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Studies on Characteristics of Fracture Lithofaciesin Wenxipo W-Cs-RbPolymetallic Deposit,Hainan Province,China

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1 Introduction

Wenxipo W-Cs-Rb polymetallic depositis located in Fengshou rubidium-cesium polymetallic prospecting area in Danzhou City,Hainan Province, China. The hornstone facies, a thermal metamorphic facies, developed surround the diorite.Alteration type of Wall rock includingmainly potassium-rich alteration, silicification,and hornstone faciesas well aschloritization, biotitization, tourmalinization, pyritization, andpyrrhotitezation.The relationships between the fracture and the mineralization regularity of tungsten were discussedin this study. The petrographic study with thestatistics and fracturemeasuring, fissure fillings,suggested that fracture’s angle in this studyarea might bedivided into four groups, i.e., 9°, 29°, 47°, 69°, respectively. The scheelitemainly occurred in the interlayer-fracture, the inclination of scheelite stringer is about 45 °,which is roughly same as stratigraphic tectonicdeformation foliation, and part of scheelite stringer occurred instrata penetration fissure in the group. In thescheelite orebody, the more fracture-density,the more fissure permeability, indicatedthat the fracture in the rocksmightprovide the migration channelsforthe ore-forming fluid and ore-containedspace for the scheelite mineralization.Crashed zone and scheeliteorebody at the higherore-grade may becontrolled by biotite diorite intrusion obviously.Indeed, Cataclastic lithofacies is proportional to the fracture densitynear the biotite diorite intrusion, fracture density up to 35 / m on average. Filling types and characteristics of fracture showed that the fracture fillings has formed in multi-phase features, fissure fillings included high temperature to low temperature mineral. The microscopic identification results show that theenrichment of scheelite mainly related to tourmalinization and silicificationclosely,speculated that thescheelite mineralization mightbe mainly related to the magmatic hydrothermal mineralization of biotite diorite. The discovery of tungsten deposit has a large prospecting potential, however, the relationship between the fracture and W-Cs-Rb enrichment regularity in the studyneed to be studied.

Rock fractures, including joint, cleavage and fissure, whichhas a very close relationshipfor formations of metal ore deposit （such as Yan et al.,2015;Fang et al.,2001;Liao et al.,2013;Wang et al.,2016;Wang et al.,2016;Lin et al.,2012）.Rubidium-cesium polymetallic deposit belongs to a skarn-greisen-type, which were found by Marine Geological Survey Institute of Hainan Province.However, previous studypaidlittle attention to fracture lithofacies.

China Non-ferrous Metals Resource Geological Survey hasfound and delineatedthe tungsten orebody,usingcomprehensive research,comprehensiveassessment,comprehensive prospecting and evaluation.it was believed that tungsten orebody is main mineral commodity,Cs and Rb is associated mineral commodity.Occurrence state of tungsten is scheelite and wolframite,they aredeemed to available industrial minerals. However, Occurrence state of Cs and Rb are in biotite and phlogopite, which may be the Cs-Rb concentration minerals for industrial utilization.

2 Methodology

Fractures in the drilling-core may providedirect information for the study on the fracture lithofacies.For it may provide quantitativeand semi-quantitative description of the varied characteristics of the fissure development in the study area. The main research

Table1. DZK1097 Fracture permeability characteristics of table in the drill core

Research unit	Depth	Crack density(strip/cm)	Width of fissure（cm)/d	Permeability (cm^2)/10^{-4}
diorite	0-149.54m	36.48	0.19	4.53
hornstone	149.54-296.43m	52.10	0.12	0.90
diorite	296.43-395.83m	25.92	0.14	0.67
hornstone	395.83-449.72m	18.09	0.15	0.98
diorite	449.72-481.44m	3.50	0.20	0.23
hornstone	481.44-488.61m	6.67	0.13	0.44

methods in this study are as follows: (1) to divide the typeof fractures in the core library. (2) to measurefor the density and inclination of fissures.(3) to measure the filling and opening degree of fissure.(4) the mechanism coupling relationships between fracture and ore-forming fluid maybe indicatedby the permeability of rock fissure.(5)to observe the micro-fractures in office studyincluding the observation and identification of micro-structures, the statistics of micro-fractures, the intertwined relationship of micro-fractures, the quantitative description of the micro-fractures development of the core and the contribution of the micro-fractures to the reservoir structure or reservoir.(6)To study on fracture fillingscombining the macroscopic observationin fieldwith office research methods. We have completeddrilling-core logging by fluorescent scanning method in the field in order to get the formations on the fracture fillings such as scheelite, fluorite and calcite with REEand to summary on the enrichment and mineralization regularity of scheelite.The filling-minerals in the micro-fractureswereobserved by EPMA. W-Cs-Rb hosted minerals filling in fractures in the study area are detail studied by EPMA and XRD in the office studies.

3 Relationships between fissure-fluid coupling and tungsten mineralization

3.1 Fissure-fillings and itscompositions

Fissure-fillings species may help to reveal fissure-fluid coupling in during W mineralization. Fissure-fillingsmay reveal compositions of the ore-forming fluids, and theycould indicate the evolution of the ore-forming fluids.Threedifferent occurrences of scheelite were found in the study area, and different alteration associationswere recognized in the fissure-fillings.Fracturealteration mineral filling sequence respectively is irontourmaline→microcline→Na-feldspar→biotite→siliceous→wolframite→scheelite-blacktungsten→pyrrhotite→pyrite→chalcopyrite→chlorite→calcite, the filling sequenceof minerals in fissure is silicate→oxide→sulphide→carbonateminerals, indicated that mineralization evolutionwere from high temperature to low temperature facies.Oxide phase is mainly mineralization of scheelite phase.

3.2 Estimation of Fracture Permeability

Itsmigration path, manners and quantity ofore-forming fluid migration are controlled by the permeability of crushed rock. The permeability of cataclastic faciesis a function of thecube of the fracture density and the fracture aperture (or width). Snow (1970) derived the following formula:$K=(nd^3)/12$,K is the permeability (cm^2); n is the crack density (strip/cm);d is the width of crushed fracture (cm).

Scheelite (table1) is mainly hosted in biotitehornstone withhigher permeability than thesein biotite dioriteexcept for near-surface (0-149.54m).Fracture density gradually reducedfrom surface to underground.Fracture density is usually high surrounded scheelitemineralization body. Therefore,the fissure is scheelite ore-hosting space and mineralization fluid migration channel.