Volume : 1 | Issue : 4 | Sep 2012 • ISSN No 2277 - 8160

Research Paper

Geology

The plutonic and hypabassal rocks in the Lower Siang valley – A Petrographic Investigation

P. Bhattacharyya Department of Applied Geology, Dibrugarh University, Dibrugarh- 786004, India

C. Taye Department of Applied Geology, Dibrugarh University, Dibrugarh- 786004, India

L. Patra Department of Applied Geology, Dibrugarh University, Dibrugarh- 786004, India

ABSTRACT

On the east bank of Siang River at lower Siang valley in between Bodak village and Siang-Yemne river confluence a huge suite of intrusive rocks has been observed. These rocks occur as a pluton and have been thrusted over the Paleocene-Eocene rocks of Yinkiong group. No report has so far been published on this suite of rocks. A detail mapping and petrographic study of this suite have been made for the first time. Petrographic study reveals that the rocks of the suite are composed mainly of gabbro, hornblende-gabbro, and diorite- plagioclase-diorite, hornblende-diorite, calc-diorite. Some doleritic dikes are found to occur along the periphery of the pluton. Also several dikes of trachyte occur in close association with more voluminous andesitic rocks. These gabbroic and dioritic rocks may be viewed as plutonic counterparts of compositionally similar extrusive basaltic and andesitic rocks in the Siang valley. The dikes of dolerite and trachyte might have acted as feeder for the deep seated magma chamber crystallized to form these plutonic rocks and the equivalent volcanic rocks.

KEYWORDS: Siang-Yemne River confluence, Yinkiong Group, diorite, trachyte, dolerite, gabbro

1. INTRODUCTION:

A suit of Gabbroic and dioritic rock is observed in the area under study in between Bodak Village and Siang- Yamne River confluence. These rocks are traversed by several dykes of dolerite and trachyte. These rocks are observed to be thrusted over the Paleocene-Eocene rocks of Yinkiong Group. The area under study lies in the Siang window and is affected by major thrust-the NPT (North Pasighat Thrust).Another major fault –the Yamne fault is running almost N-S from Dumro upto the Siang-Yamne River confluence through which the Yamne River is flowing. Several local thrust and fold have been recorded in the studied area. Further SE of the area there is another set of faults trending NW-SE or N-S which post dated deformation. This set includes the Roing fault which brings the inverted sequence of Abor volcanic and Bomdila group rest over the Yinkiong group in the Yamne valley and against which the MBF and Siwalik Group terminate. It is sub parallel to the Tidding Suture and Lohit thrust. South of Roing, it gets concealed under the thick cover of Quaternary sediment of Upper Assam and Arunachal Pradesh and possibly abuts against the Mishmi thrust (Gopendra Kumar 1997)

No detail investigation has so far been made on this suit of rocks. A detail mapping and petrographic study of this suit have been made for the first time by the authors.

2. LOCATION OF THE AREA:

Location of the area: The area under study lies in the East Siang valley and is bounded by latitudes -28º06'17"N – 28º 14'25"N and longitude -95º 18'30"E – 95º 13'30"E. They fall in the Survey of India Toposheet No. 82 p/3, 82 p/4, 82 p/7 and 82 p/8 and are a part of the East Siang district of Arunachal Pradesh.

2a. Location Map:

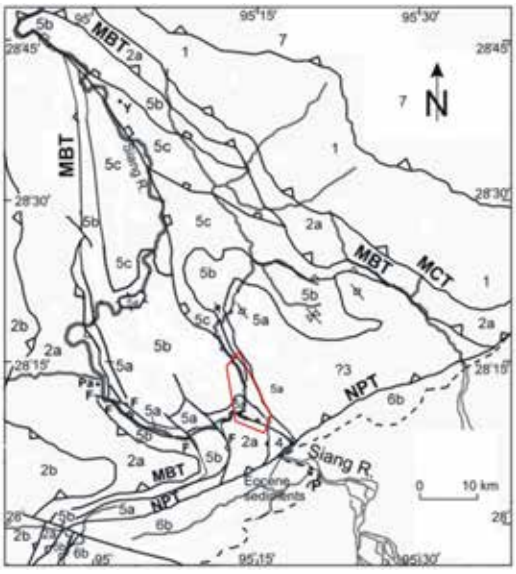


Fig: 2a- Simplified geological map of the Siang Window. Paleogene rocks differentiated to: 5a- Quartzite (Late Paleocene-Early Eocene: may include older Lower Paleozoic Miri Quartzite), 5b- Abor Volcanics, 5c- Yinkiong Fm. (modified after Acharyya& Saha 2008).

2b. Geological Map:

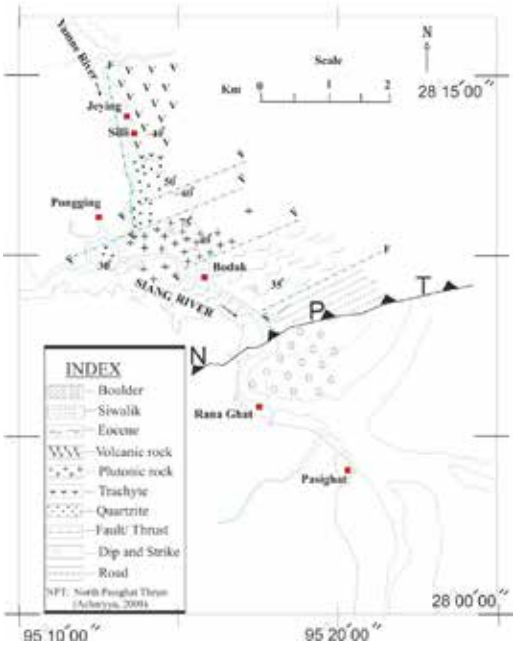


Fig: 2b- Geological map of the area under study

2c. Field Photographs:

(1) (2) (3)

(4) (5) (6)

(7) (8) (9)

Field Photograph shows: 1. Siang-Yamne Confluence (left bank of Yamne plutonic rock and right bank is the quartzitic rock), 2. Outcrop of diorite and a patch of dolomite, 3. Outcrop of dioritic rock, 4. Exposure of trachyte, 5. Hornblende diorite (samples collected from a drift), 6. Massive outcrop of diorite, 7. Exposure of Purple shale, 8. Outcrop of basic rock. 9. Exposure of gabbroic rock.

3. PETROGRAPHIC STUDIES:

3a. Modal Analysis of the rock

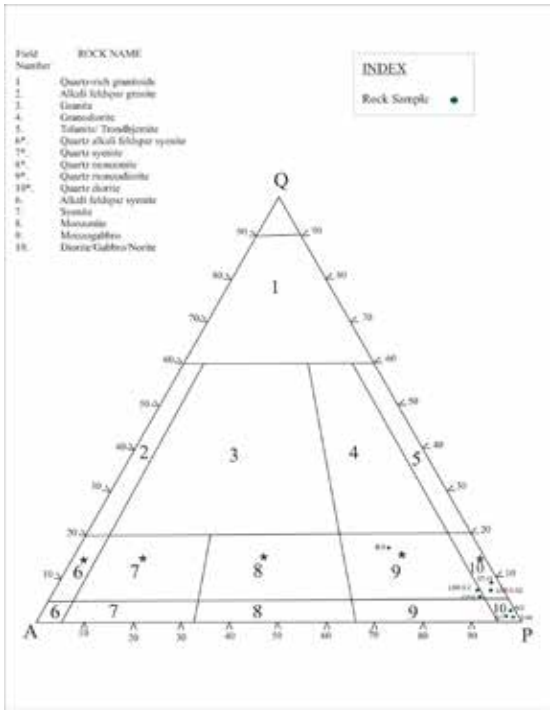
Table: 1.1: Modal composition and colour Index (C.I.) of the samples

Sample no		B/1	B/2	B/3	CF/5	LSR-9.2	LSR-09.1	LSR-9 D2	ST-11
Constituent mineral	Quartz %	1.5	1.0	11.25	4.0	4.0	0.0	5.6	4.2
	Plagioclase %	59.0	70.5	48.75	62.0	59.0	65.1	65.1	70.7
	Clino pyroxene %	24.0	18.0	27.81	15.5	15.5	26.2	9.9	11.5
	Ortho pyroxene %	0.00	9.5	0.0	0.0	0.0	0.0	3.1	4.2
	Amphibole %	10.0	0.0	5.63	8.0	12.5	6.7	0.0	0.0
	Epidote %	3.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Calcite %	0.00	0.0	1.25	0.0	0.0	0.0	0.0	0.0
	Olivine %	0.00	0.0	0.0	0.0	0.0	0.0	5.6	4.9
	Augite %	0.00	0.0	0.0	0.0	0.0	0.0	5.6	0.0
	Iron oxide %	2.0	1.0	5.31	10.5	9.0	2.0	4.9	4.5
Total Volume %		100	100	100	100	100	100	100	100
C.I (in %)		39.5	28.5	40.0	34.0	37.0	34.9	29.1	25.1

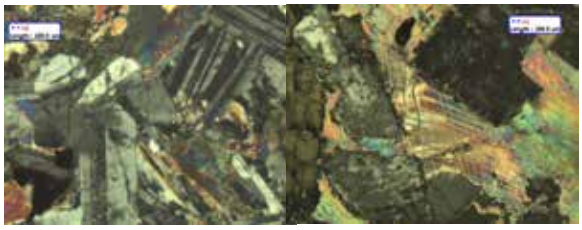
3b. Tabular Representation for Recalculated Volume percentage of the samples

Sample no	B/1	B/2	B/3	CF/5	LSR-9.2	LSR- 09.1	LSR-9 D2	ST-11
Q+A+P	60.5	71.5	60.0	60.0	63.0	60.0	70.7	74.9
Quartz %	2.48	1.4	18.75	6.1	6.3	0.0	8.0	5.6
Alkali Feldspar %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plagioclase %	97.53	98.6	81.25	93.9	93.7	100.0	92.0	94.4
Total %	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Rock Type	Hornblende-gabbro	Gabbro	Quartz monzodiorite	Diorite	Hornblende diorite	Plagioclase diorite	Quartz Diorite	Quartz diorite

3c. Triangular Classification for the Samples: QAP plot {After Streckein (1979), Hyndman (1985)}

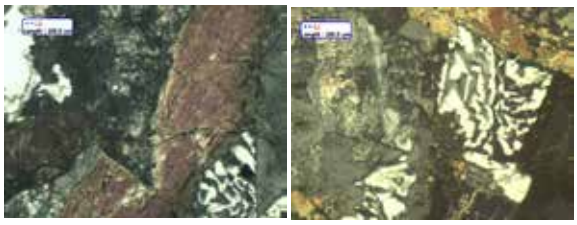


3d. Photomicrographs:



(a) **(b)**

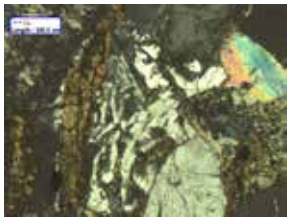
(c) **(d)**



(e) **(f)**

Photomicrographs shows: (a) Plagioclase-diorite, (b) Development of secondary calcite, formed by alteration of Augite and calcic plagioclase under the influence of pervasive CO2 bearing fluid in gabbro, (c) Development of secondary calcite in gabbro, (d) Dominance of subhedral hornblende crystals in diorite in which sericite develop along the cleavages and fractures, (e) Myrmekite intergrowth in gabbro, (f) Subhedral hornblende phenocryst in gabbro.

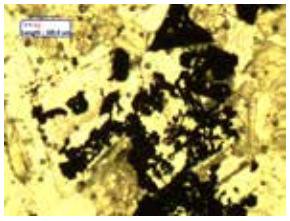
(g)



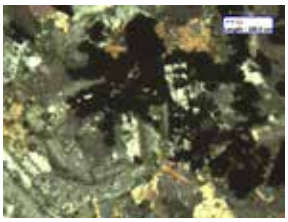
(h)

(i)

(j)

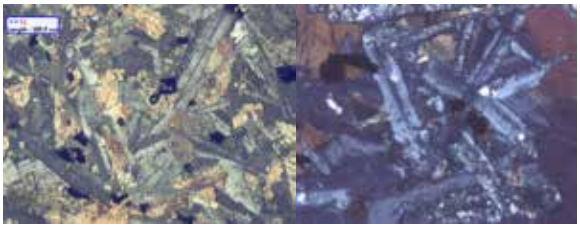


(k)

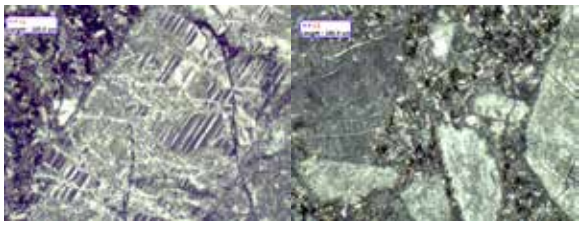


(l)

Photomicrographs shows: (g) Myrmekite intergrowth, secondary calcite, serpentine in gabbro, (h) Development of veined K2O feldspar (adularia) in calc-diorite, (i) Altered gabbro with epidotization, (j) Perthite intergrowth (microcline & albite) in diorite, (k) Clusters of magnetite/ ilmenite in diorite (under PPL), (l) Clusters of magnetite/ ilmenite in diorite (under CPL)



(m) **(n)**



(o) **(p)**

Photomicrograph shows: (m) Ophitic texture in dolerite, (n) Development of glomeroporphyritic texture in peripheral part of diorite, (o) Phenocryst of sanidine in trachyte, (p) Phenocryst of andesine in trachyte.

4. Discussion and conclusion:

Petrographic study reveals that the rocks are composed mostly of gabbro, hornblende-gabbro and diorite-plagioclase diorite, hornblende-diorite, quartz-diorite, quartz monzodiorite and calc-diorite. These gabbroic and dioritic rocks occur as pluton with sharp contact with the country rock (Boleng formation). Some doleritic dikes are found to occur along the periphery of the pluton. Also few patches of trachyte are found to occur in close association with more voluminous andesites.

The exposure of these gabbroic and dioritic rocks in the area understudy has been thrusted over the Eocene sedimentary rocks of Yingkiong Group. These rocks may be viewed as plutonic counterparts of compositionally similar extrusive basaltic and andesitic-dacitic rocks in Siang valley.

The dikes of dolerite might have acted as the feeder for the deep seated magma chamber crystallized to form these plutonic rocks and the equivalent volcanic rocks. As such these rocks should have received special attention from the point of view of dating and study of composition for tracing the source of magma.

REFERENCES

Abhinaba Roy and Kasturi chakraborti, (2008) : Journal of Geological Society of India, Vol.72, pp 123-140 | Acharyya, S.K., Mitra, N.D., Nandy, D.R :Regional Geology and Tectonic Setting of Northeast India and adjoining Region (in GSI.Mem.Vol-119, pp-7, 1986) | Acharyya, S.K., and Saha.P: Geological setting of the Siang Dome located at the Eastern Himalayan Syntaxis, Himalayan journal of sciences | vol. 5 | issue 7 (special issue) | 2008, pp-16-17 | Eastern Arunachal : Wadia Institute of Himalayan Geology Himalaya Research Programme(1997) | Jain, A.K. Thakur, V.C. : Stratigraphy and structure of Siang district, | Jain, A.K. Thakur, V.C. and Tandon, S.K. (1978) : Abor Volcanics of the Arunachal | Himalaya, Geol. Ser. India, V. 19; PP-335-349. | Kumar Gupendra (1997) :Geology of Arunachal Preadesh. | Laskar (1997) (in Krishnan 1958). Santra, D.K. (1979) : Geology of parts of the Siang | and Siyom Velleys, Siang district, Arunachal Pradesh, Geol. Surv. | India. Misc. Publ., 41 (1); PP9179-190). | Singh and Kumar (1990): An outline of the geological framework of the Arunachal | Himalaya. Jour. Him. Geol.V.1 (2), PP-189-197. | Srimal Neptune, 2005(Internet): Abor volcanic slab window volcanism at the | India-Asia collision zone- Salt Lake city Annual meeting | (October 16-19, 2005) | And Internet Sources.