Mineralogy and Trace Elements Chemistry of Quartz Vein from Tsunheg Tungsten Deposit in Western Mongolia

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The Tsunkheg deposit is tectonically located in the Mongol Altai and Khovd deep fault zones and it's characterized by the development of numerous faults to the northwest and northeast. The geology of this area is occupied by Upper Ordovician-Lower Silurian Bakhlag formation with sandstone, mudstone, and tuff conglomerate, Shargovi Silurian sedimentary rocks cut by upper Silurian diorite, and small bodies of Carboniferous diabase. The Tsunkheg deposit consists of 6 large quartz–wolframite veins, 0.15-0.45 m wide, 400-600 m long, and one stock body with a diameter of 80 m in the central part. The quartz-tungsten veins contain scheelite, sulfide minerals: chalcopyrite, bornite, arsenopyrite, molybdenite tetrahedrite; carbonate minerals: siderite, malachite, azurite, fluorite, beryllium. Cathodoluminescent (CL) texture and trace element signature of quartz from the Thunkheg deposit has been investigated to discuss their genetic significance. Results show that the pre-ore quartz (QI) displays a bright and homogeneous luminescence texture, (QII) generally shows a bright and oscillatory luminescent texture and, the syn-ore quartz (QIII) generally has a dark and homogeneous (or slightly mottled) luminescent texture that may result from annealing of original CL textures; the post-ore quartz. EPMA analyses suggest Ti, Al, K, Fe, and Ca are the most abundant elements in various generations of quartz and mainly occur as solid solutions within the crystal lattice, in which Al can be incorporated into quartz by substituting Si in the crystal lattice, with additional cations to keep the charge balance. The low Ti concentration and oscillatory euhedral growth zones of CL textures suggest that syn-ore quartz (QII) may have precipitated from a medium-temperature hydrothermal fluid. This study highlights that CL textures and trace element chemistry of quartz related to mineralization can be used to fingerprint the physical and chemical history of ore deposit formation.