mutual Solubility data of antisolvent effect as parameters for	190
	system B-H-100/90/80%Dmso-0/10/20% W at 30 °C	
	Fig. M-18 Mutual Solubility data of antisolvent effect as parameters for	191
	system B-H-100/90/80%Dmso-0/10/20% W at 40 °C	
	Fig. M-19 Mutual Solubility data of antisolvent effect as parameters for	195
	system T-H-100/90/80%Dmso-0/10/20% W at 20 °C	
	Fig. M-20 Mutual Solubility data of antisolvent effect as parameters for	196
•	system T-H-100/90/80%Dmso-0/10/20% W at 30 °C	·
	Fig. M-21 Mutual Solubility data of antisolvent effect as parameters for	197
	system T-H-100/90/80%Dmso-0/10/20% W at 40 °C	
	Fig. M-22 Mutual Solubility data of antisolvent effect as parameters for	199
	system X-H-100/90/80%Dmso-0/10/20% W at 20 °C	
	FigM.23 Mutual Solublity data of antisolvent effect as parameters for	200
	system X-H-100/90/80%Dmso-0/10/20% W at 30 °C	
	Fig. M-24 Mutual Solubility data of antisolvent effect as parameters for	201
	system X-H-100/90/80%Dmso-0/10/20% W at 40 °C	·
	Fig. M-25 Mutual Solubility data of antisolvent effect as parameters for	203
	system B-Hep-100/90/80%Dmso-0/10/20% W at 20 °C	•
	Fig. M-26 Mutual Solubility data of antisolvent effect as parameters for	204
	system B-Hep-100/90/80%Dmso-0/10/20% W at 30 °C	
	Fig. M-27 Mutual Solubility data of antisolvent effect as parameters for	205
	system B-Hep-100/90/80%Dmso-0/10/20% W at 40 °C	·
	Fig. M-28 Mutual Solubility data of antisolvent effect as parameters for	206
	system B-Oct-100/90/80%Dmso-0/10/20% W at 20 °C	·

xxxii

<u>_</u>.

Fig. M-29 Mutual Solubility data of antisolvent effect as parameters for	207
system B-Oct-100/90/80%Dmso-0/10/20% W at 30 °C	
Fig. M-30 Mutual Solubility data of antisolvent effect as parameters for	208
system B-Oct-100/90/80%Dmso-0/10/20% W at 40 °C	
Diagram for Tie line data [T]:	• •
Fig.T-1 Tie line data for the Quaternary System	241
Beneze(B)- Hexane (H)-Dmf(D) + Water(W) at 20°C	:
with antisolvent concentration as a parameter	
Fig.T-2 Tie line data for the Quaternary System	242
Benzene(B)- Hexane (H)-Dmf(D) + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-3 Tie line data for the Quaternary System	243
Benzene(B)- Hexane (H)-Dmf(D) + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-4 Tie line data for the Quaternary System	244
Toluene (T) Hexane (H)-Dmf(D) + Water(W) at 20°C	
with antisolvent concentration as a parameter	
Fig.T-5 Tie line data for the Quaternary System	245
Toluene (T) Hexane (H)-Dmf(D) + Water(W) at 30 °C	
with antisolvent concentration as a parameter	
Fig.T-6 Tie line data for the Quaternary System	246
Toluene (T) Hexane (H)-Dmf(D) + Water(W) at 40 °C	
with antisolvent concentration as a parameter	
Fig. –7 Tie line data for the Quaternary System	247
Xylene(X)- Hexane (H)-Dmf(D) + Water(W) at 20°C	
with antisolvent concentration as a parameter	· ·
Fig.T-8 Tie line data for the Quaternary System	248
Xylene(X)- Hexane (H)-Dmf(D) + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-9 Tie line data for the Quaternary System	249
Xylene(X)- Hexane (H)-Dmf(D) + Water(W) at 40°C	
with antisolvent concentration as a parameter	

xxxiii

Fig.T-10 Tie line data for the Quaternary System	250
Benzene(B)-Hept(H')-Dmf(D) + Water(W) at 20°C	
with antisolvent concentration as a parameter	
Fig.T-11 Tie line data for the Quaternary System	251
Benzene(B)-Hept(H')-Dmf(D) + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-12 Tie line data for the Quaternary System	252
Benzene(B)-Hept(H')-Dmf(D) + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-13 Tie line data for the Quaternary System	253
Benzene(B)-Oct(O)-Dmf(D) + Water(W) at 20°C	
with antisolvent concentration as a parameter	
Fig.T-14 Tie line data for the Quaternary System	254
Benzene(B)-Oct(O)-Dmf(D) + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-15 Tie line data for the Quaternary System	255
Benzene(B)-Oct(O)-Dmf(D) + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-16 Tie line data for the Quaternary System	257
Benzene(B)- Hexane (H)-Dmso(D') + Water(W) at 20°C	
with antisolvent concentration as a parameter	•
Fig.T-17 Tie line data for the Quaternary System	258
Benzene(B)- Hexane (H)-Dmso(D') + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-18 Tie line data for the Quaternary System	259
Benzene(B)- Hexane (H)-Dmso(D') + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-19 Tie line data for the Quaternary System	260
Toluene (T) Hexane (H)-Dmso(D') + Water(W) at 20°C	
with antisolvent concentration as a parameter	

xxxiv

• •

Fig.T-20 Tie line data for the Quaternary System	261
Toluene (T) Hexane (H)-Dmso(D') + Water(W) at 30°C	•
with antisolvent concentration as a parameter	
Fig.T-21 Tie line data for the Quaternary System	262
Toluene (T) Hexane (H)-Dmso(D') + Water(W) at 40°C	
with antisolvent concentration as a parameter	ŕ. . ,
Fig.T-22 Tie line data for the Quaternary System	263
Xylene(X)- Hexane (H)-Dmso(D') + Water(W) at 20°C	•
with antisolvent concentration as a parameter	
Fig.T-23 Tie line data for the Quaternary System	264
Xylene(X)- Hexane (H)-Dmso(D') + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-24 Tie line data for the Quaternary System	265
Xylene(X)- Hexane (H)-Dmso(D') + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-25 Tie line data for the Quaternary System	266
Benzene(B)- Hept (H')-Dmso(D') + Water(W) at 20°C	
with antisolvent concentration as a parameter	
Fig.T-26 Tie line data for the Quaternary System	267
Benzene(B)- Hept (H')-Dmso(D') + Water(W) at 30°C	
with antisolvent concentration as a parameter	
Fig.T-27 Tie line data for the Quaternary System	268
Benzene(B)- Hept (H')-Dmso(D') + Water(W) at 40°C	
with antisolvent concentration as a parameter	
Fig.T-28 Tie line data for the Quaternary System	269
Benzene(B)- Oct (O)-Dmso(D') + Water(W) at 20°C	
with antisolvent concentration as a parameter	
Fig.T-29 Tie line data for the Quaternary System	270
Benzene(B)- Oct (O)-Dmso(D') + Water(W) at 30°C	
with antisolvent concentration as a parameter	
FigT-30 Tie line data for the Quaternary System	271
Benzene(B)- Oct (O)-Dmso(D') + Water(W) at 40°C	
with antisolvent concentration as a parameter	

XXXV

.

•

,

.

•

Fig. D-I	Distribution Diagrams for system: B-H-Dmf+W at different	293
•	temperatures with anti solvent concentrations as a parameter	• • •
Fig. S-1	Selectivity Diagrams for system: B-H-Dmf-W at different	29
	temperature with anti solvent concentrations as a parameter.	
Fig. D-2	Distribution Diagrams for system: T-H-Dmf+W at different	29
	temperatures with anti solvent concentrations as a parameter	
Fig. S-2	Selectivity Diagrams for system: T-H-Dmf-W at different	29
	temperature with anti solvent concentrations as a parameter.	
Fig. D-3	Distribution Diagrams for system: X-H-Dmf+W at different	29
• •	temperatures with anti solvent concentrations as a parameter	
Fig. S-3	Selectivity Diagrams for system: X-H-Dmf-W at different	30
•	temperature with anti solvent concentrations as a parameter.	
Fig. D-4	Distribution Diagrams for system: B-Hep-Dmf+W at different	302
	temperatures with anti solvent concentrations as a parameter	
Fig. S-4	Selectivity Diagrams for system: B-Hep-Dmf-W at different	303
	temperature with anti solvent concentrations as a parameter.	
Fig. D-5	Distribution Diagrams for system: B-Oct-Dmf+W at different	30
	temperatures with anti solvent concentrations as a parameter	
Fig. S-5	Selectivity Diagrams for system: B- Oct -Dmf-W at different	300
	temperature with anti solvent concentrations as a parameter.	
Fig. D-6	Distribution Diagrams for system: B-H-Dmf+W at different	308
	temperatures with anti solvent concentrations as a parameter	
Fig. S-6	Selectivity Diagrams for system: B-H-Dmso-W at different	309
	temperature with anti solvent concentrations as a parameter.	
Fig. D-7	Distribution Diagrams for system: T-H-Dmso+W at different	312
	temperatures with anti solvent concentrations as a parameter	
Fig. S-7	Selectivity Diagrams for system: T-H-Dmso-W at different	313
,	temperature with anti solvent concentrations as a parameter.	
Fig. D-8	Distribution Diagrams for system: X-H-Dmso+W at different	31:
	temperatures with anti solvent concentrations as a parameter	
	Selectivity Diagrams for system: X-H-Dmso-W at different	214
Fig. S-8		210

Fig. D-9	Distribution Diagrams for system: B-Hep-Dmso+W at different	31
	temperatures with anti solvent concentrations as a parameter	
Fig. S-9	Selectivity Diagrams for system: B-Hep-Dmso-W at different	320
	temperature with anti solvent concentrations as a parameter.	
Fig. D-1	0 Distribution Diagrams for system: B-Oct-Dmso+W at different	322
	temperatures with anti solvent concentrations as a parameter	
Fig. S-1	D Selectivity Diagrams for system: B- Oct -Dmso-W at different	324
	temperature with anti solvent concentrations as a parameter.	
Fig. D-1	1 Distribution Diagrams for system: B-H-Dmf+W at different	326
	anti solvent concentrations with temperatures as a parameter	
Fig. S-1	Selectivity Diagrams for system: B-H-Dmf-W at different	327
	anti solvent concentrations with temperatures as a parameter.	
Fig. D-1	2 Distribution Diagrams for system: T-H-Dmf+W at different	33(
	anti solvent concentrations with temperatures as a parameter	
Fig. S-12	2 Selectivity Diagrams for system: T-H-Dmf-W at different	33
	anti solvent concentrations with temperatures as a parameter.	т ч ч ч ч
Fig. D-1	3 Distribution Diagrams for system: X-H-Dmf+W at different	33
	anti solvent concentrations with temperatures as a parameter	
Fig. S-13	Selectivity Diagrams for system: X-H-Dmf-W at different	334
	anti solvent concentrations with temperatures as a parameter.	· ·
Fig. D-1	4 Distribution Diagrams for system: B-Hep-Dmf+W at different	330
	anti solvent concentrations with temperatures as a parameter	• •
Fig. S-14	Selectivity Diagrams for system: B-Hep-Dmf-W at different	337
	anti solvent concentrations with temperatures as a parameter.	
Fig. D-1	5 Distribution Diagrams for system: B-Oct-Dmf+W at different	339
	anti solvent concentrations with temperatures as a parameter	
Fig. S-15	Selectivity Diagrams for system: B- Oct -Dmf-W at different	340
	anti solvent concentrations with temperatures as a parameter.	
Fig. D-10	5 Distribution Diagrams for system: B-H-Dmso+W at different	343
	anti solvent concentrations with temperatures as a parameter	
Fig. S-16	Selectivity Diagrams for system: B-H-Dmso-W at different	344
	anti solvent concentrations with temperatures as a parameter.	
		xxxvii

		• •
	Fig. D-17 Distribution Diagrams for system: T-H-Dmso+W at different	346
	anti solvent concentrations with temperatures as a parameter	
	Fig. S-17 Selectivity Diagrams for system: T-H-Dmso-W at different	347
	anti solvent concentrations with temperatures as a parameter.	· · · ·
•	Fig. D-18 Distribution Diagrams for system: X-H-Dmso+W at different	349
	anti solvent concentrations with temperatures as a parameter	1942 - S
	Fig. S-18 Selectivity Diagrams for system: X-H-Dmso-W at different	350
	anti solvent concentrations with temperatures as a parameter.	
	Fig. D-19 Distribution Diagrams for system: B-Hep-Dmso+W at different	352
	anti solvent concentrations with temperatures as a parameter	
	Fig. S-19 Selectivity Diagrams for system: B-Hep-Dmso-W at different	353
	anti solvent concentrations with temperatures as a parameter.	
	Fig. D-20 Distribution Diagrams for system: B-Oct-Dmso+W at different	355
	anti solvent concentrations with temperatures as a parameter	
	Fig. S-20 Selectivity Diagrams for system: B- Oct -Dmso-W at different	356
	anti solvent concentrations with temperatures as a parameter.	
	Fig. D-21 Distribution Diagrams for system: B-T-X-Dmf+0%W at different	358
-	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. S –21 Selectivity Diagrams for system: B-T-X-Dmf+0%W at different	359
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. D 22 Distribution Diagrams for system: B-T-X-90%Dmf+10%W at different	361
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. S-22 Selectivity Diagrams for system: B-T-X-90%Dmf+10%W at different	362
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. D-23 Distribution Diagrams for system: B-T-X-80%Dmf+20%W at different	365 ·
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. S-23 Selectivity Diagrams for system: B-T-X-80%Dmf+20%W at different	366
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. D -24 Distribution Diagrams for system: B-T-X-Dmso+0%W at different	368
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. S -24 Selectivity Diagrams for system: B-T-X-Dmso+0%W at different	369
	temperatures with molecular weight of Aromatic as a parameter.	
	XXXVİ	iii

•

.

xxxviii

	Fig. D -25 Distribution Diagrams for system: B-T-X-90%Dmso+10%W at different37	71
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. S -25 Selectivity Diagrams for system: B-T-X-90%Dmso+10%W at different 37	72
. •	temperatures with molecular weight of Aromatic as a parameter.	
.*	Fig. D -26 Distribution Diagrams for system: B-T-X-80%Dmso+20%W at different 37	74
	temperatures with molecular weight of Aromatic as a parameter.	۰.
- '	Fig. S -26 Selectivity Diagrams for system: B-T-X-80%Dmso+20%W at different 3'	7
	temperatures with molecular weight of Aromatic as a parameter.	
	Fig. D-27 Distribution Diagrams for system: B-H-Hep-Oct-Dmf+0%W at different3'	7
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. S -27 Selectivity Diagrams for system: B-H-Hep-Oct-Dmf+0%W at different38	32
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. D-28Distribution Diagrams for system : B-H-Hep-Oct-90%Dmf+10%W at different 37	79
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. S -28 Selectivity Diagrams for system: B-H-Hep-Oct-90%Dmf+10%W at different 383	3
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. D-29 Distribution Diagrams for system: B-H-Hep-Oct-80%Dmf+20%W at different38	31
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. S-29 Selectivity Diagrams for system: B-H-Hep-Oct-80%Dmf+20%W at different 38:	5
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. D-30 Distribution Diagrams for system: B-H-Hep-Oct-Dmso+0%W at different 386	5
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig. S –30 Selectivity Diagrams for system: B-H-Hep-Oct-Dmso+0%W at different 388	8
	temperatures with molecular weight of Aliphatic as a parameter.	
•	Fig.D-31Distribution Diagrams for system:B-H-Hep-Oct-90%Dmso+10%W at different 390	0
	temperatures with molecular weight of Aliphatic as a parameter.	
-	Fig. S-31Selectivity Diagrams for system: B-H-Hep-Oct-90%Dmso+10%W at different 391	l
	temperatures with molecular weight of Aliphatic as a parameter.	
	Fig.D-32 Distribution Diagrams for system:B-H-Hep-Oct-80%Dmso+20%W at different39	13
	temperatures with molecular weight of Aliphatic as a parameter.	
		A

· · ·

xxxix



Plots for Four Correlations under consideration

Fig. -I Different Correlation for the system B-H-Dmf + W at 30°C Fig. -II Different Correlation for the system B-H-Dmso + W at 30°C

Hand's plots for Different Systems[H]

Fig.H -1 Hand's Plot for System : B-H-Dmf-Water	421
with temperature and anti solvent concentration as parameter	
Fig.H -2 Hand's plot for System : T-H-Dmf-Water	422
with temperature and anti solvent concentration as parameter	
Fig.H - 3 Hand's plot for System : X-H-Dmf-Water	423
with temperature and anti solvent concentration as parameter	
Fig.H -4 Hand's plot for System : B-Hept- Dmf-Water	424
with temperature and anti solvent concentration as parameter	
Fig.H - 5 Hand's plot for System : B-Oct-Dmf-Water	425
with temperature and anti solvent concentration as parameter	
Fig.H 6Hand's plot for System : B-H-Dmso-Water	426
with temperature and anti solvent concentration as parameter	
Fig.H – 7Hand's plot for System : T-H-Dmso-Water	427
with temperature and anti solvent concentration as parameter	
Fig.H - 8Hand's plot for System : X-H-Dmso-Water	428
with temperature and anti solvent concentration as parameter	
Fig.H –9Hand's plot for System : B-Hept-Dmso-Water	429
with temperature and anti solvent concentration as parameter	
Fig.H–10Hand's plot for System : B-Oct-Dmso-Water	430
with temperature and anti solvent concentration as parameter	

Generalized Correlation Plots

.

Fig.GC-1 Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.5}	460
for the development of Generalized correlation for system:B-H-Dmf-W	
Fig.GC-2 Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.75} .	460
for the development of Generalized correlation for system:B-H-Dmf-W	
Fig.GC-3 Plots of log k Vs, log T'+log[$(S+W)/S$] ⁻³ .	460
for the development of Generalized correlation for system:B-H-Dmf-W	
Fig.GC-4 Plots of log k Vs, log T'+log[(S+W)/S]-2.5.	461
for the development of Generalized correlation for system: T- H-Dmf-W	الان و منه المراقع وي من حرق
Fig.GC-5 Plots of log k Vs, log T'+log[$(S+W)/S$] ^{-2.75}	461
for the development of Generalized correlation for system: T- H-Dmf-W	
Fig.GC-6 Plots of log k Vs, log T ⁺ log[(S+W)/S ^{1°} .	461
for the development of Generalized correlation for system: 1- H-DmI-W	
Fig.GC-7 Plots of log k Vs, log T'+log[(S+W)/S] ²²³ .	462
for the development of Generalized correlation for system: X-H-DmI-w	
Fig.GC-8 Plots of log k Vs, log $T+log[(S+W)/S]^{-2/3}$.	462
for the development of Generalized correlation for system:X-H-Dmf-W	
Fig.GC-9 Plots of log k Vs, log T'+log[(S+W)/S] ⁻² .	462
for the development of Generalized correlation for system: X-H-DmI-W	
Fig.GC-10Plots of log k Vs, log T+log[(S+W)/S] ^{2.15}	463
For the development of Generalized correlation for system; B-H-DmI-w	1.50
Fig.GC-11 Plots of log k Vs, log 1'+log[(S+W)/S] ⁻	463
The development of Generalized constation for system: B-H-DmI-w	
Fig.GC-12 Plots of log k Vs, log T+log[(S+W)/S] ³²² .	463
First and the line of the line of the second	
Fig.GC-13 Plots of log k Vs, log 1'+log[(S+W)/S] ⁻¹⁰ .	464
The development of Generalized correlation for system I - H-DmI-w	
Fig.GC-14 Plots of log k Vs, log 1+log[(S+W)/S] [*] .	464
First and the second se	
Fig.GC-15 Plots of log K Vs, log 1'+log[(S+W)/S]	464
for the development of Generalized correlation for system: 1- H-DmI-W	
Fig.GC-16 Plots of log k Vs, log T+log[(S+W)/S] ^{2/3} .	465
The development of Generalized correlation for system X-H-DmI-w	
FIG.UC-1/ FIOIS OI IOG K VS, IOG 1 +IOG[(S+W)/S] for the development of Generalized correlation for systems X II Devf W	465
F: CO 19. Plate after h Mr. her Thildref(0; MD/02 ⁻³²⁵	
FIG.GC-18 FIOTS OI log K VS, log I +log[(S+W)/S]	465
for the development of "Generalized correlation for system; A-H-DMI-W	

xli

	Fig.GC-19 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.5} for the development of Generalized correlation for system: B-Hep-Dmf-W	466
÷ .	Fig.GC-20 Plots of log k Vs, log T'+log[(S+W)/S] ⁷⁵ . for the development of Generalized correlation for system: B-Hep-Dmf-W	466
	Fig.GC-21 Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹ . for the development of Generalized correlation for system: B-Hep-Dmf-W	466
	Fig.GC-22 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75} for the development of Generalized correlation for system: B-Hep-Dmf-W	467
	Fig.GC-23 Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹ for the development of Generalized correlation for system: B-Hep-Dmf-W	467
	Fig.GC-24 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.25} . for the development of Generalized correlation for system: B-Hep-Dmf-W	467
	Fig.GC-25 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.25} for the development of Generalized correlation for system: B-Oct-Dmf-W	468
	Fig.GC-26 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.5} for the development of Generalized correlation for system: B-Oct-Dmf-W	468
	Fig.GC-27 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75} . for the development of Generalized correlation for system: B-Oct-Dmf-W	468
•	Fig.GC-28 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.5} . for the development of Generalized correlation for system: B-Oct-Dmf-W	469
	Fig.GC-29 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75} . for the development of Generalized correlation for system: B-Oct-Dmf-W	469
	Fig.GC-30 Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹ for the development of Generalized correlation for system: B-Oct-Dmf-W	469
	Fig.GC-31 Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.5} for the development of Generalized correlation for system: B-H-Dmso-W	476
	Fig.GC-32 Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.75} for the development of Generalized correlation for system: B-H-Dmso-W	476
	Fig.GC-33 Plots of log k Vs, log T'+log[(S+W)/S] ⁻³ for the development of Generalized correlation for system: B-H-Dmso-W	476
	Fig.GC-34Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.5} for the development of Generalized correlation for system: T- H-Dmso-W	477
	Fig.GC-35Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.75} for the development of Generalized correlation for system: T- H-Dmso-W	477
	for the development of Generalized correlation for system: T- H-Dmso-W	477
	Fig.GC-37 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.333} for the development of Generalized correlation for system: X-H-Dmso-W	478
	Fig.GC-38 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.5} for the development of Generalized correlation for system: X-H-Dmso-W	478
	xlii	
•		

Fig.GC-39 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75}	478
for the development of Generalized correlation for system: X-H-Dmso-W	
Fig.GC-40 Plots of log k Vs, log T'+log[(S+W)/S]-2.75	479
for the development of Generalized correlation for system: B-H-Dmso-W	
Fig.GC-41 Plots of log k Vs, log T'+log[(S+W)/S] ⁻³ for the development of Generalized correlation for system: B-H-Dmso-W	479
Fig.GC-42 Plots of log k Vs, log T'+log[(S+W)/S] ^{-3.25}	479
for the development of Generalized correlation for system: B-H-Dmso-W	
Fig.GC-43 Plots of log k Vs, log T'+log[(S+W)/S] ^{-2.75}	480
for the development of Generalized correlation for system: T-H-Dmso-W	
Fig.GC-44 Plots of log k Vs, log T'+log[(S+W)/S] ⁻³	480
for the development of Generalized correlation for system: T-H-Dmso-W	
Fig.GC-45 Plots of log k Vs, log T'+log[(S+W)/S] ^{-3.25}	480
for the development of Generalized correlation for system: T-H-Dmso-W	
Fig.GC-46 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75}	481
for the development of Generalized correlation for system: X-H-Dmso-W	•
Fig.GC-47 Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹	481
for the development of Generalized correlation for system: X-H-Dmso-W	
Fig.GC-48 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.25}	481
for the development of Generalized correlation for system: X-H-Dmso-W	
Fig.GC-49 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.5}	482
for the development of Generalized correlation for system: B-Hep-Dmso-W	
Fig.GC-50 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75}	482
for the development of Generalized correlation for system: B-Hep-Dmso-W	•
Fig.GC-51 Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹	482
for the development of Generalized correlation for system: B-Hep-Dmso-W	
Fig.GC-52 Plots of log k Vs, log T'+log[(S+W)/S]-1.25	483
for the development of Generalized correlation for system: B-Hep-Dmso-W	
Fig.GC-53 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.5}	483
for the development of Generalized correlation for system: B-Hep-Dmso-W	
Fig.GC-54 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.75}	483
for the development of Generalized correlation for system: B-Hep-Dmso-W	
Fig.GC-55 Plots of log k Vs, log T'+log(S+W/S) ^{-0.5}	484
for the development of Generalized correlation for system: B-Oct-Dmso-W	
Fig.GC-56 Plots of log k Vs, log T'+log[(S+W)/S] ^{-0.75}	484
for the development of Generalized correlation for system: B-Oct-Dmso-W	
Fig.GC-57Plots of log k Vs, log T'+log[(S+W)/S] ⁻¹	484
for the development of Generalized correlation for system: B-Oct-Dmso-W	

xliii

.

Fig.GC-58 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.25}	485	
for the development of Generalized correlation for system: B-Oct-Dmso-W		
Fig.GC-59 Plots of log k Vs, log T'+log[(S+W)/S] ^{-1.5}	485	
for the development of Generalized correlation for system: B-Oct-Dmso-W		
		· . ,
$F_{1,2} \subseteq C \subseteq C \subseteq D$ bet after the lag $T' + \log \Gamma(S + W)/(S)^{-1.75}$	105	÷
Fig. GL-00 Plots of log K VS, log I +log[(S+W)/S]	405	:.
Fig GC-61 Plots of log k Vs. X1 for the development of Generalized correlation	492	
for systems B/T/X-H-Dmf-W		к., 1
Fig.GC-62 Plots of log k Vs. X2 for the development of Generalized correlation	492	
for systems B/T/X-H-Dmf-W		і. 4-
Fig.GC-63 Plots of log k Vs, X3 for the development of Generalized correlation	493	j j
for systems B/T/X-H-Dmf-W	- 1	
Fig.GC-64 Plots of log k Vs, X4 for the development of Generalized correlation	494	, jj
for systems B/T/X-H-Dmf-W		Ч Т
Fig.GC-65 Plots of log k Vs, X5 for the development of Generalized correlation	494	
for systems B/I/X-H-Dmf-W	405	
Fig.GC-66 Plots of log k Vs, X1 for the development of Generalized correlation	495	•
Fig GC 67 Plots of log k Vs. X2 for the development of Generalized correlation	105	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W	473	۰.
Fig GC-68 Plots of log k Vs X3 for the development of Generalized correlation	496	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W	150	'
Fig.GC-69 Plots of log k Vs, X1 for the development of Generalized correlation	496	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W		
Fig.GC-70 Plots of log k Vs, X2 for the development of Generalized correlation	497	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W	÷ .	,
Fig.GC-71 Plots of log k Vs, X3 for the development of Generalized correlation	497	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W	Q	
Fig.GC-72 Plots of log k Vs, X1 for the development of Generalized correlation	498	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W		
Fig.GC-73 Plots of log k Vs, X2 for the development of Generalized correlation	498	
for systems B/1/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W		
Fig.GC-74 Plots of log k Vs, X3 for the development of Generalized correlation	499	
Fig GC 75 Dista of log is Va. X4 for the development of Consoling Log values	400	
Fig. UC-15 FIGIS OF 10g K VS, A4 10T the development of Ucheralized Correlation for systems R/T/Y_H_Dmf.W and R_H' Dmf.W and R Oct Dmf.W	477	
Fig GC-76 Plots of log k Vs X5 for the development of Generalized correlation	500	
for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W	500	

,

.

.

xliv

Fig.GC-77	Plots of log k Vs. X6 for the development of Generalized correlation	500
	for systems B/T/X-H-Dmf-W and B-H'-Dmf-W and B-Oct-Dmf-W	
Fig.GC-78	Plots of log k Vs X1 for the development of Generalized correlation	507
	for systems B/T/-H-Dmso-W	
Fig.GC-79	Plots of log k Vs X2 for the development of Generalized correlation	507
	for systems B/T/-H-Dmso-W	
Fig.GC-80	Plots of log k Vs X3 for the development of Generalized correlation	508
č	for systems B/T/-H-Dmso-W	· ·
Fig.GC-81	Plots of log k Vs X4 for the development of Generalized correlation	509
	for systems B/T/-H-Dmso-W	
Fig.GC-82	Plots of log k Vs X5 for the development of Generalized correlation	509
- 	for systems B/T/-H-Dmso-W	
Fig.GC-83	Plots of log k Vs X1 for the development of Generalized correlation	510
	for systems B/T/X-H-Dmso-W	•
Fig.GC-84	Plots of log k Vs X2 for the development of Generalized correlation	510
	for systems B/T/X-H-Dmso-W	•
Fig.GC-85	Plots of log k Vs X3 for the development of Generalized correlation	511
. •	for systems B/T/X-H-Dmso-W	
Fig.GC-86	Plots of log k Vs X4 for the development of Generalized correlation	512
,	for systems B/T/X-H-Dmso-W	
ig.GC-87	Plots of log k Vs X5 for the development of Generalized correlation	512
	for systems B/T/X-H-Dmso-W	
ig.GC-88	Plots of log k Vs X1 for the development of Generalized correlation	513
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-89	Plots of log k Vs X3 for the development of Generalized correlation	513
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-90	Plots of log k Vs X2 for the development of Generalized correlation	514
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-91	Plots of log k Vs X4 for the development of Generalized correlation	515
-	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-92	Plots of log k Vs X5 for the development of Generalized correlation	516
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-93	Plots of log k Vs X6 for the development of Generalized correlation	516
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W	
ig.GC-94	Plots of log k Vs X1 for the development of Generalized correlation	517
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W and B-Oct-Dmso	-W

Fig.GC-95	Plots of log k Vs X2 for the development of Generalized correlation	518
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W and B-Oct-Dmso-W	N .
Fig.GC-96	Plots of log k Vs X3 for the development of Generalized correlation	518
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W and B-Oct-Dmso-W	V
Fig.GC-97	Plots of log k Vs X4 for the development of Generalized correlation	519
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-Wand B-Oct-Dmso-W	7
Fig.GC-98	Plots of log k Vs X5 for the development of Generalized correlation	520
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W and B-Oct-Dmso-W	V [*] ,
Fig.GC-99	Plots of log k Vs X6 for the development of Generalized correlation	520
	for systems B/T/X-H-Dmso-W and B-Hep-Dmso-W and B-Oct-Dmso-W	

· .

.

•

•

.

.

٢

.

~

.

.

xlvi

.

Figure Index

Chapter-6: Results and Discussion for Liquid-Liquid Extraction of Aromatics in Packed Column

i,

Figure I	Number Tittle	Page
Fig.1 (a)	The plot of % Hold up Vs. Vd with Vc as a parameter	569
	for the system: B-H-80%Dmf+20%W at 30 ° C	· · · · · ·
Fig.1 (b)	The plot of % Hold up Vs. Vc with Vd as a parameter	569
· · · · · · · · · · · · · · · · · · ·	for the system: B-H-80%Dmf+20%W at 30 ° C	
Fig. 2 (a)	The plot of % Hold up Vs. Vd with Vc as a parameter	574
• •	for the system: B-H-80%Dmso+20%W at 40 ° C	
Fig. 2 (b)	The plot of % Hold up Vs. Vc with Vd as a parameter	574
	for the system: B-H-80%Dmso+20%W at 40 ° C	
Fig. 3	The plot of $Vd + Vc(X/1-X)$ Vs. X(1-X)	579
, ,	for the system: B-H-80%Dmf+20%W at 30 ° C	
Fig. 4	The plot of $Vd + Vc(X/1-X)$ Vs. X(1-X)	579
	for the system B-H-80%Dmso-20%Water at 40 °C	
Fig. 5	Comparison of plots of Vd+Vc(X/1-X) Vs. X(1-X)	582
	for Solvents-Dmf and Dmso.	· · ·
Fig.6	A Plot of limiting values of %AE Vs S/F ratio	585
•	for systemB-H-80%Dmf-20%Wat30°C	
Fig.7	A Plot of limiting value of %AE Vs S/F ratio	585
	For system B-H-80%Dmso-20%Wat40°C	
Fig.8	The plot of % AE Vs. Vd with Vc as a parameter	588
	for the system: B-H-80%Dmf+20%W at 30 ° C	
Fig.9	The plot of % AE Vs. Vc with Vd as a parameter	588
•	for the system B-H-80%Dmf+20%W at 30 ° C	
Fig.10	Effect of Vd on %AE with Vc as a parameter	593
	for system B-H-80%Dmso-20%W at 40 ° C	· ·
Fig.11	Effect of Vc on %AE with Vd as parameter	593
· ·	for system B-H-80%Dmso-20%W at 40 ° C	
Fig.12(a)	A plot of %AE VsØ1 for solvent Dmf	596
Fig.12 (b)	A plot of %AE VsØ2 for solvent Dmf	596
Fig.13 (a)	A plot of %AE VsØ1 for solvent Dmso	601
Fig.13(b)	A plot of %AE Vs.Ø2 for solvent Dmso	601
Fig.14(a)	Comparison of plots %AE VsØ1 for solvents Dmf and Dmso	603

xlvii

	· .		xlviii	
		Area under the curve for the system:B-H-(Dmso+W)		
	Fig.19I	Plot of 1/(HB1-HB*) Vs. HB1 for determination of		630
		System B-H-80%Dmf -20%W at 30 ° C		
	Fig.18 (b)	Plot of Koc.a Vs.Vc with Vd as a parameter		627
		System B-H-80%Dmf -20%W at 30 ° C		e
	Fig.18(a)	Plot of Kod.a Vs.Vd with Vc as a parameter		627
	Fig.17(e)	Equilibrium Curve for B-H-80%Dmf-20%W at 30 ° C		624
		system: B-H-80%Dmf-20%W at 30 ° C		
	Fig.17(d)	The plot of (HTU)od Vs. Gd/Gc		623 ··
4		system: B-H-80%Dmf-20%W at 30 ° C		
	Fig.17(c)	The plot of (HTU)oc Vs. Gc/Gd		623
		with Vd as parameter for system B-H-80%Dmf-20%W at 30 ° C		
•	Fig.17(b)	Plot for effect of Vc on Kocxa		620 ·
	·	with Vc as parameter for system B-H-80%Dmf-20%W at 30 ° C		
	Fig.17(a)	Plot for effect of Vd on Kodxa		620
		for the system:B-H-80% Dmf+20%W at 30° C		. *
	Fig.16(b)	The plot of NTUoc Vs. Vc with Vd as parameter		617
	- •	for the system:B-H-80% Dmf+20%W at 30° C		
	Fig.16(a)	The plot of NIUod Vs. Vd with Vc as a parameter		617
		Area under the curve for the system:B-H-(Dmf+W)		
	Fig.15-VIII	Plot of 1/(H'B* - HB1) Vs. HB1 for determination of		615
	-	Area under the curve for the system:B-H-(Dmf+W)		
:	Fig.15-VII	Plot of 1/(H'B* - HB1) Vs. HB1 for determination of		614
		Area under the curve for the system:B-H-(Dmf+W)		
	Fig.15-VI	Plot of 1/(H'B* - HB1) Vs. HB1 for determination of		613
		Area under the curve for the system:B-H-(Dmf+W)		
	Fig.15-V	Plot of 1/(H'B* - HB1) Vs. HB1 for determination of	· ··-	612
		Area under the curve for the system:B-H-(Dmf+W)	•	~~*
	Fig 15-IV	Plot of 1/(HB1-H'B*) Vs HB1 for determination of		611
	115.10 111	Area under the curve for the system:B-H-(Dmf+W)		010
,	Fig 15- III	Plot of 1/(HB1-H'B*) Vs. HB1 for determination of	4 - S 10	610
	116.15-11	Area under the curve for the system B-H-(Dmf+W)		007
	Fig 15-II	Plot of 1/(HR1-H'R*) Vs HR1 for determination of	;	600
	rig.15-1	A rea under the curve for the system B-H-(Dmf+W)	• •	008
	Fig.14(0)	Diet of 1/(UP1 UP*) Vs. UP1 for determination of		608
	Fig 14(b)	Comparison of plots %AF VsØ2for solvents Dmf and Dmso		603

•

Fig.19II	Plot of 1/(HB1-HB*) Vs. HB1 for determination of	631
	Area under the curve for the system:B-H-(Dmso+W)	
Fig.19 III	Plot of 1/(HB1-HB*) Vs. HB1 for determination of	632
e	Area under the curve for the system:B-H-(Dmso+W)	
Fig.19 IV	Plot of 1/(HB1-HB*) Vs. HB1 for determination of	633
	Area under the curve for the system:B-H-(Dmso+W)	
Fig.19 V	Plot of 1/(HB* - HB1) Vs. HB1 for determination of	634
·. ·	Area under the curve.	
Fig.19VI	Plot of 1/(HB* - HB1) Vs. HB1 for determination of	635
	Area under the curve for the system:B-H-(Dmso+W)	
Fig.19VII	Plot of 1/(HB* - HB1) Vs. HB1 for determination of	636
	Area under the curve for the system:B-H-(Dmso+W)	
Fig.19-VIII	Plot of 1/(HB* - HB1) Vs. HB1 for determination of	637
х.	Area under the curve for the system:B-H-(Dmso+W)	
Fig20(a)	The plot of NTUod Vs Vd with Vc as parameter for the	641
	system: B-H-80%Dmso -20%Wat 40 ° C	
Fig20(b)	The plot of NTUoc Vs Vc with Vd as parameter for the	641
	system: B-H-80%Dmso -20%W at 40 ° C	
Fig21(a)	The plot of HTUod Vs Vd with Vc as parameter for the	644
	system: B-H-80%Dmso -20%W at 40 ° C	
Fig21(b)	The plot of HTUoc Vs Vc with Vd as parameter for the	644
	system: B-H-80%Dmso -20%W at 40 ° C	
Fg.21©	Plot of(HTU)ocVs.Gc/Gd for	645
	system: B-H-80%Dmso -20%W at 40 ° C	
Fg.21(d)	Plot of(HTU)odVs.Gc/Gd	645
	system: B-H-80%Dmso -20%W at 40 ° C	
Fig.21(e)	Equilibrium Curve for	646
	System:B-H-80%Dmso+20%Wat40°C	
Fig.22(a)	Plot for effect of Vd on Kodxa with Vc as parameter for	649
	system B-H-80%Dmso-20%W at 40 ° C	
Fig.22(b)	Plot for effect of Vc on Kocxa with Vd as parameter for	649
*	system B-H-80%Dmso-20%W at 40 ° C	

.

.

xlix

~

• ·