

Hydrothermal alteration and gold mineralization in NW Jiaodong Peninsula, China

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Jiaodong is the most important gold province of China, with many large and superlarge gold deposits, and nearly one-third of the country's gold resources. The fracture zone altered-type gold deposit, termed “Jiaojia type” gold deposit, is the most important gold deposit type of the region, which makes up more than 90% of the proven amount of gold. The Jiaojia gold deposit, which is located in the the Jiaojia gold belt of NW Jiaodong Peninsula, is named after “Jiaojia type” fracture zone altered rock type gold deposit. The Dayingezhuang gold deposit, which located in the middle of the Zhaoping gold belt, is also a typical fracture zone altered-type gold deposit. Large-scale sericite-quartz alteration zones with a width of 20~200m)and potassic alteration zones with a width of 50~300m occur at these two gold deposits, and the altered rock type gold orebodies mainly develop in the sericite-quartz alteration zone which is in the footwall of Jiaojia and Zhaoping fault zones.

Based on detailed geologic observations in the field, we researched the alteration systematics of these two gold deposits, collected different type of altered rock samples in the orebody, conducted geochemical analyses of many of the samples, used methods of mass balance to describe element migration in the hydrothermal alteration zones, and studied mechanisms of gold precipitation. The K-feldspar alteration occurring as a pre-gold event is usually lumpy and present as breccia fragments in the pyrite-sericite-quartz and sericite-quartz altered rock, which is controlled by the secondary faults in the footwall of the main fault. Whereas the width of the sericite-quartz alteration zone is largest in the footwall of the main fault, the sericite-quartz alteration controlled by secondary faults is relatively limited, usually present as 0.1~1 m wide veins in the K-feldspar alteration zone, which indicates sericite-quartz alteration is later than K-feldspar alteration. Therefore, the hydrothermal alteration can be divided into K-feldspar alteration, sericite-quartz alteration, pyrite-sericite-quartz alteration, and carbonatization in sequential order. Compared to unaltered biotite granite host rocks, the rocks from various alteration zones show high contents of K_2O and low contents of Al_2O_3 , CaO , and Na_2O . During the process of K-feldspar alteration, K, Fe, Cu, Pb, and Rb are enriched in the wallrock, while Si, Al, Na, Ca, Ba, Sr, and Cr are depleted. At the same time, the Au is released from the ore-forming fluid because of the interaction between fluid and the wallrocks. Sericite-quartz alteration and pyrite-sericite-quartz alteration are associated with the mineralization.