Discrete gold and molybdenum mineralizations of the Dahu Au-Mo deposit, Xiaoqinling district, central China: Constraints from microstructure analysis of quartz veins and trace element geochemistry of pyrite

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Xiaoqinling district of central China is one of the most important gold provinces in China, which hosts many large-scale gold-only lode-type deposits. However, both gold and molybdenum mineralizations occur at the Dahu deposit, which is significantly different from most of the gold-only deposits in the Xiaoqinling district. On the basis of a systematic study on the typical microstructure of quartz veins, and trace element geochemistry of pyrite by using microscope and in situ LA-ICP-MS analysis technique, we found the gold and molybdenum mineralization took place separatedly at different tectonic environments. The geological characteristics of the molybdenite-quartz veins, open-space filling structures, euhedral-subhedral textures, occurrences of Au-Bi-Te-As free pyrite, bleb-like micro-inclusions of native gold and other Pb-Cu-Bi sulfosalt minerals, indicate that the Mo-mineralized quartz veins crystallized at a relatively slow growth rate by a slow cooling in a dilatational space under a relatively low regional differential stress field environment, which is likely controlled by a tensile fracture system generated by a hydraulic fracturing. In contrast, the mineral paragenesis, mineralization styles, and trace element association of Au-Bi-Te similar with other gold-only lode-type deposits in the Xiaoqinling district indicate that the auriferous quartz vein in the Dahu deposit belongs to a unified large-scale gold event in the Xiaoqinling district. The constant orientation of individual lode and typical lamination structure indicate a channeled-fluid flow along the closed and connected fractures. Ductile deformation structures of the auriferous quartz veins suggest a continuous activation of the normal faulting. It is suggested that the auriferous quartz veins formed under a relatively high regional differential stress field environment, which is likely controlled by a transtensional fault system under a syn-mineralization S-N oriented extensional tectonic regime coupled with the uplift and exhumation of the metamorphic core complex in the Xiaoqinling district.