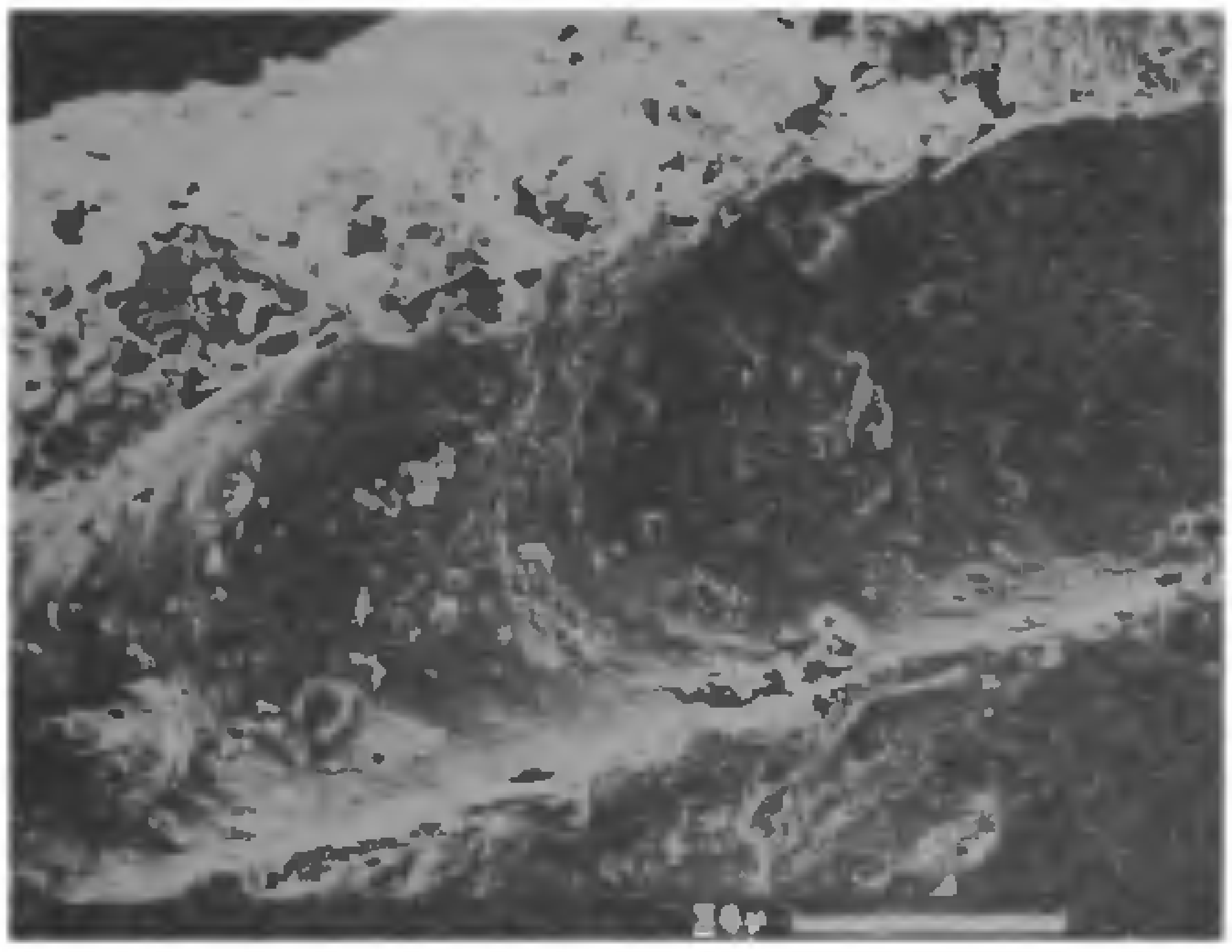

Figure 7. Transverse section of the utricle showing uniformly smooth wall (× 535).

(figure 6). The transverse section of the wall is about 50 μm thick and uniformly smooth and the transverse fracture surface within it has a flaky appearance (figure 7).

The lime-encrusted utricles are very brittle and difficult to collect even with brush and needles. Besides, it is an established fact that the external calcification turns into calcareous mud readily after the death of the plant. These properties make the preservation of the utricles as fossils a rare occurrence. Therefore, their presence along with gyrogonites indicates their deposition in a very quiet and specific environment, probably in a bog or swamp. Palynological investigation of the 'Calcutta peat' by Mukherjee and Chakraborty[6] also revealed that the locus of formation of the litho-units of late Quaternary age lay within the region of broad, relatively flat alluvial plain characterized by numerous swamps clothed with hydrophytic vegetation. The abundant growth of *C. fragilis* in a pond in the Botanical Garden of the Punjab University, Chandigarh[5], and also in a similar situation in the Gangetic Bengal (Chatterjee, personal communication) is indicative of its wide occurrence in comparatively undisturbed ponds or puddles which were abundant in the area from which the fossil specimens were collected. It may also be inferred that the *C. fragilis* is of wide occurrence, as specimens (gyrogonites) have been retrieved from two areas as widely separated as Calcutta and Chandigarh.

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GEOCHEMICAL DISTINCTION OF LAVA FLOWS FROM AJRA-MAHAGAON AREA

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An attempt has been made to ascertain the existence of any relation between the present height of exposure of lava flows and their chemical composition by studying the basaltic flows atop Dharwarian Schists and the Kaladgi sandstones exposed over an area of 609 km^2 around Ajra-Mahagaon townships, Kolhapur district, Maharashtra state. These flows form the southwestern fringe of the Deccan Basalts (Survey of India toposheet No. 47 L/4 and L/8) and extend between longitudes 74°12'30" and 74°30'E, and latitudes 16° and 16°15'N. Maximum elevation is 1050 m. The exposed thickness of the greenish-black, fine grained flows, 3–4 in number (apparently due to the steps produced by erosion), is around 384 m.

Representative samples (38 in number) have been chemically analysed and the results are given in tables 1–3. The analysed samples have been arbitrarily grouped into three groups corresponding to levels 667–767, 767–867, 867–967 m respectively. To establish the existence or otherwise of these groups, geostatistical *F*-test analysis has been carried out and the results are given in table 4. A triangular variation diagram (figure 1) depicting critical oxide content of the samples (TiO_2, CaO and K_2O, 99% level of confidence, table 4), has been constructed, which demonstrates that only two groups, and not three, exist amongst the rocks

Table 1 *Chemical composition of group I of basaltic flows of Ajra-Mahagaon area, 12 samples, altitude — 667 to 767 m*

Sample numbers	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	Na_2O	K_2O	MnO	P_2O_5
431	49 81	13.12	14.38	3.44	10.19	5.42	2 26	0 47	0.23	0.29
32	50.25	12 81	15 65	3.44	9.69	5.23	2.27	0.47	0.21	0.27
183	51.28	15.33	12.92	1.50	10.92	5.00	1.96	0.23	0.20	0.16
216	50.30	14 26	13.69	3.32	9.90	4.86	2.35	0.49	0.23	0.37
1	49 69	13.80	14 04	3.23	9.71	5.80	2.33	0.63	0.20	0.37
29	50.84	14 07	14.06	3.30	10.07	5.23	2.16	0 41	0.25	0 33
456	49.72	13.66	14.34	3.51	10.11	5.37	2.24	0.52	0.24	0.32
445	52.21	11.95	14.75	2.56	8 65	5.52	2.35	0.69	0.21	0.49
366	52.34	13.60	13.90	2.85	9.83	4 94	2.04	0.27	0.22	0.34
51	49.66	14 99	13.43	1.56	11.60	6.34	1.78	0.13	0.22	0.14
33	49.78	14.90	13.20	1.53	11.66	6.62	1 86	0 12	0.22	0.13
469	50.21	12 00	15 97	3.80	9.78	5.16	2.19	0.38	0.25	0.23

Table 2 *Chemical composition of group II of basaltic flows of Ajra-Mahagaon area, 14 samples, altitude — 767 to 867 m*

Sample numbers	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	Na_2O	K_2O	MnO	P_2O_5
404	48.18	13.96	15.65	4 24	9.86	5.34	2.02	0.35	0.23	0.26
137	49.89	14.10	13.92	1.51	11.55	6.50	1.84	0.13	0.24	0.10
206	50.89	13.28	14 64	2.61	10.25	4.95	2.21	0.43	0.23	0.27
171	50.58	15.11	13.31	1.71	10.79	4.96	2.08	0.27	0.20	0.15
459	50.44	13.76	14.67	2.78	10.04	4.50	2.28	0.43	0.25	0.28
71	49.12	13.63	15.08	2.96	10.15	5.24	2.16	0.42	0.32	0.25
19	50.83	13.90	14.62	2.78	9.99	4 78	2.12	0.46	0 24	0.28
66	50.58	13.32	14.63	2.66	10.20	5.14	2.18	0.45	0.26	0.30
337	49.09	13.50	15.00	3.98	10.33	5.10	2.23	0.51	0.23	0.27
35	51.00	14.00	13.00	2.95	10.19	5.52	2.27	0.51	0.19	0.37
48	49.30	13.70	14.50	1.55	11.88	6.42	1.94	0.20	0.21	0.10
257	50.37	13.16	14.01	3.52	10.22	5.53	2.18	0.49	0.24	0.36
23	49 10	13.00	15.01	4.12	10.28	5.60	2.22	0.46	0.23	0.27
5	50.96	13.60	14.00	3.31	10.04	4.97	2.33	0.57	0.24	0.33

Table 3 *Chemical composition of group III of basaltic flows of Ajra-Mahagaon area, 12 samples, altitude — 867 to 967 m*

Sample numbers	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	Na_2O	K_2O	MnO	P_2O_5
161	49.11	14.78	13.22	1.52	11.08	5 52	2.09	0.14	0.23	0.41
16	50.86	15.84	13.87	1.40	10.72	4.70	2.01	0.22	0.22	0.17
158	49.89	14.60	13.56	1.58	11.35	5.60	1.91	0.17	0.22	0.17
117	50.72	15.38	13.32	1.64	11.04	4.98	2 06	0.24	0.20	0.23
164	49 68	15.24	13.35	1.52	11.09	5.86	1.93	0.16	0.19	0.13
98	50.41	14.60	13.55	1.78	10.72	5.40	2.11	0.27	0.20	0.15
326	49.14	13.67	13.96	1.51	11.72	6.80	1.87	0.16	0.22	0.09
463	50.57	14 64	13.69	1.84	11.26	5.50	1.95	0.16	0.21	0.13
147	49.56	15.04	12.98	1.49	11.70	6.15	1.92	0 17	0.24	0.14
471	50.83	12.60	14.80	2.38	9.88	5.52	2.26	0.54	0.22	0.36
285	47.60	13.90	15.60	3.97	10.29	5 24	2.06	0.38	0.22	0.27
77	50.51	14.30	13.70	2.16	11.22	5.44	2.06	0.30	0.22	0 13

Table 4 *F-test analysis of basaltic flows of Ajra-Mahagaon area (3 groups and 38 samples)*

Variables	Between group S.S	Between group d.f	Between group M.S I	Within group S.S	Within group d.f	Within group M.S II	*F*-test value	Level of confidence
SiO_2	1.7847	2	0.89235	28.2564	34	0.83167	1.073	Insignificant
Al_2O_3	4.9817	2	2.4908	23.6558	34	0.6957	3.5710	95%
Fe_2O_3	2.6001	2	1.30005	21.7461	34	0.6396	2.032	Insignificant
TiO_2	7.8308	2	3.9154	23.9520	34	0.70447	5.557	99%
CaO	4.4157	2	2.20785	15.7147	34	0.46219	4.776	99%
MgO	0.3614	2	0.1807	10.8009	34	0.3176	0.5689	Insignificant
Na_2O	0.1365	2	0.06825	0.7943	34	0.023361	2.9215	Insignificant
K_2O	0.2128	2	0.1064	0.7664	34	0.02254	4.7204	99%
MnO	0.0028	2	0.0014	0.0176	34	0.0005176	2.704	Insignificant
P_2O_5	0.0589	2	0.02945	0.3327	34	0.009785	3.009	Insignificant

F-test value: 3.27 and 5.28; Level of confidence: 95 and 99.

under description. Group I (667–867 m) is richer in TiO_2 and group II (867–967 m) is richer in CaO. Minor elements present in greater than 100 ppm amounts are Zr, Y, Sr, Rb, V, Cr and Ni. Group I flows are remarkably richer in Sr and Ba (averages 504.50 and 473.70 ppm respectively), but group II flows are poorer in these elements (369.39 and 265.03 ppm respectively).

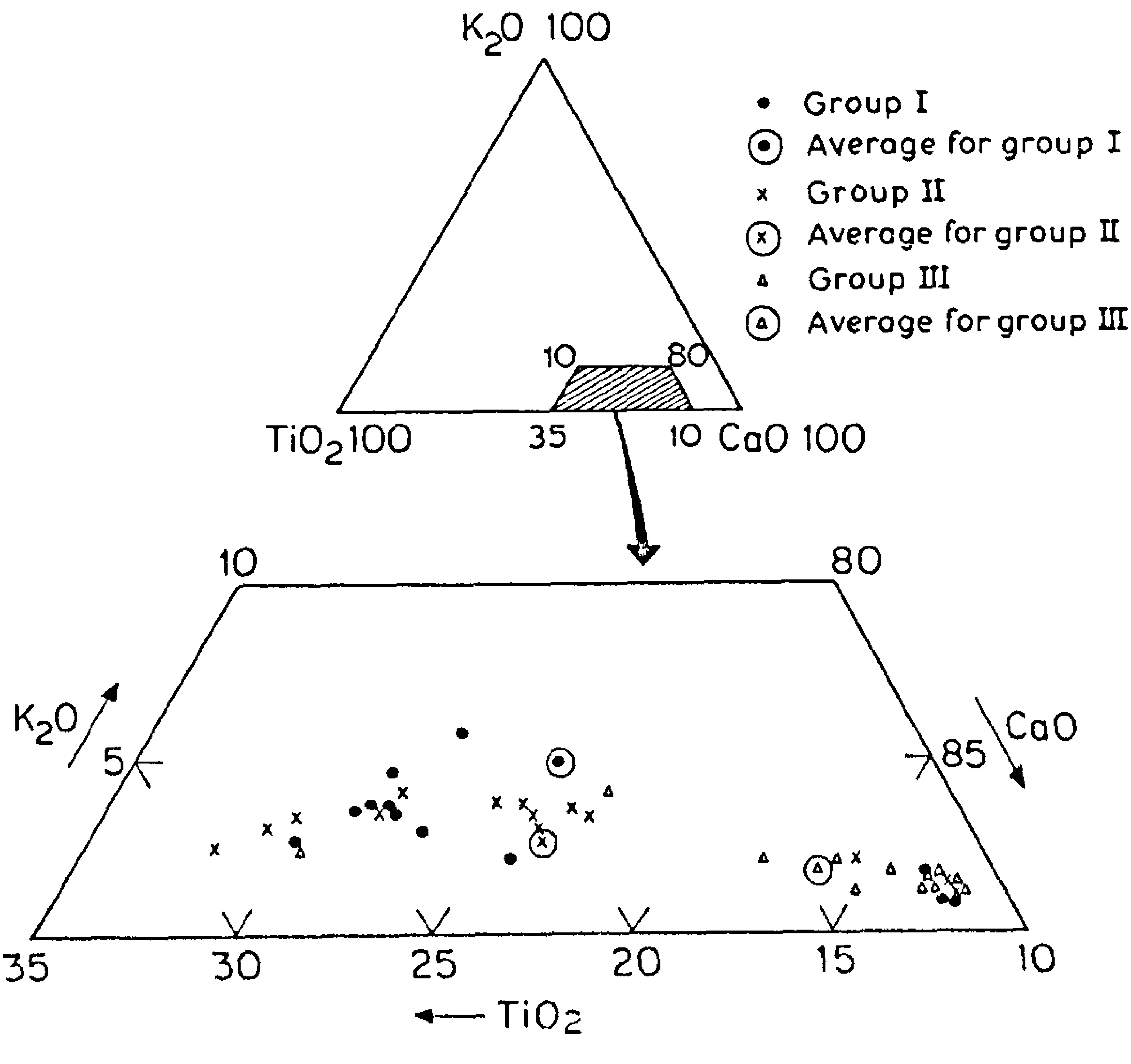

Figure 1. TiO_2, CaO and K_2O diagram for basaltic lava flows of Ajra-Mahagaon area (38 samples).

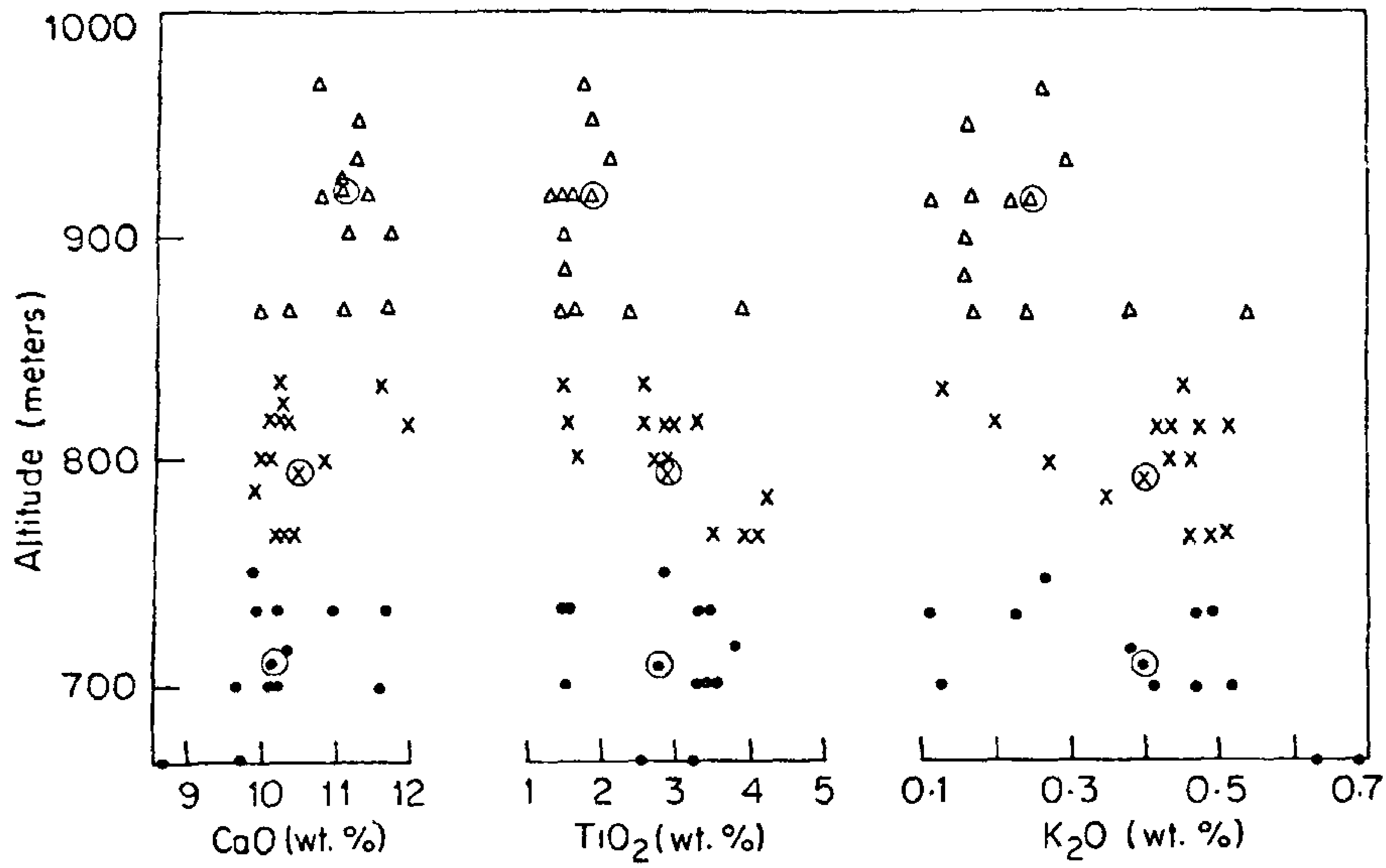

Figure 2. Altitude vs CaO, TiO_2 and K_2O of basaltic lava flows of Ajra-Mahagaon area (38 samples) (symbols used are the same as shown in figure 1).

Modal composition of the 38 representative samples corroborates differentiation into two groups, the average modal values in per cent for group I being, plagioclases 42.57, pyroxenes 49.69 and opaques 7.72; for group II the values are 49.23, 45.15 and 5.61 respectively. Thus group I (lower flows) is richer in pyroxenes, while group II (upper flows) is richer in plagioclases.

Figure 2 demonstrates the relation between the height of the lava flows and the critical oxide (TiO_2, CaO and K_2O) content of the rocks. It is observed that the CaO content is greater while TiO_2 and K_2O are less in the upper flows; the situation is reversed in the lower flows.

From the foregoing account it is found that the chemical composition of the flows apparently differs according to the present height. Two flows are distinguishable, the lower flows being richer in TiO_2 and K_2O, while the upper ones are richer in CaO. Though minor elements Sr and Ba are present at different levels, the lower flows being richer in these elements. Mineralogically too, the lower flows contain more pyroxenes than the plagioclases, the situation being reversed in the upper flows.

Though the distinction into two flows is possible in terms of chemistry and mineralogy, these compositional variations appear to have occurred at depth from where these were later brought to the surface. In conclusion it may be said that the chemical composition also can be utilized to distinguish flows from one another, in addition to the other criteria used, such as vesicularity, chilled contact, etc.

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ORIGIN OF 'CYTOSPINDLE' MICROTUBULES IN *PARAMECIUM*

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MICROTUBULES are ubiquitous organelles in all the eucaryotic cells which can form complex cell structures such as centrioles, kinetosomes, cilia, etc. The cortex of ciliates like *Paramecium* is replete with microtubule systems. In the cortex of *Paramecium* two sets of microtubular ribbons are seen associated with the ciliary kinetosomes[1,2]. These are the postciliary and transverse tubular fibrils. Apart from