Cathodoluminescence and trace elements features of hydrothermal K-feldspar and quartz in the Liubagou gold-molybdenum deposit, Inner Mongolia, China

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The Liubagou Au-Mo deposit is hosted by Archean metamorphic rocks, and orebodies occur as subparallel, sheet-like ore vein that are confined to the nearly EW-trending faults. Wall rock alterations mainly include potassic, phyllic, and propylitic alteration. Ore-forming process can be divided into four stages: K-feldspar-quartz-molybdenite stage (I), quartz-pyrite-epidote/chlorite stage (II), quartz-polymetallic sulfide-gold stage (III), and carbonate-sulfate-quartz stage (IV). The studies of SEM-CL and LA-ICP-MS of K-feldspar and quartz of different hydrothermal stages indicate that the CL textures and trace element concentrations of K-feldspar and quartz are effective indicators tracing the mineralization. K-feldspar and quartz in stage I are characterized by high CL intensity, high Ti concentrations (tens of ppm up to 100ppm), high Ba (ranging from several thousand up to thousands ppm) and Sr concentrations (several hundred ppm), which show characteristics of high-temperature hydrothermal fluid. Quartz in ore-forming stage (stage II and III) are characterized by low CL intensity, no CL textures and low Ti contents (generally <1 ppm). Overprinted by late hydrothermal superimposition, altered K-feldspar in late stage has low CL intensity, low Ti concentrations (generally <1 ppm to several ppm). The contents of Ba and Sr decline one order of magnitude compared with those in stage I. Barium and Sr came from early K-feldspar provide important material source for the precipitation of barite and celestite. Overall, Mo mineralization occurred predominantly in stage I, characterized by K-feldspar and quartz of high Ti contents and high CL intensity. Gold is precipitated mainly during stage III with quartz of low Ti and CL intensity, less commonly, is hosted in the altered K-feldspar of low Ti concentrations and low CL intensity during stage II and/or III.

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