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Recenzja/Review

of the doctoral dissertation of Mr Aung Myo Thy M. Sc. ent. „Geology and Genesis of the Nwe Yon-Kwinthonese Gold District, Central Myanmar: insight from mineralogical, fluid inclusion and (S.C.O.H.PB) isotopes".

The Review has been prepared according to an agreement with AGH Krakow, represented by Faculty Dean prof. dr hab. inż. Jacek Matyszkiewicz, in connection with the procedure of granting Aung Myo Thy M. Sc. the title of Doctor of Science, conducted by AGH Krakow.

The Doctoral Thesis of Aung Myo Thy M. Sc. is a very broad, comprehensive and extensive work. Broad since it contains 259 pages of text and additional 50 pages of references. Comprehensive, since it presents a complete geological, mineralogical and geochemical description of the Nwe Yon-Kwinthonese gold district of the Central part of Myanmar. The Abstract, Acknowledgements and Table of contents add 19 further pages to this list. The work is composed of 8 main Chapters with a numerical system of Subchapters/Subsections. This system, although generally accepted, seems to be too extensive; some of the low-rank subchapters are less than one page long.

The List of Figures is shown according to their position in the Chapters; the same refers to the list of Tables. Generally, there is a very good correlation between the Figures and the Tables in text. The author also presents a list of abbreviations which is rather long. I have found it instructive, as it appears at the beginning of the dissertation and avoids additional explanations in text.

Each Chapter (and even some subchapters) starts with an Introduction which in my opinion is an unnecessary complication, and it is a source of many repetitions.

Chapter 1. Introduction (12 pages)

In the first three subchapters the author presents a very interesting discussion which took place over the last 20 years regarding the origin of orogenic gold deposits and intrusion-related gold deposits. The basis for this discussion is the relation of their formation to plate tectonics and different compressional and transpressional regimes. The importance of those deposits is world-recognized, as they account for a third of the world's gold resources. This debate is still active and vigorous, and due to several similarities this work may give us some new insights to this discussion.

The author feels strong in this discussion and knows the recent achievements. He accurately presents the major locations of ORGD and ORD deposit, their depth of formation, temperature, and the role of fluids of different origins in their formation, serving as a source of gold mineralization. The role of oxidized and reduced plutons is extensively elaborated. However, as a representative of the older generation of economic geology, I should point out that the works of Sillitoe (1991) and Groves at al., (1992) are not the oldest ones about intrusion- and orogenic-related gold deposits. An extensive review of older publications on these topics is accessible in the textbook of Sawking, who for the first time classified ore deposits with respect to plate tectonics regimes.

Some principal and rudimentary information concerning the Nwe Yon-Kwinthoneze gold district is later presented, including on active economic ore bodies as well as the different developed small-scale artisan mining activities. It is worth to mention that first artisan work started in the late 80s, while large-scale mining operations began just recently. In Section 1.5, the author clearly presents 5 main objectives of his study. A very concise and clear form of presentation, bravo. During an 8-month period of field work he collected 45 large rocks of ore samples from an area that covers 280 km^2. For his study, he used standard transmitted and reflected light microscopy, microprobe investigations, as well as ICP-AES and ICP-MS trace element analyses, S, C, O, H isotopes, and lead examinations. The methods are more extensively described in the corresponding Chapters. This sophisticated analysis was possible due to the involvement of the supervisor Prof. dr hab. inż. Adam Piestrzyński, who organized support of AGH Krakow as well as the Queens University of Canada, the Geological Survey of Finland and ALS Perth Australia.

Previous works on the Nwe Yon-Kwinthoneze gold district were very limited, leaving a large open space for the doctoral thesis of Aung Moy Thu M.Sc. Subchapter 1.8 is in my opinion an unnecessary complication.

Chapter 2. Regional Geology (17 pages)

I am deeply impressed with the doctorand's description of the tectonic setting, regional geology and the mineral epochs in Myanmar. He shows his outstanding knowledge about geology and mineralization in South-East Asia. For me it was like a journey of a newcomer into

the unknown with a younger, but very smart guide. I am impressed with his explanation of the Paleozoic-Cenozoic Tethyan/Indian oceanic subduction and collision between the terranes (microcontinents) which compose the mainland of Southeast Asia. He stressed the importance and value of the Paleozoic separation of the Sibumasu Terrane and the Mogok Metamorphic Belt which are separated by the Sagaing Fault. The Mogok Metamorphic Belt extends over 1500 km along the western margin of the Sibumasu terrane. This is impressive that there are so many gold prospects and deposits located along the Saging fault, of which the Nwe Yon-Kwinthoneze district is a small examined part.

His presentation of the mineralization epochs of Myanmar starting from the Precambrian to the Miocene up until the recent times is clear and good illustrated. Evidently, he is paying special attention to igneous activity in Myanmar, as it is vitally important for the metalorganic potential. The evolution and timing of igneous activity in Myanmar are excellently illustrated in Figure 2.5. It is adapted from Kin Zaw (2017), with valuable contribution from the author. As preliminarily suggested by the doctorand, two stages of evolution may be important for the discussed mineralization: the late Cretaceous and the Miocene-recent, as they may be related to the region of the Nwe Yon-Kwinthoneze gold district.

The reviewer has a rather critical attitude to Introductions to every chapter and the numerous conclusions or concluding remarks; however, in this cause the concluding remarks (Subdivision 6.2.) help to understand the geology, tectonics and lithology of the Mogok Metamorphic Belt, and its relation to the Wuntho-Popa magmatic arc that hosts significant gold and copper molybdenum porphyry and epithermal mineralization.

Chapter 3. District-scale geological setting of the Nwe Yon-Kwinthoneze gold district (31 pages).

One major, however unimportant problem of this Chapter, like also in several other Chapters, are the repetitions. The introducing Subchapters 3.1., 3.2. and 3.3. include several repetitions, in some cases without differences from the materials presented earlier. For instance, Fig 3.2 is analogous with Fig. 2.2. This Figure appears in the dissertation with or without major changes several times. In a version prepared for publication I suggest improving or rejecting some parts of the text.

The description of the Mogok Metamorphic unit (3.3.3 10 pages) shows excellent petrographic work, and it is perfectly illustrated with photo-macro and -micrographs. This part of the work documents the author's excellent skill in petrology, with proper use of petrographic terms, textures and structures of minerals and rocks. Calc-silicate rocks and marbles resemble those known elsewhere, also from Poland, from the surroundings of the Kłodzko-Złoty Stok granitoid massive. He documents in hand specimens and in outcrops maculose structures which credibly developed due to the increasing temperature of the Kabaing granite intrusion. A perfect description of the Irrawaddy Formation and its contact with the gold-bearing

conglomerate and the Kabaing granite (16.5+ 0.5 MA) which is supposed to be the primary source of gold in the district.

At this moment, it is good to stress the high quality of the attached photo-macro and -micrographs of the local outcrops, hand specimens and various microscopic images that are a credibly convincing part of the doctoral dissertation. All field photographs have their exact geographic locations which is additionally valuable for future exploration. The outcrop photographs illustrating the contact between the biotite gneisses and the marble deserve to be shown in a petrology textbook.

One of the most important Subchapters is 3.4 (20 pages) which includes the status of available information about the investigated deposits and prospects. Only two real deposits are included, while other 11(9) prospects present different stages of exploration and documentation. Some prospects were discovered recently, and the quality of the available material is not fully comparable. Therefore, the work of Aung Myo Thy M.Sc. is to some extend a pioneering type of work. All prospects as shown in Fig. 3.2 are related closely to the Sangaing Fault and the Mongog host rocks, which underwent high grade metamorphism probably during the middle Eocene.

The main host rocks for gold mineralization are different types of marbles (among them diopside phlogopite, graphite, pyroxene), gneisses, microgranite and the Kabaing granite with calc-silicate assemblages related to granite. According to the author, the dominant forms of mineralization are auriferous quartz gold lodes, veins and veinlets. Gold mineralization also occurs in the alteration zones of some prospects.

Alteration processes play an important role in all occurrences, with the importance of silicification, sericitization, chloritization, ankeritization, chloritization and pyritization changing relative to the prospects. In the investigated deposits, the author observed that mineralization is controlled by faults and foliation that is parallel to quartz-sulphide and sulphide veins and wall rock alterations. Favourable sites often have enhanced permeability on rheological/lithological contacts and boundaries.

Gold occurs predominantly in sulphides (mostly pyrite), quartz and in some places accompanied by Au-Ag-Te tellurides.

The author is trying to compare some prospects that show some similarities, but due to their different stages of exploration, it is hard to do further going spatial and temporal comparisons.

They may represent the same mineralization system, but have a different level of excavation, and their characteristics are from low-temperature mineralization to higher-temperature garnet pyroxene assemblages. The different types of country rocks may also add some differences to the composition of certain prospects. In the light of those constrains, Table. 3.2. in which the author summarises his knowledge at this stage of documentation, is a proper one, and it corresponds to the results of field work. Once again, I would like to stress the high quality of all photographs, some of which were probably not easy to take.

The author's descriptions of certain prospects are concise and refer to different levels of exploration. In certain cases he reports the thickness of gold veins and for how long they extend; in others, due to the level of exploration, this type of information is not available.

Due to more than a dozen prospects, additional Subchapter Discussion and Summary in this case seem reasonable. Summarized characteristics of the described materials are consistent with intrusion-related gold deposits. Also, wall rock alteration processes and spatial relationships to the I-Type Kabaing granitoid metal zonation system confirm the still preliminary results presented in a credibly formulated summary.

Chapter 4. Whole-rock igneous geochemistry (32 pages)

The major problem with using whole-rock geochemistry to trace hydrothermal alteration processes that affected the mineralized samples is to separate them from the weathered intrusive rocks. In this case, this problem was additionally complicated because the samples were collected from relatively shallow mines, prospects and outcrops. Also, the number of visually fresh samples (23) was very limited relative to the investigated area. The author recognizes this problem and tries to limit the number of weathered samples using LOI ignition index measured by TGA analyses. However, the results of LOI index may partially depend on hydrothermal alteration.

Quite rightfully, the doctorand employs several alteration indices to separate altered and weekly altered samples from hydrothermal alteration modifications. Among them, he employs CPI alteration indices that have been developed for chlorite and carbonate (Fe-Mg) alteration as well as pyrite, magnetite and hematite enrichments. Also, (AAAI) argillitic indices are used to calculate SiO_2 enrichment due to high sulfidation environment. The results plotted in the Figures (4.2. A.B) fall exclusively in the least altered box, which confirms the proper selection of samples. Only samples from microgranite and some from the mineralized granite show pronounced signs of sericite alteration.

Figure 4.1 on page 76 is analogous with Figure 3.2.

In order to classify igneous rocks based on major element geochemistry, the author uses several discrimination diagrams, among them the QAP diagram of Streckeisen. This brings me back memories when in the mid-90s I took part in an excursion in Romania to commemorate the 100th Adversary of the Romanian Geological Survey together with Professor Streckeisen (93 at the time) who always arrived first at every place. As may be expected, the Kabaing granite falls in the monzogranite box with mineralized granite in quartz-rich granite. All the other classifications confirm the affiliation to calc-alkaline trends.

Subchapter 4.5 and the following ones (16 pages) are in my opinion probably one of the most important parts of the reviewed dissertation. When used properly, trace element chemistry may give a convincing answer to the problems of origin of mineralized fluids responsible for

any type of mineralization. In this part of the work, the author shows excellent knowledge of the related literature, and how the trace element geochemistry should be useful for partial melting of Kabaing and fractional crystallization. He proves that he can independently interpret complicated compositional variation diagrams and present proper conclusions. The most important chondrite normalized whole rock REE profiles for all analysed samples share similar geochemical patterns with negative Eu anomalies, corresponding to upper continental melting. I prefer his interpretation that the Kabaing granitoid should be classified as an I-type, with a geotectonic position in volcanic arc granites in a syncollisional granite field.

As the major and trace elements show negative correlation with the SiO_2 content, the evolution of fractional crystallization in the Kabaing granite is not debatable. The Kabaing granitoid shows scattered ratios, inconsistent with the partial melting trend. In the author's opinion, it is unlikely that partial melting is responsible for the diverse concentrations of elements. Plagioclase, hornblende biotite and K-feldspar fractional crystallization is evidenced clearly, and they are proven by the author to be the mechanisms responsible for compositional variation in the Kabaing granitoids. In the presented fractionation diagram of the Rb/Sr ratios versus the oxidation state diagram, all samples are plotted in Au-Bi and Cu-Au fields. Importantly for the genetic implications of the Nwe Yon-Kwinthonese gold district, the author presents a convincing interpretation of the ore-forming potential of the study area.

He classifies the Kabaing granites as moderately reduced, ilmenite series granitoids that are typically correlated with a reduced intrusion gold-related system elsewhere. However, in this case he does not exclude the S-type granitoid, due to the lack of Al-rich minerals. At the present stage of discussion, the crystallization temperature of the Kabaing granite is probably between 745 and 770°C.

Chapter 5 Mineralogy texture and Paragenesis (40 pages)

In my opinion, this Chapter should be located after Chapter 3 and before Chapter 4 'Whole rock igneous geochemistry'. This is because this chapter is making extensive use of the data from Chapter 3, and this is also a proper construction, when we are going from macroscopic through microscopic observations to analytic chemical ones. This is also suggested by the doctorand who wrote cit. 'it is necessary to integrate this Chapter with the gold deposits geology data presented in Chapter 3'. The Chapter utilized extensive mineralogic and petrographic work done on the paragenesis of the Nwe Yon-Kwinthoneze gold district.

In Subchapter 5.5. 'Ore mineralogy and paragenesis of gold prospect' the doctorand has presented four main paragenetic assemblages that he identified during his study of the investigated gold prospects. He summarizes the paragenetic succession of mineral paragenesis in Fig 4.1, and later he describes the 4 distinguished stages and minerals deposited in those stages. The arrow suggests a temporal connection of the distinguished stages, as do several minerals that appear in different stages. This is somehow a risky

inference, as the discussed prospects are relatively distant from each other, and their connection with the Kabaing granitoid is not a close one.

This is also upside down to some extent, as the criteria that allowed him to recognize the four stages are presented in Chapter 5.6.

The description of minerals, their textural and structural features and relations to the host rocks and the accompanying paragenesis are very professional. The text is excellently supported with photomicrographs that clearly illustrate the character of contacts between the minerals and the host rocks. In stage 2, the author stresses the important role of rheological contacts as a site of high-grade mineralization. He distinguishes 5 generations of pyrite in stage 2 of mineralization. Some of them may represent different forms of recrystallization of the same pyrite. This is to some extent supported by an isotopic analysis of pyrite. From my observations, documented by photomicrographs, telluride mineralization seems to be secondary to native gold.

In this Chapter, the author also clearly explains the position and sequence of alteration processes. As mineralized gold veins are mostly quartzy, silicification is the most important alteration process. The intensity of chloritization, carbonatization, sericitization and pyritization is relative to different prospects. Alteration which is connected to the veins is present in a sequence of up to 1-2 metres. Sericitization occurs primarily near orebodies in granite and gneisses. As noted earlier in Chapter 5.6, the criteria that allowed the recognition of four paragenetic stages are elucidated, and it is stressed that not all stages are present in every prospect, which makes the situation clearer. However, the author presumed that they all are spatially and temporarily associated with the Kabaing granitoid intrusion.

Special attention has been paid to the newly discovered Au-Cu (Pb. Zn) skarn prospect (10 pages). This is one of the most interesting parts of the dissertation of Aung Myo Thy M. Sc. A concise, professional language, perfectly illustrated by field photographs with visible contacts of intrusive rocks and the adjacent Mongok marbles. Convincing photomicrographs of endo- and far more developed exoskarns. After all, high quality photomicrographs correspond clearly to the three stages of mineral succession recognized here: the prograde stage, retrograde and sulphide grade. In the Table of succession, he recognises 4 stages with minor supergene minerals. There are not proven to be supergene ones. As usual, gold occurs preferentially in pyrite.

In the reviewer's opinion, this part of the dissertation could be extended and published as a separate publication, this is the gem of the doctoral thesis.

Chapter 6 Mineral and whole rock geochemistry (20 pages)

This is the essential part of the dissertation in which the candidate shows his knowledge of modern analytical methods, and the ability to properly and accurately interpret the obtained

results. Thanks to his supervisor, Aung Myo Thy M.Sc. has had access to very sophisticated SEM and EPMA at the Laboratory of Critical Elements. Also, the possibility to use Fire Assay Fusion with atomic spectroscopy is the method for gold analyses preferred in the world.

On page 146, the same figure for the third time? This also concerns Fig 6.2. and 6.2 B.

The whole rock geochemistry concerns only twelve samples collected from channels in the A2 and New A2 deposits.

The major element composition of ore minerals has been done by using EPMA and reported in several Tables. However, the number of samples in not exactly shown, but the number of measurements of certain minerals and their suggested generations is generally large, and allows for credible interpretations. As I expected, the mineral composition of pyrite is generally homogenous, with little variance between the stages of mineralization. The same concerns Cu and Ni. Interesting results show sphalerite which occurs in stages 2 and 3, and it is important in the sulphide association of skarn deposits. The negative correlation of Zn with Fe indicates isovalent substitution. The distribution maps in zoned sphalerite with dark bands being enriched in Zn and devoid in Cu are of interest. A majority of sphalerite results have a Zn/Cd ratio of less than 250, which may be interpreted as a low temperature indictor.

To me, the fineness of gold causes some problems with interpretation. Personally, I do not see any convincing patterns. Stibnite identified as a late gold mineralization stage is devoid of gold mineralization, and occurs exclusively in the antimony prospect.

The mineralogy of gangue minerals based on EPME analyses and a microscopic textural and structural description is very interesting and concise. Special attention is paid to chlorite, which is an important mineral of stages 2, 3, and in the skarn prospect. They have relatively similar composition besides chlorite from the skarn, which has a higher Fe content and Fe/(Fe+Mg) ratio. They are all trioctahedral. The temperature of their formation based on different geothermometers falls within an acceptable range. The gangue mineral chemistry of the Zee Phyu Kone Au-Cu (Pb-Zn) skarn prospect is discussed separately due to compositional differences. The composition of the garnet and pyroxene ternary diagram locates the examined skarns in the field of Au skarns. The temperatures of the fluids range from 215-331° C in stage 2 of chlorite and 180-334° C for stage 3, and complies with the homogenization temperatures of quartz-carbonate veins.

The title of Subchapter 6.4 'Whole rock ore Geochemistry' which is the same like Subchapter 6.2.2 is confusing to some extent. After small confusion, it is clear that this is a continuation of Subchapter 6.2.2, and a more extended description of the obtained results of analyses of samples collected from the A 2 and New A 2 orebodies. The results as presented by the author confirm a high tenor of gold, silver and tellurium mineralization, as well as Cu-Zn content. Only the Pb contents ate relatively low. The high gold average of 165 ppm and the correlation with the Au/Ag ratio is typical of orogenic gold deposits. This is to some extent confirmed by the

high tellurium content (Av. 105.8 ppm) and the Te/A ratio typical of intrusion- and orogenic gold-related deposits.

The correlation of the gold fineness value of Nwe Yon-Kwinthoneze is so variable, that in my opinion, also shared to some extent by the author, it does not allow an easy correlation with gold of the main types of gold deposits.

Chapter 7. Fluid inclusions, Stable and Radiogenic Isotopes (37 pages)

This Chapter is in my opinion perfect. This Chapter could be separately proceeded as the doctoral dissertation of Aung Myo Thu M. Sc. The number of analysed samples (60), the number of prospecting sites, the variety of used geological material: quartz, carbonates, pyrite galena, stibnite etc., the wide scope of examinations used cover a spectrum of geological material which allows answering and explaining the evolution of hydrothermal fluids, and the genetic problems of gold deposit formation in the Nwe Yon-Kwinthonese district.

The use of double polished thin sections together with microthermal measurements performed in GFZ Potsdam, Germany, is the best possible methodology to characterize the nature and composition of ore-forming fluids. The same concerns the analyses of the composition of stable sulphur isotopes, where two methods were employed. A classical one, with the combustion of samples resulting in the production of sulphur dioxide, and a modern one, with a laser microprobe and an ablation cell. Those complicated analytical procedures used are described by the author, showing deep knowledge of this sophisticated methodology and the constraints of its use. Without the help of several institutions like AGH Krakow, the Finland Geological Survey, GFZ Potsdam FRG and the Quins University Canada which were kind enough to participate in this work, the methodological success of this dissertation would be impossible.

This shows how lucky the doctorand was having such an excellent supervisor.

The journey through this methodology was nostalgic to me to some extent. I may observe the tremendous progress since the early 1970s when, along with Professor Andrzej Kozlowski, we constructed our own thermometric stages and implemented fluid inclusion studies to economic geology in Poland. In the mid 1980s together with Professor Achim Bechtel we proved the presence of thermochemical sulphur in the Rudna mine by sulphur isotopes. This Chapter is as usual excellently illustrated with photomicrographs, tables and histograms of sulphur isotope composition.

Sulphur isotope composition of the skarn prospect has been described separately, which in this case is evident due to different spatial correlation with the Kabaing granite, which is confirmed by the narrow histogram of sulphur composition. The carbon and oxygen composition of the gold and skarn prospects are well supported by the corresponding graphs, on which hydrogen/oxygen data confirm the magmatic to metamorphic origin of mineralizing

fluids. The histogram of Stage 2 pyrite is very narrow and not fully confirms the microscopic observations that allowed the recognition of 5 Pyrite 2 generations.

Fig. 7.10 (four illustrations) is very good and informative, where we can observe in situ isotope analyses of Pb (galena) on thin sections according to the paragenesis and the textures of minerals on polished sections from different prospects .The results of $^{206}Pb/^{204}Pb$ plotted versus $^{207}Pb/^{204}Pb$ all fall above the upper crust line in the upper corner of the Lhasa terrane basement box.

In my opinion, all the conclusions in this Chapter are properly formulated and well supported.

I will repeat only selected items which deserve to be acclaimed. 1) The homogenization temperatures and the values of salinity of the ore forming fluids in the Nwe Yon-Kwinthonese (NYK) gold district are low-to medium temperature, low salinity, like in the majority of intrusion-related Au deposits. 2) The author correctly suggests that the main source of carbons was hydrothermal magmatic, with a mixture of metasedimentary ones. 3) The sulphide association is composed mostly of pyrite, with minor other sulphides, but lacking sulphates. Thus, δ^{34} represents the total S composition, and a value of -0.5 to +6.6 is typical of magmatic fluids. For stage 3, the assimilation of local sulphur from host rocks is slightly changed. 4) The δ^{34} values of the skarn prospect are closer to the world's known porphyry Cu-Au deposits, probably due to a reaction of the Kabaing intrusion with carbonate wall rocks. 5) Positive correlations of Pb with Au, Ag, Bi and Te assemblages are typical of magmatic hydrothermal and may suggest a magmatic source of lead. An upper crust origin is also suggested by isotope investigation. 6) It is credible that magmatic fluids may have interacted to some extent with the metamorphic rocks of the Mongok unit during its evolution.

Chapter 8. Summary and Conclusion

I will not discuss the contents of this Chapter, as its contents have been several times (in parts) presented in several conclusions and summaries in the Chapters, and also in some Subchapters.

Additionally, looks like a so-called Executive Summary, and it may be directly and without major changes (only by adding some figures) published in a world-class scientific magazine. The only new element is the discussion about the classification of the Nwe Yon-Kwinthonese gold district as an orogenic or a gold intrusion-related deposit. My belief is that the question has not yet been fully answered and closed.

As an exploration geologist myself, I will add geophysical surveying to the list of recommendations. Due to extensive alteration processes, it will be easier and cheaper to trace mineralization along rheological contacts.

Concluding remarks

1) The geological material collected by Aung Myo Thy M. Sc. is absolutely sufficient for the description of the scientific side, and to some extent economic value of the Nwe Yon-Kwinthoneze gold district. The samples include all ores and various petrographic rocks from the investigated prospect.

2) The author has collected extensive and corresponding literature from this part of South Asia, Myanmar, and about gold-related deposits in the world and in this region. He has shown deep knowledge about this literature, which allows him to present an excellent summary about the geology, metamorphism, as well as the volcanic activity and the gold deposits in Myanmar.

3) The goal, the main objectives of the Doctoral Thesis are presented clearly and in a proper and concise manner. The monography type of the dissertation makes the main goal vast and composed of all the geological aspects of the investigated Gold district: structural, petrographical, mineralogical, geochemical, which result in an answer about the origin of gold mineralization.

4) Aung Myo Thy M.Sc. chose the best possible methods of investigation, starting from field work, microscopic and different microprobe investigations, isotope and fluid inclusion studies. He documented his ability to properly conduct work and interpret results. His field work was of a pioneering type in the mostly artisan work.

5) His conclusions from his work are properly documented; his interpretations are supported by a wide scope of analytical results. The graphical part of work: the photomicrographs, field photographs, various tables, diagrams, plots, figures, etc. are generally perfect and well correspond to the text.

6) He proved that he has the ability to independently explain and interpret complicated geological problems, which is a major requirement for a doctoral degree.

Taking the above into account, I unanimously support his candidacy to the Sc.D. degree, and recommend AGH Krakow to continue the doctoral procedure.

Praca doktorska Pana Mgr Aung Myo Thy w pełni spełnia wymogi dla prac doktorskich zgodnie z Ustawą o stopniach i tytule naukowym.

Stanisław Speczik