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Petrography and geochemistry of the Pinkish Lagoi Granite, Bintan Island: Implication to magmatic differentiation, classification, and tectonic history

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Abstract: The combination of geochemistry and petrography analysis is useful in describing the source, evolution, type, and tectonic of granitoids. The closure of Palaeo-Tethys and the collision between Sibumasu and East Malaya are related to granitic magmatism in Southeast Asia which is classified into East Province, Main Range, and West Province with different characteristics. This study tries to characterize the magmatic differentiation, alphabetic classification, and tectonic history of Lagoi granite which is situated on the Eastern Granite Province in Southeast Asia based on the petrography and geochemistry analysis. Eight granitoid samples have been collected from Lagoi area and analyzed for both petrology and geochemistry using a polarized microscope, XRF, and ICP-MS. Petrographically, the granite consists of quartz, alkali feldspar, biotite, hornblende, and plagioclase. The pinkish Lagoi granite ranges from granodiorite to granite and shows metaluminous character. Seven of the samples are classified in high-K calc-alkaline series, whereas the other one is shoshonitic. The SiO_2 content of high-K calc-alkaline group depicts very good negative correlation to TiO_2, Al_2O_3, Fe_2O_{3T}, MnO, CaO, MgO, and P_2O_5 whilst positive one to K_2O. Plagioclase reduction during magmatic differentiation is evidenced by Ba and Sr contents, Rb/Sr and CaO/Y ratios, and Eu negative anomaly. The rocks are categorized into I-type in relation to the location relative to Southeast Asia granitic belt, mineral content, and geochemistry composition. The pluton shows syn-collision affinity which formed at the time of Sibumasu and East Malaya collision.

Keywords: Pinkish granitoid, geochemistry, Lagoi, Peninsular Malaysia

INTRODUCTION

Background

A well known three parallel granite provinces of Southeast Asia: the Eastern Province, the Main Range, and the Western Province are related to the Palaeo-Tethys history and the collision of East Malaya (Indochina) and Sibumasu (Cobbing *et al.*, 1992). These three north-south-trending zones were classified based on differences of stratigraphy, mineralization, and structure (Metcalfe, 2000). The Western Province extends from upper Peninsular Thailand into Myanmar with a mixture of tin-bearing S-type granites and I-type plutons of dominantly Cretaceous age (Searle *et al.*, 2012). The Eastern Province contains mainly Early Permian to Late Triassic I-type arc-related biotite ± hornblende granites, associated with Cu-Au deposits, and subordinate hornblende-barren plutons hosting limited Sn-W deposits. Late Triassic S-type collision-related biotite granites, associated with Sn-W deposits, and subordinate muscovite-bearing and hornblende-bearing granites built the Main Range Province. Cobbing (2005) proposed the younger volcanic arc Province with I-type biotite-hornblende diorites, tonalites, granodiorites, and monzogranites of Volcanic Arc affinity and are confined to the Barisan Range, Sumatra (Figure 1).

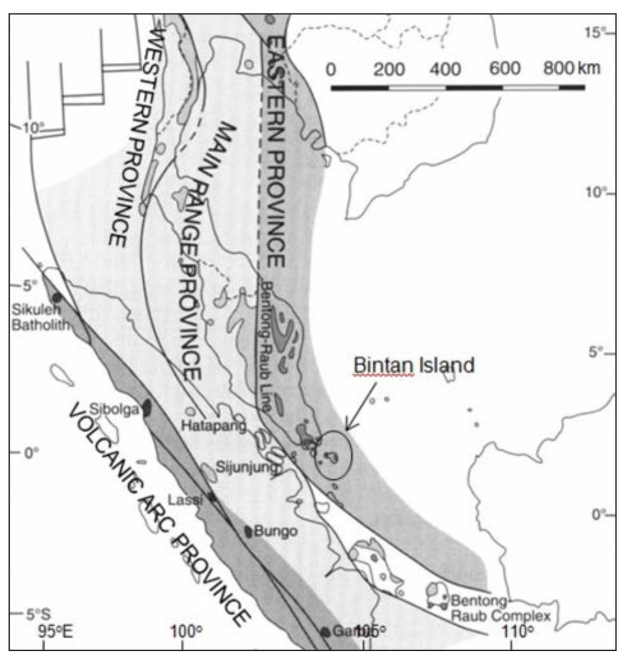

Figure 1: The four granite provinces in Southeast Asia (modified after Cobbing (2005)). Lagoi is located in the northern Bintan on the Eastern Granite Province.

Both petrographic and geochemistry characters were proposed to classified granitoids alphabetically. Partial melting of Al oversaturated metasedimentary sequence involving muscovite and/or biotite breakdown produces S-type granitoids while the I-type ones are the result from the fractionation of Al undersaturated hornblende bearing magma (Chappel *et al.*, 1998; Chappel, 1999). A-type granitoids which were originally proposed by Loiselle & Wones (1979) are alkaline rocks from anorogenic or rift-related environment. M-type granitic rocks are thought to arise from the mantle, specifically in island arc settings, whereas C-type is originated from charnokitic magma type. Castro *et al*. (1991) then proposed the H-type to encompass the granitoids showing hybrid characteristics of both the mantle and the crust. However, I–A–S types have been widely applied with the pretext that such classification can help readily identify the precursor of the felsic plutons (Mondal & Hussain, 2011). The differences of the granitoid types based on mineral assemblages, geochemistry, and tectonic setting were discussed in the previous studies (Whalen *et al*., 1987; Chistiansen & Keith, 1996; Frost *et al*., 2001; Mondal & Hussain, 2011).

Lagoi is located in the northern part of Bintan Island, Riau Islands Province, and falls into the eastern granite province of Southeast Asia. Previously, Irzon *et al*. (2017) conducted a study focusing on REE content in the granitoid and REE comparison to other pinkish plutons, namely, Singo (Nagudi & Koeberl, 2003), Seychelles (Ashwal *et al*., 2006), Endau Rompin (Ghani *et al*., 2013), Gabal Adara Adatalob (Shahin & Masoud, 2014), and Panbari-Geleki (Majumdar & Dutta, 2014). The study concluded that Lagoi granite samples contain medium REE concentration, intermediately REE fractionated, and shows Eu negative anomaly. This study broadens the characterization of Lagoi granite with petrographic analysis and major oxides and trace elements geochemistry to learn about its differentiation process, alphabetic granitoid classification, and tectonic setting.

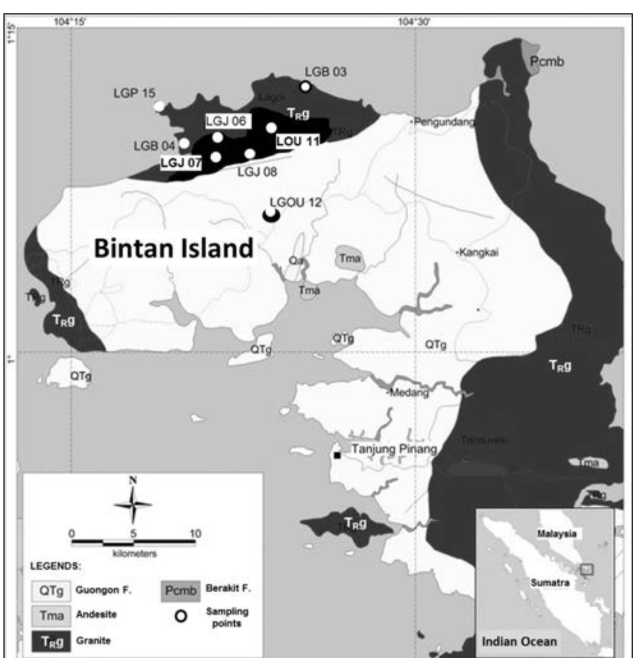

Figure 2: Geological map of research area and sampling points in Lagoi Area, northern part of Bintan Island (Irzon *et al.* (2017) modified from Kusnama *et al*. (1984)).

Geological setting

Geology of the Bintan Island is shown in Figure 2. The oldest rock unit is the Permian Berakit Formation occurs at the southwest of the island and made up of phyllite, slate, and schist. Granitic rocks in Bintan Island are dominated in the western, northern and southwestern coastal area. The study area (Lagoi) located in the northern part of the island and the granitic rocks here is mainly pinkish in color. Early Miocene andesitic rocks occur as small bodies scattered within Guongon Formation and in the granite. The largest formation in the island is 200 m thick Plio-Pleistocene Guongon Formation. The formation is made up of tuffaceous sand, tuffaceous lithic, and siltstone. The Quaternary alluvium can only be found near Teluk Bintan on the south coast of the island. A total of eight pinkish granites from previous REE study were utilized (Irzon *et al*., 2017).

ANALYTICAL METHOD

Both petrography and geochemistry analyses were done in the geological laboratory of the Centre for Geological Survey in Bandung. Thin sections were prepared for petrography analysis of the sample to depict the texture, mineralogy, alteration, and deformation. The petrographic study can be useful in classifying the rocks and its correlation with the whole rock chemical data. The samples were analyzed for major oxides composition (SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, and K_2O) using X-ray fluorescence analyzer (XRF) while trace elements and REE contents were analyzed using quadrupole ICP-MS. The sample preparation process and instruments settings adapted the previous study of Irzon (2017). Two certified reference materials, AGV-2 and GBW 7113, were also prepared and analyzed to ensure the quality of instrument measurement result.

RESULT

Petrography

The thin section reveals quantitative results on mineral composition of eight granitoids from Lagoi. The granite is generally holocrystalline, medium to coarse-grained, phaneritic, and pinkish in color. The plutons composed of quartz, K-feldspar, biotite, and plagioclase as major minerals. Quartz is mainly anhedral and constitutes between 40 to 50%. Main K-feldspar type is orthoclase and microcline and occurs about 34% to 45% of the total rocks. K-feldspar alteration to sericite is quite common. Plagioclase is not found in most of the sample, except on LGOU 11 (5%) and LGB 03 (7%). Biotite and hornblende are the main mafic phases and constitutes between 7 to 14% and 0-5% respectively. Occasionally the biotite altered to chlorites. Some photomicrographs of Lagoi granite are presented in Figure 3. Streckeisen (1976) proposed plutonic rock classification based on quartz (Q), alkali/K-feldspar (A), plagioclase (P), and feldspathoid (F) composition in petrography analysis. The collected samples are classified in alkali feldspar granite and syenogranite fields (Figure 4).

Geochemistry composition

The major, trace and rare earth element contents of Lagoi granite samples are given in Table 1. The felsic character of the rock samples is confirmed by the range of SiO_2 in 68.4–74.33%. Al_2O_3, Fe_2O_{3T}, and CaO contents ranging from 11.94-13.29%, 2.64-5.23%, and 1.45-3.66%, respectively. On the other hand, the mean composition of MgO, TiO_2, P_2O_5, and MnO are very low: 0.76%, 0.23%, 0.1%, and 0.06% respectively. Loss on Ignition (LOI) is a good indicator of the degree of weathering based on the physical aspects. The eight samples are relatively fresh based on the low LOI value (<2%).

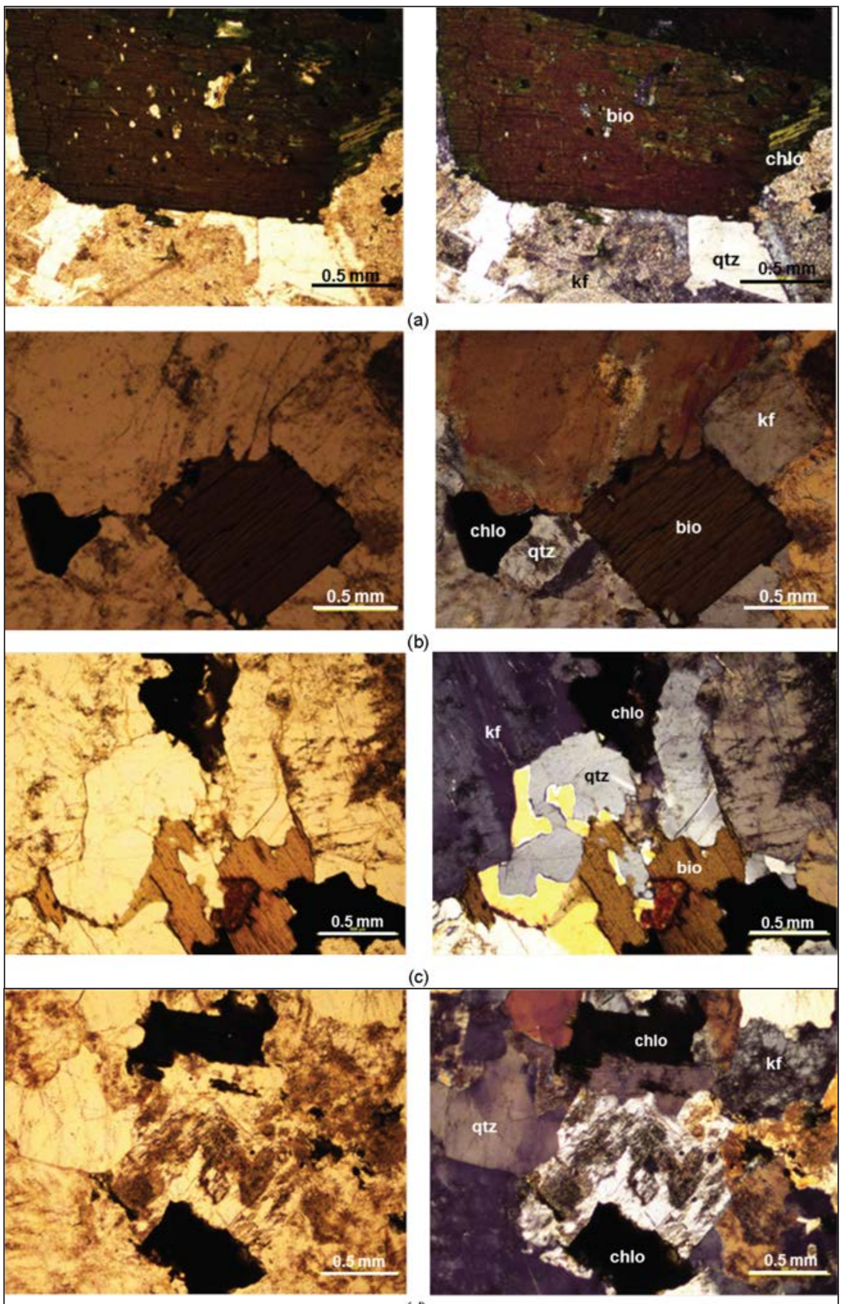

Figure 3: Photomicrographs of selected samples in plane polarised light (left) and cross polarised light (right): a) LGB 03; b) LGB 06; c) LGB 07; and d) LGP 15. The granites are holocrystalline with anhedral crystal. Biotite are presence in all samples.
qtz = quartz, hbl = hornblende, kf = alkali-feldspar, bio = biotite, chlo = chlorite.

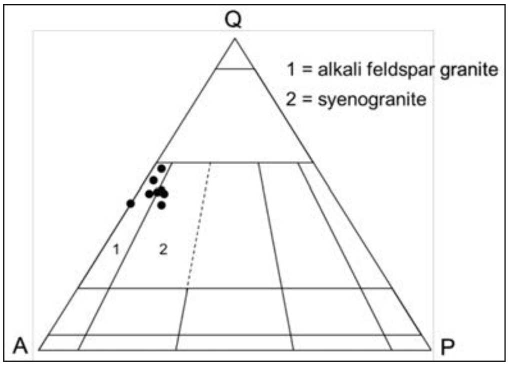

Figure 4: The rock samples are categorized as alkali feldspar granite and syenogranite on the QAPF diagram (Streckeisen, 1976).

Most of the samples fall within the granite field of Middlemost (1994) diagram, but only one which is lied in the granodiorite because of the least silica concentration (Figure 5a). The metaluminous character is shown on molecular ratio $Al_2O_3/(CaO+Na_2O+K_2O)$ of 0.82 to 0.9 and is confirmed in A/CNK – A/NK diagram (Shand, 1943) (Figure 5b). In metaluminous rocks there is likely to be excess Ca after Al has been accommodated in the feldspar which results in containing calcic phases such as hornblende and augite but lack muscovite as ferromagnesian phase (Frost *et al*., 2001). The metaluminous character is confirmed by petrographic data where almost half of the samples contain hornblende but none of them have muscovite. The samples contain high alkali composition (Na_2O+K_2O) in which seven of the samples fall in the high-K calc-alkaline series field and one in the Shoshonite on Peccerillo & Taylor (1976) classification (Figure 5c). This fact emphasizes that most of the rocks formed from the same magma series. On the AFM diagram all sample plot in the calc-alkaline field (Figure 5d).

DISCUSSION

Magmatic differentiation of the high-K calc-alkaline series

Evidence for some kind of relationship between the rocks came from plotting variation diagrams which correlation of oxide components. SiO_2 is used in felsic rock because of its consistency with differentiation. LG 07 is not used in the correlation diagram because it falls within Shoshonite series whilst seven other samples in high-K calc-alkaline on Peccerillo & Taylor (1976) discrimination. Most major oxides of high-K calc-alkaline series show good correlation to SiO_2 (r>0.8 or r<-0.8) (e.g., MnO, TiO_2, CaO, Fe_2O_{3T}, $A1_2O_3$, MgO and K_2O) to suggest similar compositional trends in Lagoi granite. MnO, TiO_2, Fe_2O_{3T}, $A1_2O_3$, and MgO decrease with the increasing of SiO_2 whilst Na_2O remains nearly constant (Figure 6a–e). Nevertheless, SiO_2 shows good positive correlation to K_2O with a coefficient of 0.8 (Figure 6d). These trends are alike other granitoid units in Eastern Granite Province of Peninsular Malaysia,

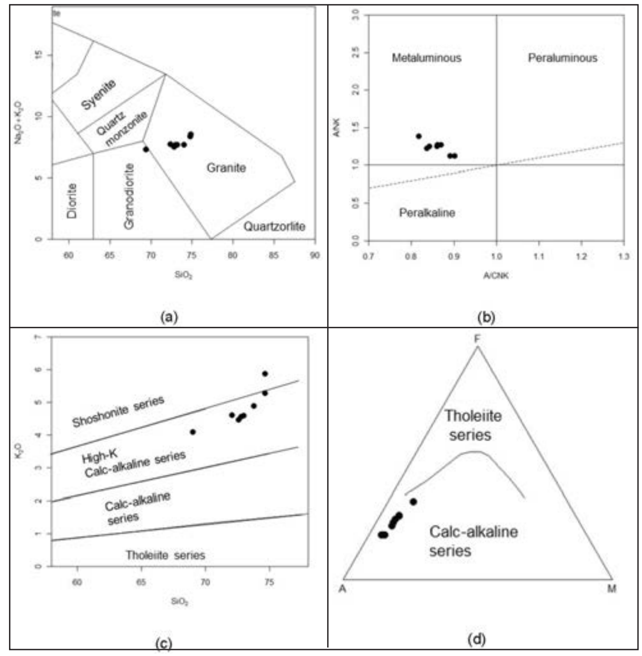

Figure 5: a) Most of the rock the samples are plot in granite field, except LGJ 08 (granodiorite), on Total alkali-silica classification diagram (Middlemost, 1994); b) the eight rocks show metaluminous affinity in A/CNK – A/NK plot (Shand, 1943); c) most of the samples depict high potash calc-alkaline series character to emphasize that these rocks were formed from the identic magma source; d) Calc-alkaline affinity is shown on the AFM diagram (Irvine & Baragar, 1971).

i.e. Endau Rompin (Ghani *et al*., 2013), Karimun (Irzon, 2017), both groups of Muncung (Irzon, 2015), and Central Terengganu sector (Ahmad *et al*., 2002). Among trace elements, V, Ga, Sc, Sr, and Ba depict negative correlation to SiO_2 whilst only Rb with a positive one (Figure 6g-h). On the other hand, no strong correlation is detected on other trace elements to silicon oxide.

Magmatic differentiation of Lagoi granite is indicated on the curvilinear trend in TiO_2 versus Al_2O_3/TiO_2 plot for the seven high-K calc-alkaline rock samples (Figure 7a) (Gürsu & Göncüoglu, 2006; Haruna, 2014). The regular trends of decreasing Al_2O_3, TiO_2, MgO, CaO, Fe_2O_{3T}, and P_2O_5 with increasing SiO_2 contents suggesting that fractional crystallization played an important role in the petrogenetic process (Matos *et al*., 2009). Decreases in CaO, TiO_2 and P_2O_5 with increasing SiO_2 composition are attributed to fractionation of their bearing minerals such as titanite ($CaTiSiO_5$) and apatite ($Ca_5(PO_4)_3(F,Cl,OH)$), respectively (Thuy *et al*., 2004; Bagherzadeh *et al*., 2015). Moreover, the depletion in MgO and Fe_{tot} content toward magma evolution indicates a separation of mafic minerals such as biotite during crystallization (Yanbo & Jingwen, 2010). It appears that the negative relationship of MnO with silica is possibly due to the alteration of manganese-bearing minerals into silicate minerals.

Average compositions for Ba, Sr, and Rb of 1016, 257, and 173ppm, respectively. The concentrations of Rb,

Tabel 1: Major, trace, and rare earth elements contents of the studied samples.

	LGOU 11	LGOU 12	LGB 03	LGB 04	LGP 15	LGB 06	LGB 07	LGJ 08
Major elements in wt%								
SiO_2	71.56	71.86	71.63	70.99	73.65	72.80	74.33	68.40
TiO_2	0.24	0.21	0.22	0.25	0.15	0.20	0.20	0.36
Al_2O_3	12.39	12.53	12.42	12.45	11.71	11.94	12.21	13.29
Fe_2O_3	3.86	3.32	3.59	3.91	2.64	3.08	2.66	5.23
MnO	0.070	0.059	0.060	0.065	0.035	0.050	0.047	0.078
CaO	2.56	2.49	2.49	2.66	1.45	2.49	1.55	3.66
MgO	0.798	0.688	0.711	0.834	0.510	0.732	0.656	1.190
Na_2O	3.02	3.02	3.07	3.06	3.07	2.76	2.64	3.18
K_2O	4.40	4.53	4.49	4.37	5.70	4.82	5.26	4.05
P_2O_5	0.059	0.107	0.114	0.132	0.062	0.109	0.084	0.187
LOI	0.49	0.49	0.67	0.71	0.46	0.49	0.69	0.62
Total Major	99.45	99.34	99.47	99.43	99.43	99.47	100.32	99.62
Trace elements in ppm								
Sc	6.88	5.98	6.06	6.88	5.45	6.32	10.85	8.75
V	20.97	19.13	21.69	23.62	11.04	20.05	17.01	22.08
Ga	14.81	14.98	14.89	15.64	15.16	14.68	17.32	15.93
Rb	180.54	171.39	174.45	182.91	199.55	169.30	189.70	138.63
Sr	257.66	260.22	250.29	260.56	166.25	284.29	198.12	325.53
Y	28.37	64.96	51.81	27.28	34.27	47.01	52.75	48.30
Nb	4.12	2.15	4.54	2.30	1.78	2.39	2.69	4.11
Cs	9.24	7.86	7.86	9.31	6.08	6.15	7.68	7.52
Ba	940.32	966.97	900.52	880.18	739.67	1,342	930.03	1,346
Tl	1.07	1.11	1.03	1.08	1.11	0.96	1.19	0.88
Th	28.91	21.97	31.12	33.51	25.62	25.84	34.12	19.92
U	11.73	9.28	12.80	11.76	9.76	9.83	9.31	7.83
Rare earth elments in ppm*								
La	41.17	87.52	59.41	46.15	44.20	80.15	275.68	65.32
Ce	88.23	170.01	124.46	95.23	67.48	166.13	465.73	123.40
Pr	10.59	20.12	14.77	11.24	8.77	20.12	37.21	15.16
Nd	30.91	60.62	41.95	33.30	27.91	59.63	161.47	47.94
Sm	4.93	9.44	7.74	5.33	5.07	9.00	20.19	7.72
Eu	0.97	1.46	1.23	1.03	0.77	1.49	2.16	1.95
Gd	5.23	11.71	9.36	5.81	5.32	9.61	22.40	10.47
Tb	0.76	1.73	1.56	0.84	0.89	1.34	2.41	1.63
Dy	4.07	9.95	8.78	4.37	4.85	6.81	10.34	8.84
Ho	0.91	2.68	2.13	0.99	1.14	1.54	2.24	2.00
Er	2.74	8.70	6.22	2.93	3.25	4.47	6.73	5.21
Tm	0.43	1.37	0.95	0.46	0.52	0.70	1.02	0.73
Yb	2.68	7.84	5.59	2.82	2.97	4.28	6.62	4.07
Lu	0.46	1.54	1.00	0.50	0.52	0.74	1.13	0.67
ΣREE	194.08	394.68	285.15	210.99	173.65	366.00	1,015.	295.11

*data from Irzon *et al*. (2017)

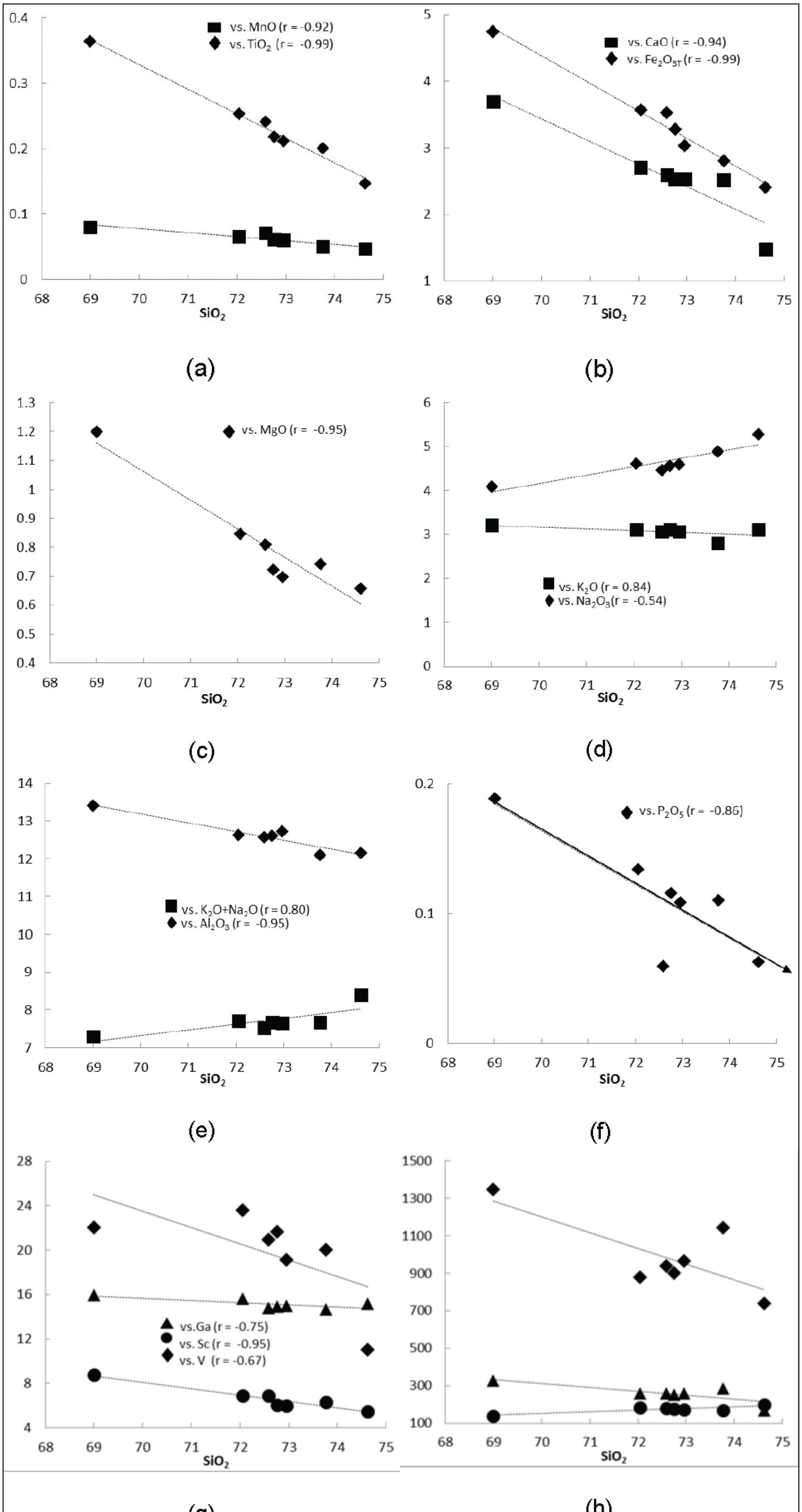

Figure 6: Variation diagram of major oxides against SiO_2 (wt%): a) versus MnO and TiO_2 (all in %); b) versus CaO and Fe_2O_{3T} (all in %); c) versus MgO (%); d) versus K_2O and Na_2O (all in %); e) versus K_2O+Na_2O and Al_2O_3 (all in %); f) versus P_2O_5 (%); g) versus Ga, Sc, and V (all in ppm); and h) versus Sr, Rb, and Ba (all in ppm).

Sr, Ba, and their corresponding Rb/Sr and Sr/Ba ratios provide crucial information regarding the fractionation of the rocks because these elements are compatible with biotite, muscovite, plagioclase, and K-feldspar. Ba and Sr are strongly compatible, display a very good positive correlation (Figure 7b) and show large variation, decreasing from the more mafic to the more felsic varieties. The amount of Rb, on the other hand, increases toward the escalation of SiO_2 composition which causes Rb/Sr and Sr correlate negatively (Figure 7c). The decrease in Ba with increasing SiO_2 on the granite may be attributed to fractional crystallization of biotite (and K-feldspar) (Im *et al.*, 2002). A negative correlation between Sr and Rb/Sr and the lower Sr contents towards higher silica samples also indicate plagioclase fractionation. Sr-SiO_2 (r= -0.79) exhibited tighter correlation than Ba-SiO_2 (r= -0.74) to emphasize that plagioclase separation from the evolving melts plays a more important role than feldspar (Matos *et al.*, 2009; Azer *et al.*, 2016). As well, the decreasing CaO/Y ratio towards higher silica content (Figure 7d) implies fractionation of plagioclase and hornblende (Azer *et al.*, 2016).

In the primitive mantle-normalized trace element spider diagram (McDonough & Sun, 1995), the rocks depict Ba, Nb, Sr, and Ti negative anomalies. The Sr negative anomaly can be explained by plagioclase fractionation whereas P negative anomaly might be related to apatite fractionation. The Ti and Nb negative anomalies are typical of all types of calc-alkaline magmas and may be explained by residual hornblende and/or Fe–Ti oxides (rutile, ilmenite) in the source of the parental magmas (Bagherzadeh *et al*., 2015) as shown in Figure 8a. The large ion lithophile elements (LILE), such as Cs, Rb, and Ba are enriched in the Lagoi granite with abundance >100 times of primitive mantle. Nevertheless, high field strength elements (HFSE), namely Ti, Lu, and Y are relatively low in the range of 1-30 times of primitive mantle.

Among the trace elements, the REE is a particularly useful group of elements to understand the differentiation

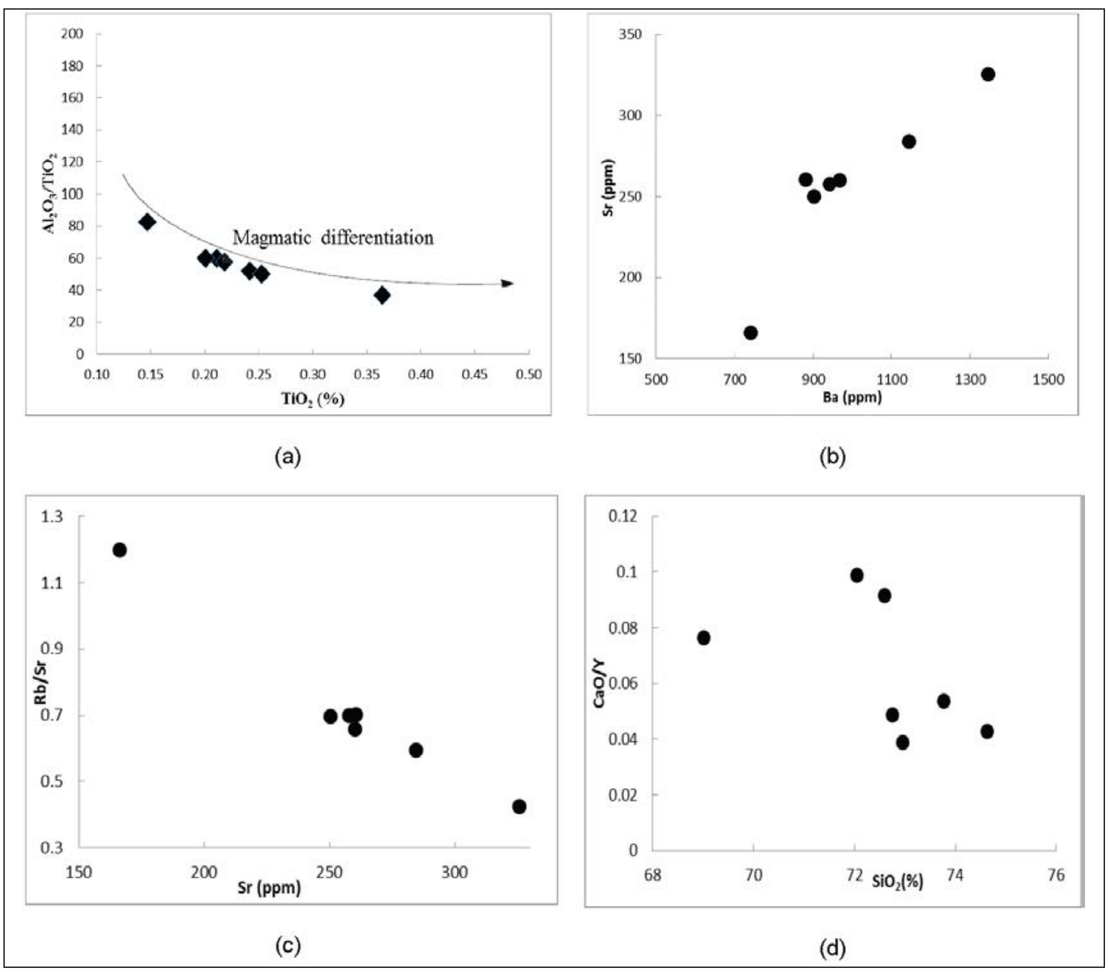

Figure 7: a) TiO_2 – Al_2O_3/TiO_2 ratio diagram shows the importance of magmatic differentiation; b) strong positive correlation of Ba – Sr; c) strong negative correlation of Sr – Rb/Sr ratio; d) negative correlation is detected on SiO_2 versus CaO/Y discrimination.

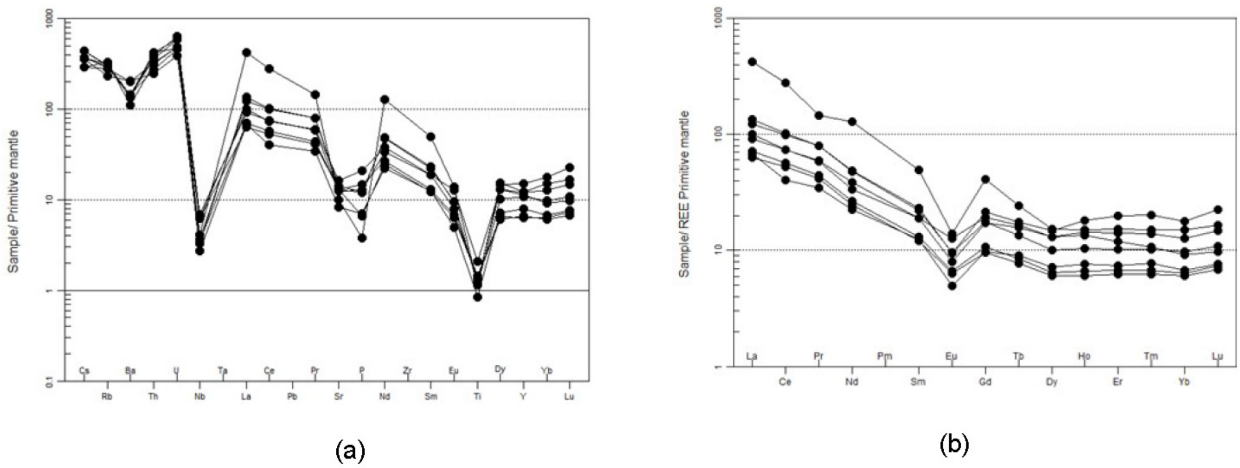

Figure 8: Primitive mantle (McDonough & Sun, 1995) normalized of the eight Lagoi granites samples: a) extended spider diagram; and b) REE spider diagram.

of any magmatic suite because of the coherent behavior. Total REE for the samples ranging from 173 (LGP 15) to 1015 ppm (LGB 07) with an average of 259 ppm (Irzon *et al.*, 2017). Eu negative anomaly is pronounced in the seven high-K calc-alkaline samples from Lagoi (Figure 8b) in the range of 0.42-0.67 and is attributed to plagioclase and/or feldspar fractionation process (Bagherzadeh *et al.*, 2015; Coloma *et al.*, 2017; Haruna, 2014; Saleh & El-Nisr, 2013). The increase in negative Eu anomaly is correlated strongly with silicon oxide rise (r=0.83) to emphasize plagioclase fractionation along magmatic differentiation. Moreover, Eu anomaly also correlates positively to Sr and Ba but negatively to Rb with correlation the coefficient of 0.62, 0.63, and -0.60 respectively suggesting that these elements are mainly controlled by separation of plagioclase and K-feldspar from the fractionating melt (Yanbo & Jingwen, 2010).

Alphabetic classification

A-type granites show a large number of highly charged cations such as Y, Nb, Ce, and Zn with the minimum values of 10 ppm, 20 ppm, 85 ppm, and 100 ppm, respectively. Moreover, the anorogenic granite is highly alkaline with the total K_2O+N_2O is more than 8.5% (Whalen *et al.*, 1987). Although Ce composition of the studied rocks is in the range of 67 ppm to 465 ppm, the total alkaline, Nb, and Y content of the studied rocks are not high enough to be classified into A-type granite. Three of the samples contain hornblende (LGOU 11, LGOU 8, and LGB 04) as a mineral identifier of I-type (Chappell & White, 2001). On the other hand, no muscovite, as the common mineral of S-type, is identified in these rocks. Muscovite is a hydrated phyllosilicate mineral of aluminum and potassium. The absence of muscovite might explain the metaluminous character of Lagoi granite with A/CNK ratio <1 which is closely associated with the I-type granitic rock (Frost *et al.*, 2001; Ghani *et al.*, 2013). Moreover, calc-alkaline affinity (Figure 5d), relatively high Na_2O contents, and moderate value of Rb are typical of I-type granites (Haruna, 2014).

Furthermore, these rocks show remarkable decreases in P_2O_5 with increasing SiO_2 content (Figure 6f). This feature is also an important criterion for distinguishing I-type granites from S-type granites in several previous studies (Yanbo & Jingwen, 2010; Ghani *et al.*, 2013; Sarjoughian & Kananian, 2017). Formerly, Cobbing (2005) divided granitoid in Sumatra into three provinces: volcanic arc, Eastern, and Main Range. The studied granitoid is classified into the Eastern Granite Province. Granitoid of the Western Province in the Southeast Asia Tin Belt is not outcropped in Sumatra as it is only located in northwestern Malaysia, western Thailand, and Burma (Schwartz *et al.*, 1995; Cobbing, 2005). Petrology and geochemistry based discussion on Lagoi granite confirms the prior suggestion that Eastern Province Granites are classified into I-type granitoid.

Tectonic implication

The Palaeo-Tethys, an ocean located along the northern margin of the Gondwana paleocontinent, separated the Sibumasu and East Malaysia during Carboniferous times (Metcalfe, 1996; Metcalfe, 2000). The accretionary complex and I-type granitoids were developed during the subduction of the ocean beneath East Malaya in the Permian. The I-type Eastern Province granites were also formed together with S-type Main Range granites as the result of Sibumasu-East Malaya collision throughout Triassic (Figure 9a). The plot of studied samples in the syn-collision field on Batchelor & Bowden (1985) discrimination (Figure 9b) and the previous 226 ± 8 Ma result on Rb-Sr dating (Cobbing *et al.*, 1992) imply that the I-type Lagoi granite was formed during Sibumasu-East Malaya collision in Triassic.

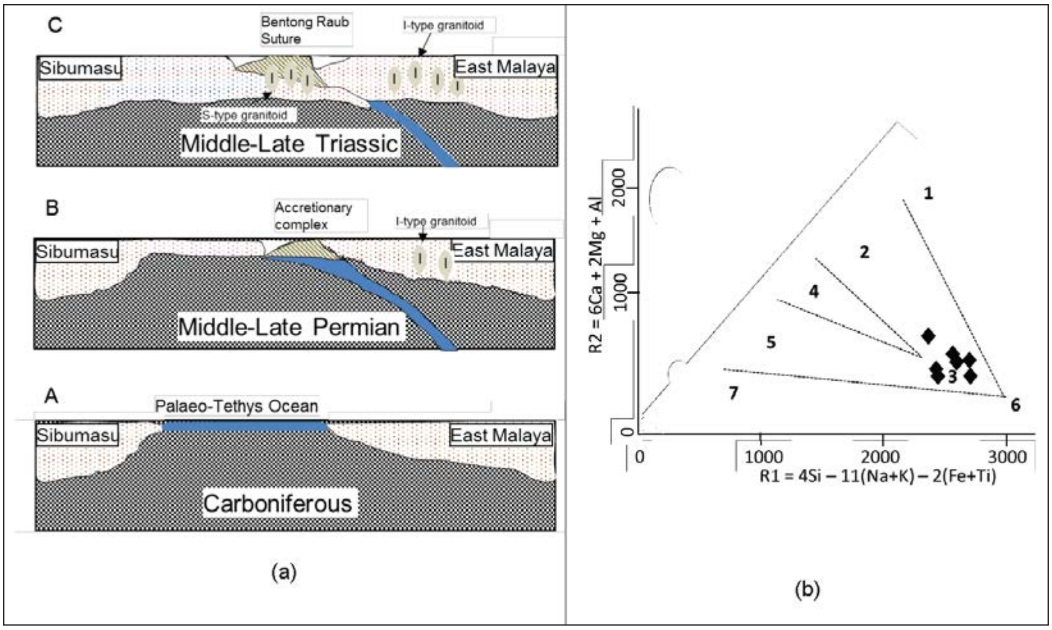

Figure 9: a) Tectonic history of the closure of Palaeo-Tethys Ocean until the collision of Sibumasu with East Malaya in Malay Peninsular;
b) Selected samples are in syn-collision filed on Batchelor & Bowden (1985) discrimination to show that the pluton was formed during the collision of Sibumasu dan East Malaya.
1 = mantle fractionate,
2 = pre-plate collision,
3 = syn-collision,
4 = post-collision uplift,
5 = late orogenic,
6 = post orogenic,
7 = anorogenic.

CONCLUSIONS

Following the mineral configuration, most of the studied samples are classified as alkali feldspar granite. Geochemically, pinkish Lagoi granite ranges from granodiorite to granite and most of them depict high-K calc-alkaline affinity. The high-K calc-alkaline granites show TiO_2, MnO, CaO, Fe_2O_{3T}, MnO, and MgO depletions but K_2O enrichment along with SiO_2 rise. Among trace elements, only Rb portrays positive correlation to SiO_2. The major oxides and trace elements correlation to SiO_2 describe the mineral composition along magmatic differentiation. Plagioclase separation was evidenced by the negative correlation between Sr and Rb/Sr, the lower Sr contents towards higher silica, the decrease of CaO/Y along SiO_2 rise, and the negative Eu anomaly on the high-K calc-alkaline granite. The samples are not classified into A-type granitoid. The studied granite is situated in Eastern Province which is classified into I-type granitoid. Hornblend detection in some samples without any muscovite and negative P_2O_5 correlation to SiO_2 emphasize the I-type character of Lagoi granite. Granite in Lagoi was crystallized at the time of Sibumasu-East Malaya collision during Triassic after the closure of Palaeo-Tethys.

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