Highly oxidized fluid exsolution and ore-forming process of Chalukou (NE China) Giant porphyry Mo deposit and its transition to vein-style Zn-Pb mineralization

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Located in the north Great Xing'an Range, NE-China,the newly discovered Chalukou world-class porphyry Mo deposit (2.46Mt@0.087% Mo) is characterized by fluorine-rich and highly oxidized magmatic system and hydrothermal fluid and mineralized system with upper vein-type Pb-Zn and lower porphyry Mo, and its geologic features including: (1) multiple ore-forming intrusions consist of syn-ore aplite porphyry (147.9±1.3Ma), granite porphyry (147.5±1.7Ma) and quartz porphyry (147.3±1.5Ma) (Li et al., 2014). (2) A consistent, broad-scale alteration zoning pattern. The alteration zones comprise a strong quartz-potassic zone, a quartz-sericite-pyrite- fluorite-illite zone, an illite-hydromuscovite-fluorite zone, and a weak propylitic zone centrally from the ore-forming porphyry outwards and upward. Hydrothermal fluorine, magnetite and hematite are widespread in this deposit, indicating hydrothermal fluid is fluorine-rich and highly oxidized. (3) The porphyry-Mo to vein-style Zn-Pb mineralization is recorded through a series of vein cross-cutting relations from V1 to V5.

Our study of quartz CL textures and trace elements, fluid inclusion petrography and microthermometry reconstructs the temperature-pressure-fluid compositional evolution of this world-class ore deposit. We therefore infer that fluorine-rich fluids may be instrumental in leading to the metal zonation from Mo-rich porphyry mineralization that grades outwards and upwards to Zn-Pb vein-style mineralization.