Scheelite geochemistry as a DVD recorder for contrasting magmatic and hydrothermal fluid systems in the Yangchuling porphyry W-Mo deposit, South China

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Yangchuling deposit is the first recognized typical large size porphyry W–Mo deposit in South China, where host the most abundant tungsten resources in the world. Scheelite is the main ore mineral in this deposit, and occurs as disseminated and stockworks/veins. Scheelite formed in different stages can be served as an excellent record of the ore-forming processes. In this study, we performed a detailed cathodoluminescence (CL), electron probe micro-analysis (EPMA) , in *situ* LA-ICP-MS trace elements, and chemical mapping of scheelite from different ore stages, in order to reveal the scheelite formation processes in contrasting magmatic and hydrothermal fluid systems.

Three major ore stages are distinguished including magmatic stage (I), magmatic–hydrothermal transition stage (II), and hydrothermal stage (III). The early medium-grained scheelite (Sch I) disseminated in the magmatic stage (I) show blue CL colour. The coarse-grained scheelite (Sch II) from magmatic–hydrothermal transition stage II has a strong oscillatory zonation with dark-green to dark-blue CL colour. The most of scheelite (Sch III) from the hydrothermal stage III are hosted in stockworks/veins show light-blue and purple CL colour. It is worth noting that some overgrowing scheelite grains (＞1cm) in the quartz-scheelite veins (stage III) exhibits complex dark-green to dark-blue and light-blue CL. This work reveals that: (1) significant chemical variations in scheelite with respect to Mo (2~24706 ppm), Y(22~1368 ppm), and Nb (7~1143 ppm); (2) the highest Mo and lowest Y concentrations are found in Sch II with dark-green CL; (3) Sch I has the higher Ta and Nb, but extra higher Nb/Ta ratio are found in Sch II; (4) Sch III shows decreasing Mo concentrations from early to later sub-stages; (5) Sch I with negative Eu anomalies, Sch II with positive Eu anomalies, but Sch III show positive or negative Eu anomalies in the chondrite-normalized REE patterns, which may record scheelite arising from differing environments. These characteristics of scheelite from Yangchuling W–Mo deposit are unique and complex, which are differ from other large size tungsten deposits in South China.