Structural characteristic of the hydrothermal-ore system of the Bambukoy river basin, Western Transbaikalia

E N Kungulova, I Matveev

Department of Geology and Geography, Tomsk State University, Lenin Avenue 36, Tomsk, 634050, Russia
E-mail: kun2609@mail.ru

Abstract. The hydrothermal ore system of the Bambukoy basin of the Western Transbaikalia is located within the South Muya Ridge is a set of quartz veins with different orientations, performing fissure paragenesis, formed during the development of thrust and shear deformations. The rocks enclosing are terrigenous deposits of the Amatkan Formation of the Vendian age, presented in the form of interbedded aleurolites and sandstones of varying grain size. The terrigenous deposits intensively deployed in inclined, recumbent, diving folds. In the structure of the zone, there are two types of quartz veins. The first type includes veins concordant stratification and cleavage, the second type are counter veins. Due to the kinematic reconstruction was revealed that the formation of sub-concordant veins is associated with the initial stages of the formation of the thrust system. In turn, the counter veins are derived from the subsequent stages of deformation, expressed in the development of left-side shifts that complicate the thrust system.

1. Introduction
Vein hydrothermal deposits are widely distributed in nature and are important objects industrially, since they serve as a source of production of many metals. Vigorous bodies of hydrothermal deposits, controlled by cracks, form restricted distribution fields and are localized in rupture zones. The laws of deformations realized in the Earth control the interrelation of the processes of deep-seated and near-surface tectogenesis, the place in this interrelation of crustal discontinuous zones and the mechanism of formation of the latter [1]. The aim of the research is to restore the kinematic processes that contribute to the formation of the quartz-vein zone of the Bambukoy river basin.

The work area is located in the northeastern part of Western Transbaikalia in the junction zone of the Baikal-Muya and Barguzino-Vitim structural-formation zones within the South Muya Range. The development of the territory took place in an accretion-collision zone during the Paleozoic and Mesozoic phases. The Paleozoic era was marked by massive sedimentation and the development at the end of the early Paleozoic of a single thrust system of the northwestern (300°-310°) strike. The Mesozoic stage of development did not reflect in any way in sedimentation, because, with different intensity, starting from the Middle Paleozoic to this day, the territory was denudated. However, during the Mesozoic time, the left-sided shear faults of the west-north-west strike are laid, breaking the thrust system into separate segments. This stage is the least studied, although it has the greatest ore controlling value, being currently the final one [2].
2. Characteristics of enclosing rocks
The hydrothermal ore system is located in the middle reaches of the Bambukoy River and is confined to the terrigenous sediments of the Amatkan Formation of the Vendian age. Deposits of the Amatkan Formation form a section of cyclically alternating and interleaved aleurolites and sandstones of varying grain size (from fine-grained to coarse-grained), intensively deployed in inclined, recumbent, diving folds. The rocks of the complex are characterized by a rather high sorting of the material, they are predominantly of quartz-feldspar composition and cemented by hydromica open pore cement. In some places, the cement penetrates into the cracks of minerals with the formation of corroded grain boundaries (figure 1). Rocks are sericitized to varying degrees (figure 2). On cracks ferrous cement develops in the form of films and individual pyrite crystals. The degree of metasomatic study of rocks increases closer to the contacts of the complexes and tectonic disturbances. In such places, the deposits are more compacted and fine-grained. A number of observed signs indicate that the sandstones were transformed under late catagenesis.

3. Structure of the quartz-vein zone
In the structure of the vein zone, there are two types of veins. The first type includes streaks of subgenerate stratification and cleavage, the second type of intersecting. Sub-consistent veins are most widely represented in the northern part of the ore zone, their orientation is strictly subordinated to the direction of cleavage and layering in folded structures. Such streaks have a tapered morphology with irregularly varying thickness from the first centimeters to 0.5 meters in the bulges. Ore mineralization, represented by sulphides and ankerite and sericite associated with them, is localized at the contacts of the veins with the host rocks.

In the southern part of the ore zone, cutting veins, representing steeply dipping veins of various extent, are of predominant importance. The host rocks of the Amatkan Formation, enclosed between the veins of this type, are strongly stationed and altered by the action of metasomatism. Among the cross-cutting veinlets found here by their orientation, three groups can be distinguished. The first group of ore bodies is the trunk buddinated veins associated with faults. The power of such veins reaches the first tens of centimeters. The second group of veins has a northeastern strike, is characterized by a large extent and forms cascades of vein bodies. The third group of veinlets is characterized by a limited strike in the north-west direction.

The structure of the studied vein zone is complicated by the manifestations of brittle deformations recorded by local spastic zones of the northwestern and northeastern directions with an intense increase in the degree of schistosum and metasomatism of contact rocks. For the northwestern faults, a fault kinematics is proposed, which is manifested against the background of the rear stretching of the...
thrust system. At the same time, violations of the northeastern direction can be associated with stretching zones and/or with left-side dropping shifts.

4. Kinematic reconstruction of quartz veins

The kinematic nature of quartz veins was determined by the structural position of localization cracks and the identification of characteristic fracture parageneses. During which it was found that the formation of sub-consonant veins is associated with the initial stages of the formation of the thrust system and is controlled by the stretching vector during the formation of deformations of thrown nature [3]. In a pie chart showing the structural position of elements veins you can see two trends of folded variations of layering, according to which sub-consonant veins develop (figure 3).

Secondary veins are derived from the subsequent stages of deformation, expressed in the development of left-sided shifts that complicate the thrust system. A set of secant veins forms a paragenesis of conjugated cleavages, known in the literature as Riedel's paragenesis [4]. In this case, cores of the first type (trunk veins) perform deformed shear surfaces, cores of the second type perform syn-shear stretching systems, and veinlets of the third type approach in their orientation to antitectic chips, and are most likely formed simultaneously with trunk veins.

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Thus, the formation of the hydrothermal-ore system of the Bambokoy river basin took place in two stages. At the beginning of the Paleozoic era, as a result of the development of the thrust system, consonant metamorphogenic veins and veins are formed. Quartz of these veins is characterized by intense manifestations of deformation, expressed in chips and sub-blocking of grains. During the Mesozoic era, the thrust system is complicated by shear deformations, which leads to the formation of main veins.

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