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## Studies on Cataclastic Lithofacies and Copper Metallogenic Regularity for the Glutenite-type Sareke Copper deposit, Xinjiang

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### 1 Introduction

Large-size glutenite-type copper deposit was controlled by the Mesozoic Sarekebayi intracontinental pull-apart basin in Xinjiang. Strata exposed in the study area include the Mesoproterozoic Akesu Group Complex, Silurian system, the lower Jurassic Shalitashi group and Kangsu group, the middle Jurassic Yangye group and Taerga group, the upper Jurassic Kuzigongsu group, the lower Cretaceous Kezilesu Formation. The Kuzigongsu group is a set of purple-celadon mingled conglomerates. Sareke glutenite type copper deposits occur in the stratified horizon. The Kuzigongsu group assumes the circular distribution of the ordinal level in the basin, local visible Akesu Group Complex was thrust nappe overlapped the Kuzigongsu group, and it is in conformable contact with the Kezilesu group. At the same time, it is in conformable contact with underlying the Yangye group. The lower part of the Kuzigongsu group is a wetland fan but its upper part is a dryland fan. Industrial copper orebody mainly occurs in arid fan with color-fading in the purple irony conglomerate. At Sareke glutenite type copper mine, industrial copper orebodies were controlled by the middle-fan subfacies of the dryland fan and superimposed by cataclastic lithofacies. Cataclastic lithofacies developed in the interlayer sliding zone of the middle-fan subfacies, which was account for channels of basin fluid migration, ore-forming fluid traps, and the construction of reservoir lithology strata.

### 2 Cataclastic lithofacies

Cataclastic lithofacies is the tectonic lithofacies, and it is

multiple coupling of structure-lithology-lithofacies for ore-forming fluid as well as metallogenic tectonic space. On the one hand, macroscopic fracture characteristics is the bedding cracked and fractured zone, plus fractured lithofacies zone, rupture bituminization, and veinlets of copper sulfides. Cataclastic lithofacies may be controlled by fractured zone and interlayer faulting zone in study area, and responsible for coupling parts of the ore-forming fluid, copper enrichment space and structure lithofacies. On the other hand, the cutting layer and layer cracks and fractures in the cataclastic lithofacies, belongs to the nature of compressive shear field, may be controlled by the skirt-type fold and faults in the basin. In time domain, cataclastic lithofacies mainly distributed in the lower Cretaceous Kezilesu Formation and the upper Jurassic Kuzignogsu group whereas it was poor in the other strata but faulted zone. In the Kezilesu group, bituminization lithofacies developed along the rupture zone, micro-fracture and microscopic fissure in scattered forms. Typical characteristics of bituminization and discolored altered facies is poor in copper mineralization in the Sareke northern mineralized belt, however, the sandstone-hosted type copper orebodies had been formed in altered facies of bleaching-fading sandstone in the Sareke southern mineralized belt. Most important of all, the Kuzigongsu group had undergone extensive cataclastic lithofacies characterized by bituminization facies in fractured zone, copper mineralization in cracks and fractures. At the same time, bituminization lithofacies, Fe-Mn-calcite, and Fe-Mn-ankerite are in veinlets along interlayer fissure filling in the conglomerate in the Kuzignogsu group, indicating that copper ore-forming way is of the hydrothermal fillings of the copper sulfide in the late fractures of conglomerates

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### 3. Fissure-fillings and Its Permeability

Studies on the hydrothermal fissure fillings on cataclastic lithofacies in Sareke copper deposit had shown that microscopic cracks and seams were better the ore-hosted structure and the copper ore-forming fluid reservoir. First, the fracture fillings for ore-forming fluid in dilatations of the microscopic structure resulted in precipitation and enrichment of copper sulfides. Second, in the viewpoint of kinds of the fillings, microscopic characteristics of the fracture and crack was filled by chlorite thin-veins, chalcocite fine-veins, bituminization fine-veins, silicification veins, and Fe-carbonate fine-veins during late basin deformation.

According to their distribution characteristics, the micr-cracks may be divided into 3 types of the seam, i.e., the seam crossing gravels, the seam along boulder's edge, and the seam inside gravel. ① seams crossing gravel are mainly distributed in gravel inside, all is at the early sedimentary stage, had been more early the ore-bearing hydrothermal fluid filling, extend the length of the small, not cut through the edge of the gravel, small scale of this kind of fracture, seam density of about 5/cm, seams crossing gravel opening smaller, about 0.5~0.8 mm. ② seams along boulder's edge, a sets of small and short seams main distributed along the edge of the gravel. With opening of about 2.2 to 5 mm and seam density of 50/cm, these seams under the late tectonic movement and under the action of abnormal high pressure fluid significantly increased. However, this kind of seams had been filled by more dolomite, asphalt thin-vein, calcite veinlet, and chlorite veinlet. First of all, these seams were filled by chalcocite fine-veins, chalcopyrite and bornite fine-veins in distribution along the layer sliding fractures, and it is one of the most important ore-hosted microstructure in the study area. ③ seams inside gravel, controlled by the main tectonic fracture and crack formed during the late basin deformation, were often filled by calcite fine vein, dolomite, asphalt, chalcocite, bornite, and pyrite. The seam opening is from 1.5 mm to 7 mm while seam density is 95/cm. In the Sareke copper mining area, due to the basin on both sides of the thrust nappe and extrusion tectonic movement, faulted and fissured zone distributed in the skirt-type fold during late basin deformation, where are the best ore-hosting space.

The microscopic study on fracture under a microscope showed that fracture density in the lower Cretaceous Kezilesu Formation is the highest, with development of bituminization fine-veins but low porosity and permeability argillaceous siltstone and sandy siltstone, which are account for overall lithology traps for basin ore-forming fluid. However, purple irony conglomerate in the Kuzigongsuzu

group are of higher porosity and permeability. The higher porosity and permeability of conglomerate, the more favorable for migration channel of ore-forming fluid and main reservoir for the copper ore-forming in Sareke Glutenite-type copper deposit.

Fissure intensity and the fissure permeability in cataclastic lithofacies may reveal relationships among the ore-forming fluid migration channel, the basin fluid, and the ore-forming fluid reservoir. Based on darcy's law, it estimates the fissure permeability according to the results, permeability of conglomerates in the Kuzigongsuzu group, a copper ore-hosting layer, is a mean of  $0.15691 \text{ cm}^2$  ranging from  $0.68921 \text{ cm}^2$  to  $0.002731 \text{ cm}^2$ . nevertheless, the other's permeability of ore-bearing layer is of a mean of  $0.068278 \text{ cm}^2$  ranging from  $0.91125 \text{ cm}^2$  to  $0.000128 \text{ cm}^2$ . Based on the test of the Kuzigongsu group of ore-bearing bed, gas-logging permeability is  $0.09354 \times 10^{-3} \mu\text{m}^2$  to  $0.00353 \times 10^{-3} \mu\text{m}^2$ , with a mean of  $0.03712 \times 10^{-3} \mu\text{m}^2$ . The scope of gas-logging permeability of ore-bearing layer is  $0.003113 \times 10^{-3} \mu\text{m}^2$  to  $0.002123 \times 10^{-3} \mu\text{m}^2$ , with a mean of  $0.002727 \times 10^{-3} \mu\text{m}^2$ . Both calculation of fracture permeability and the test of gas-logging permeability confirmed fissure permeability of ore-bearing layer of the Kuzigongsu group, compared with the other's permeability, has higher value. Therefore, it proved that cataclastic lithofacies with higher permeability could have provided the channel and reservoir for the ore-forming fluid.

To sum up, based on studies on natures of cataclastic lithofacies, irony conglomerate in the Kuzigongsuzu group are of higher porosity and permeability, and superimposed by cataclastic lithofacies during the late basin deformation. The cataclastic lithofacies of conglomerate in the study area were a multiple coupling position of structure-lithology-lithofacies for ore-forming fluid as well as metallogenic tectonic space.

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