LIST OF FIGURES

	Figur	e No.		Page No.
	1.1	•	Location map of the study area.	3
	2.1	:	Generalized geological map of the Aravalli Mountain Belt, Northwestern India (after GSI).	10
	2.2	:	Lithostratigraphic map of the area around Lunavada (after Gupta et al. 1980).	11
	3.1a 3.1h	•	Photograph of satellite imagery of Aravalli Mountain Bel	t. 51
	5.10	•	the study area.	, ⁷ 52
	3.1c	:	Tectonic map of the Aravalli Mountain Belt.	53
	3.2	•	Geological map of the area around Lunavada and Santrampur, Panchmahals district, Gujarat, India	
			(modified after Gupta and Mukherjee, 1938).	54
	3.3	:	Field photographs of well sections documenting the	
	~ .		presence of quartzite alternating with chlorite schists.	57
	3.4	:	Culminations and depressions related to F ₃ folding in	. 50
	0 5	-	quartzites. Location: Kadana.	59
	3.5	:	Fold hinge (F ₂) in quartzite. Location: Munpur.	59
	3.6	:	Ridges of homogenous jointed quartzite.	0 4
~	~ -		Location: Santrampur.	61
	3.7		F ₂ fold hinge of a recumbent fold in quartzite.	63
	38	-	E fold in quartzite Location: Limbodhra crossing	63
	3.9	•	Photograph documenting sub-parallel relationship	
	0.0	•	hetween schistosity and hedding plane	•
			Location: Ankalva	65
	3 10	•	Field photograph showing presence of lithological	00
	0	•	variation (colour banding) in quartzite Location: Gada	65
	3 11	•	Reclined E, fold in quartzite-schist assemblage exposer	1
	0	•	along a canal cutting I ocation: Aniavana	- 67
	3 12	•	Axial plane cleavage developed due to reclined folding	0,
	U . (L	•	in quartzite-schist sequence. Location: Aniavana	67
	3 13	•	Field photograph showing presence of vertical hedding	•,
	0.10	•	plane on the nose portion of reclined fold	
			Location: Aniavana	68
	3.14	•	Hinge of E ₄ reclined fold Location. Aniavana	68
	3.15		Mineral lineation on foliation plane (S_2) in schists	
		•	Location: Banks of river Panam. S of Lunavada town.	70
	3.16	:	F ₃ kinks in schists 1 ocation: Banks of river Panam.	
			S of Lunavada town.	70
	3.17	:	Lineations in guartzites. Location: Kotwal Dungar	
			(S of Lunavada).	71
	3.18	:	Slickensides on joint planes in quartzite implying local	

-

			movement. Location: (a) Jodhpur, (b) Gada.	72
	3.19	:	Well section showing quartz-pegmatites associated	
			with Godhra Granite intrusion. Location: Boriya.	74
	4.1	:	Structural map of the study area.	77
	4.2	:	Map showing the distribution of the structural domains in	
			the study area.	87
	4.3	•	Structural analysis of field data from Domain I.	90
	4.4	•	Structural analysis of field data from Domain II.	91
	4.5	:	Structural analysis of field data from Domain III.	92
	4.6	:	Structural analysis of field data from Domain IV.	95
	4.7	:	Structural analysis of field data from Domain V.	9 6 ⁻
	4.8	:	Structural analysis of field data from Domain VI	97
-	4.9	:	Structural analysis of field data from Domain VII.	103
	4.10	:	Structural analysis of field data of reclined fold located	
			at Anjavana in Domain VII.	104
	4.11	:	Structural analysis of field data from Domain VIII.	105
	4.12	:	Structural analysis of field data from Domain IX.	106
	4.13	:	Structural analysis of field data from Domain X.	107
	4.14	:	Structural analysis of field data from Domain Xia.	108
	4.15	:	Structural analysis of field data from Domain Xib.	109
	4.16	:	Structural analysis of field data from Domain Xic.	110
	4.17	•	Structural analysis of field data from the entire Domain XI.	111
	4.18	:	Map showing π -diagrams for the various structural.	
			domains of the study area.	113
	4.19	:	Map showing the orientations of statistically determined	
			fold axes in the various structural domains of the study	
		-	area.	114
	5.1	:	AMS orientation data from rocks of the study area plotted	
			as lower hemisphere projections.	126
	5.2	:	Jelinek plots for schists (a), quartzites (b) and calc-	
			silicates (c) occurring in the study area.	128
	5.3	:	Flinn type plots prepared from AMS data for (a) schists,	
			(b) quartzites and (c) calc-silicates occurring around	
			Lunavada and Santrampur.	129
	5.4	:	Flinn diagram for the quartzites from Bhadaria.	130
	5.5	:	Sketch showing the orientation of S2 foliations at an	
			oblique angle to D3 shortening.	131
	6.1	:	Map showing the grade of metamorphism of metapelites	•
			in different parts of the study area.	136
	6.2	:	Photomicrograph of chlorite schist showing presence	
			of S_0 , S_1 and S_2 on the microscale (X-nicols).	139
	6.3	:	Photomicrograph of chlorite schist showing microscale	
			displacement along the discrete crenulation cleavage	
			(S ₂). (PPL).	140

	6.4	:	Photomicrograph documenting the drag effect along discrete crenulation cleavage (S ₂) in chlorite schist.	
			(X-nicols).	140
	6.5	:	Photomicrograph showing obligue relationship	
			between bedding (S_0) and cleavage (S_1) in biotite	
			schist. (X-nicols).	143
	6.6	:	Photomicrograph exhibiting the presence of differentiated	
			crenulation cleavage (S_2) in garnet biotite schist.	
			(X-nicols).	143
	6.7	:	Photomicrograph of garnet biotite schist. (X-nicols).	144
	6.8	:	Photomicrograph of garnet porphyroblast with guartz	
			inclusion trails (S ₁), (X-nicols).	144
	6.9	:	Photomicrograph of biotite porphyroblast with microfolded	
			quartz inclusion trails. (X-nicols).	146
	6.10	:	Photomicrographs of garnet porphyroblast which has	
			grown over crenulation cleavage zone (S ₂), (a, X-nicols:	
			b, partially X-nicols).	147
	6.11	:	Photomicrograph of calc-schist, (X-nicols).	150
	6.12	:	Photomicrograph of guartz crystals in guartzite showing	
			presence of sutured/serrated grain boundaries implying	
,			dynamic recrystallization Grain Boundary Migration	
			Recrystallization (GBMR) of the rock. (X-nicols).	152
	6.13	:	Photomicrograph of guartzite showing deformation bands	
			in quartz crystals. (X-nicols).	152
	6.14	2	Photomicrograph of quartz crystals in quartzite showing	
			straight grain boundaries and 120° triple points. (X-nicols).	153
	6.15	:	(a) Photomicrograph of cleavage zone (Mica-domain) in	
			mica schist (X-nicols).	
			(b) Explanatory line drawing of microstructural relationships	
	, ,		observed in (a).	157
	6.16	:	Photomicrograph of cleavage zone (M-domain) in mica	
			schist showing presence of an embryonic S ₂ ' surface	
			at a low angle to S_2 (domain boundary). (X-nicols).	158
	6.17	:	Photomicrograph of cleavage zone (M-domain) in mica	
			schist showing development of well developed S ₂ ' at	
			low angle to the domain boundary (S_2) . (X-nicols).	159
	6.18	:	Model showing the sequential development of micro-	
			structures in M-domains during crenulation cleavage	
			development (after Mamtani and Karanth, 1996a).	162
	6.19	:	Photomicrographs of biotite porphyroblasts in garnet	
			biotite schists showing presence of millipede	105
	0.00		microstructure. (X-nicols).	165
	6.20	•	Explanatory line drawings of the millipede bearing	400
	0.04		biotite porphyroblasts.	166
	0.21		wap snowing the locations from which samples of schists	400
	6 00		and quartzites were collected for USD study.	169
	0.22	•	Frequency histograms for schist close to granite	470
	6.00		(Sample A) and far from granite (Sample B).	172
	0.23	•	Cou plot for schist samples.	113

-

-

.

	6.24	:	CSD plot for quartzites.	178
	6.25	:	Diagram showing the "nine diagnostic forms" of	
			porphyroblast-matrix relationships (after Zwart, 1962).	180
	6.26	•	Schematic diagram representing the inclusion of quartz	
			in syndeformational and postdeformational	400
			porphyroblasts (after Mamtani and Karanth, 1996c).	182
	6.27	:	Explanatory line drawing of microstructural relationships	40.4
			observed in figure 6.10b.	184
	6.28	:	Schematic diagram simulating stages of growth of	
			porphyroblast over crenulation cleavages during	404
	6.00		Crenulation cleavage genesis.	104
	0.29	•	Diagram snowing time relationship between crystallization	
			and deformation in gamet mica schists of the Lunavada	100
			region.	100
	71		Back Scattered Emission (RSE) images of the garnet	
	1.1	•	porphyrophasts analyzed using the microprobe	188
	72		Garnet zoning profile recorded in garnet biotite schist	100
	1.4	•	from Aniavana	192
*	7.3	•	X-ray maps for (a) Fe (b) Mg (c) Mg and (d) Ca	
		•	in garnet in Aniavana sample	193
	7.4	:	Garnet zoning profile recorded in garnet biotite schist	
			from Lunavada.	195
	7.5	:	X-ray map for (a) Fe, (b) Mg, (c) Mn and (d) Ca	
			in garnet in Lunavada sample.	196
	7.6	:	P-T conditions for garnet core (a) and rim (b) determined	
			on the basis of thermobarometric calculations	-
			(Sample-Anjavana area).	200
	7.7	:	P-T conditions for garnet core (a) and rim (b) determined	
			on the basis of thermobarometric calculations	
			(Sample-Lunavada area).	201
	7.8	:	Sketch illustrating the occurrence of different types of	
			fluid inclusions in the garnet biotite schists of the	
	-		Lunavada region.	208
	7.9	:	Photomicrograph showing cluster of Type-1 fluid	
			in the mica schist studied.	209
	7.10	:	Photomicrograph of a group of Type-1 fluid inclusions	
			in quartz crystal of garnet biotite schist from Lunavada	040
	7 4 4		region. Director in a statistic of Targe 4 Shrid	210
	7.11		Photomicrograph showing a cluster of Type-1 fluid	014
	7 10		Photomicrograph chaving Type 1 fluid inclusion with	211
	1.12	•	e develter minerel	212
	7 13		a dauginer minieral. Destemicrograph showing Type 1 fluid inclusion with	212
	7.10	•	a daughter minoral	213
	7 14		Frequency diagram for Type-1 fluid inclusions	210
	1.17	٠	(homogenizing in the liquid phase)	219
	7,15	·	Graph of average diameter of Type-1 fluid inclusions	2,0
		·	against T _h	222

7.16	:	Schematic diagram illustrating the occurrence of Type-2 fluid inclusions in quartz crystals of mica schist of	
		Lunavada region.	224
7.17	:	Photomicrograph documenting the occurrence of Type-2 fluid inclusions along inclusion trails.	225
7.18	:	Photomicrograph of inclusion trails with Type-2 fluid	
		inclusions.	226
7.19	:	Photomicrograph documenting presence of aqueous fluid	
		inclusions (Type-2) along trails.	227
7.20	:	Type-3 fluid inclusions along a trail in quartz crystal from	
		garnet biotite schist of the Lunavada region.	233
7.21	:	Type-4 fluid inclusions along quartz grain boundaries.	234
7.22	:	Photomicrographs of Type-5 fluid inclusions in quartz	
		crystal occurring in garnet biotite schist from Lunavada	
		region.	235
7.23	:	Raman spectra for (a) CO_2 , (b) N_2 and (c) CH_4 .	237-238
7.24	:	Diagram showing the isochores for the CO ₂ rich	
		Type-1 fluid inclusions which were analyzed by Raman	
		microspectroscopy.	241
8.1	:	Schematic model explaining the uplift mechanism during	
		D ₂ deformation in the Lunavada region.	250

.

.

.

-

-

.