

Structural Geology of D-pit at Akara Mining, Pichit Province, North Central Thailand

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Abstract

D-pit, the mineralization zone at Chatree epithermal gold deposits, is located on Loei-Petchabun-Chanthaburi volcanic belt of Pichit Province, North Central Thailand. This belt has been related to palaeo-oceanic plate and the Indochina terrane subduction causing the gold mineralization structure. The purpose of this study is to analyze the geologic structural data from core-logging and field mapping. Rocks and geologic structures include breccia vein, massive vein, dyke, joint and shear zone inferring the age from older to younger, respectively. Main structures consist of the two trends in the NNW-SSE and N-S. Dykes show the N-S major trending and NE-SW minor trend conform with the NE-SW strike-slip fault within Chatree gold mine. Joint developed throughout whole rock units also with N-S trending. The entire structures have major trending in N-S which indicates maximum stress (σ_1) performs in N-S direction. Sinistral shear zone with dextral shear fracture and sinistral shear fracture indicated σ_1 performed in NW-SE direction which is concerned by Riedal shear. Sequences of deformation indicated σ_1 performed in N-S direction and changed to NW-SE direction causing the difference in pattern of geological structures during the subduction in Permo-Triassic period.

Key words: Structural geology, Riedal shear, Epithermal gold deposit, Chatree gold deposit

1. Introduction

The Chatree gold deposits or Akara mining The Chatree Au-Ag deposit is located in the Permo-Triassic volcanic rocks of the Loei-Petchabun-Chanthaburi Volcanic Belt (Charusiri et al., 2002). Diemar and Diemar (1999) and Diemar et al. (1999) reported that gold-silver mineralization has occurred as a low sulfidation quartz-carbonate-andularia style epithermal. This gold deposit was controlled by host rock sequence, paleogeothermal and geological structure. Especially structure controlled the orientation of ore vein and others structures include dyke, joint and shear zone in ore deposit. The purpose of this study is to analyze the mechanism and relationship of both structure also define the maximum palaeostress which took place in the study area. D-pit, the study area was diamond core drilled in early year 2010, has many information of geologic

structure. Therefore, we decide to study the structural geologic in D-pit.

2. D-pit geology

The general geology of D-pit consists of 3 rock units (James and Cumming, 2007). They can be classified to hosted rock, ore zone and dyke which arrange from older to younger units; 1) Hosted Rock Unit comprise fine grained andesite/monomictic andesitic breccia (closed to fault/ sheared zone). Weak to moderately quartz-carbonate vein/ veinlets stockwork usually occurred from weak hydrothermal breccia (cracked). 2) Ore Zone Unit are 3 main vein zones which can be classified from styles of veins comprise vuggy qtz-chlorite-pyrite vein (major ore zone) and the others vein zone is carbonate \pm qtz vein/ veinlets (lower cut off grade) intercalated randomly between ore zones. 3) Dyke Unit comprises porphyritic andesite dyke exposed

in the western part of pit and aphyric andesite dyke exposed in the central part.

3. Methodology

We began with the literature review including reports, thesis, and paper. Field investigation area subsequently taken place

and, then, it is divided into three parts; thin section part for growing of quartz veins, geologic structure in field, and plotting the orientation data of both from field investigation and measuring diamond core. Seven rock samples was slab making and polishing for microscopic study consisting 1 host rock sample, 4 mineralized sample and 2

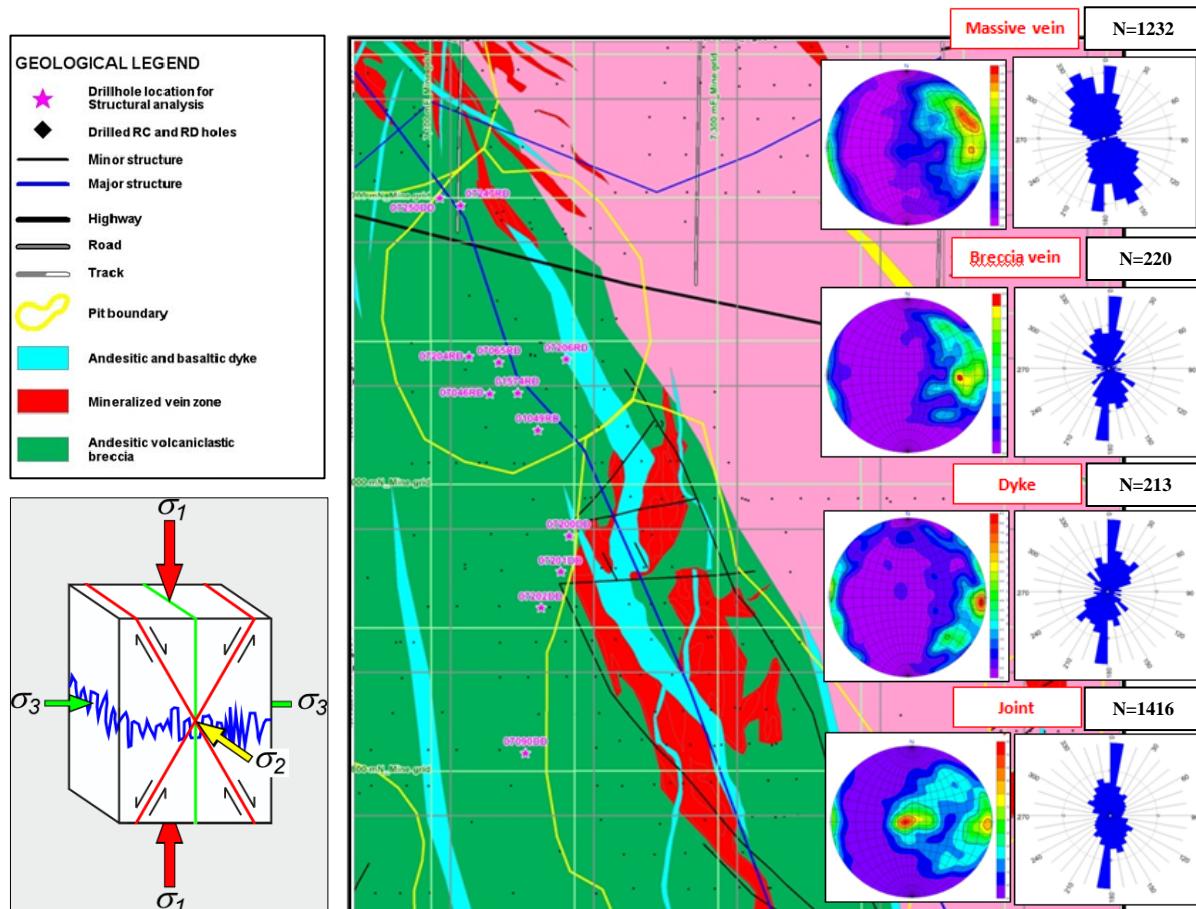


Figure 1. D-pit geological map stereo net and rose diagram plot sum of orientation data of each structural type in D-pit. The fracture structure including massive vein, breccias vein, dyke and joint have major trending in N-S which indicates maximum stress (σ_1) from north and south direction

for geological map and rock sample collecting from outcrop in D-pit. The samples were collected by orientating sample correction for preserve orientation of rock in field. The diamond cores in study area have been drilled 12 holes (Fig.1) give many information including lithology and attitude of geological structure and their relationship between each other. The law of cross-cutting relationship is applied for them. The important step is using data to the analysis of the geological structure

samples for porphyritic dyke and aphanitic dyke. For Mineralized vein or massive vein, thin section used to define a mechanism of opening fracture by growing quartz from wall to opposite wall. All data correcting and results will be used to interpret their mechanism and relationship, then, conclude and discuss on the history of geological structure in D-pit. We also created the model explaining the stage of deformations in the study area

4. Structural geology

4.1. Mesoscopic structures

Field investigation and diamond core showed crosscut relationship among each of structures. Massive vein and breccias vein cut through the host rock with veinlet or stockwork (Kromkham and Zaw, 2005). Dyke rocks, which feature porphyritic and aphanitic dyke, arise through the volcanic facies succession and ore zone with sharp contact (Tangwattananukul et al., 2008). Joint, the non-infill fracture, develop throughout whole rock units. Shear zone take place and overprint all rock unit in the study area represent by crusted rock and sigmoidal quartz deform. Shear fracture associate with shear zone have 2 types; sinistral shear fracture and dextral shear fracture which cut across and slightly move quartz veins with variously orientation fracture plane.

4.2. Microscopic structures

In the polarizing microscope, the contact between vein and host rock presents the growing of quartz crystals which perpendicular to host rock walls. It indicates that the opening fracture has no significant of shear movement during or after fracturing.

4.3. Stereo net and Rose diagram

Stereo net and rose diagram plot (Fig.1) showing the major trend of massive vein and breccia vein have similar direction in N-S but NNW-SSE direction dominated in

massive vein and subordinated in breccia vein. Dykes have the major trend in N-S and minor trend in NE-SW with west dipping. Joint orientation is clearly divided into 2 groups: sub vertical and sub horizontal joint with same striking direction. The sub horizontal joint is concerned that was controlled by stratigraphy which gentle east dipping in the study area. Shear zone have NNW-SSE trending associated with sinistral shear fracture and dextral shear fracture in direction NW-SE and E-W respectively.

5. Discussion on Palaeostress

From the stereonet and rose diagram plots, it is significant that the whole open fracture structure including massive vein, breccias vein, dyke and joint have the major trending in N-S which indicate maximum stress (σ_1) from north and south direction (Fig.1). Minor structural trend of breccia and major NNW trend of massive conform NNW strike-slip fault in The minor trend of dyke in NE-SW direction probably controls by NE striking fault in Chatree mine which may develop during σ_1 perform in N-S and it open fracture for magma derived from mantle intrude through whole rock in the study area. The subhorizontal joint is concerned that it may be affected by stratigraphic control. The maximum stress (σ_1) changed in direction from N-S trending to NW-SE trending represent by sinistral shear zone with NNW-SSE orientation. The shear zone with

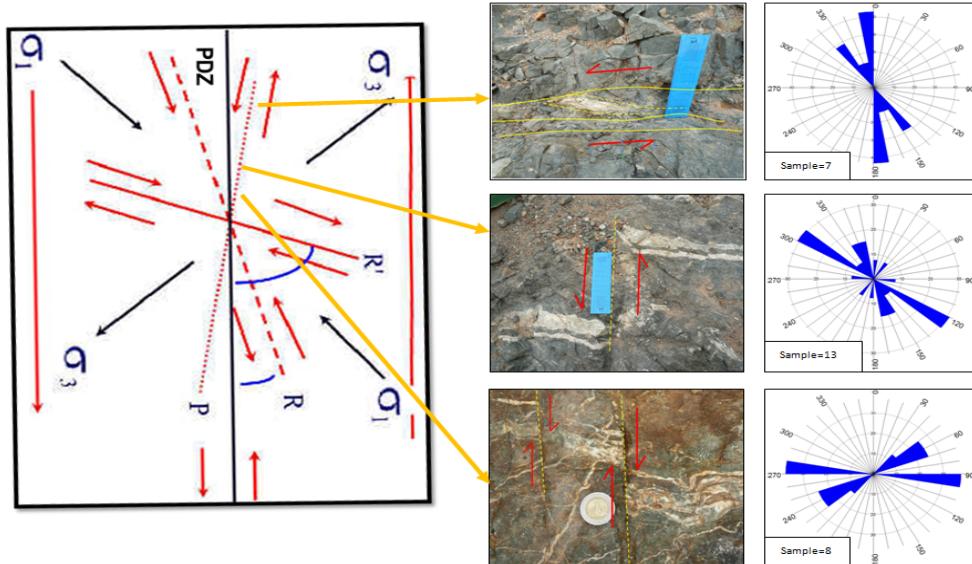


Figure 2. The shear zone with synthetic shear fracture and antithetic shear fracture demonstrate Riedal shear components indicating maximum stress or σ_1 perform in NW-SE direction.

synthetic shear fracture and antithetic shear fracture demonstrate Riedal shear components indicating maximum stress or σ_1 perform in NW-SE direction (Fig.2).

6. Conclusions

From the field investigation, diamond core log, orientation plot and thin section, it can be concluded for characteristics of geological structure in D-pit as follows.

1. The geological structure can be divided into 4 types: ore vein, dyke rock, joint and shear zone which order from older to younger respectively.
2. N-S trending dominated in massive vein, breccias vein dyke and joint indicate the maximum stress or σ_1 perform in N-S direction.
3. Open fractures have no significant movement after fracturing indicating by growing of quartz perpendicular to host rock wall.
4. Minor trend of massive vein conforms with the NWW-SSE striking fault and the minor trend of dyke is concerned to have been developed by NE-SW strike-slip fault.
5. From the stereonet plot, joint can be divided into 2 groups: sub-vertical joint and sub-horizontal joint which may be affected by stratigraphic control.
6. Sinistral shear zone with dextral shear fracture and sinistral shear fracture which have oblique normal movement can indicate the maximum stress or σ_1 perform in NW-SE direction
7. The study area was possibly affected by 2 maximum stress events which changing from N-S direction to NW-SE direction and causing the difference in geological structure patterns during subduction event possibly in Permo-Triassic.

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