

Scheelite Trace Elements and Sr-Nd Isotopic Signatures: Implications for the W-Cu-Mo Polymetallic Mineralization of Dahutang Tungsten Deposit in the Jiangxi Province, China

Keke Sun^{1*} and Bin Chen^{1,2}

¹ School of Earth and Space sciences, Peking University, Beijing, China 100871

² School of Resources and Environmental Engineering, Hefei University of Technology, Hefei, China 230009

*E-mail, sunkk@pku.edu.cn

Scheelite (CaWO₄) is a ubiquitous mineral in different types of ore deposits, from porphyry to skarn and is also developed in quartz vein-type and a few metamorphic type deposits. It is of particular interest to ore geologists because it has the potential to provide important information on the genesis of ore minerals and their related deposits. We report the in situ major and trace element signatures, cathodoluminescence (CL) images, and Sr-Nd isotope geochemistry of scheelite from the giant Dahutang deposit, a large and newly discovered W-Cu-Mo polymetallic deposit with an estimated WO₃ reserve of 2 Mt. Scheelite is the most important ore mineral in the Dahutang deposit, and its rare earth element (REE) patterns and Sr-Nd isotope composition help constrain the path and origin of the mineralizing fluids.

The analysis revealed $3\text{Ca}^{2+}=2\text{REE}^{3+}+\square\text{Ca}$ (where $\square\text{Ca}$ is a Ca-site vacancy) is the substitution mechanism in this study. All the scheelite shows LREE enrichment and can be grouped two types according to distinct Eu anomaly: positive Eu anomaly (type I) and negative Eu anomaly (type II). Both the two type of scheelites can occur in different grains and sometimes even in the same grain. The variation of Eu anomaly recorded the ore-forming processes. The negative Eu anomaly were inherited from the porphyritic granite, the positive Eu anomaly were attained by destruction of plagioclase of country rock during fluid-rock interaction. The variations of the CL colors from red to blue to yellow are linked to the increase in REE content. The higher Nb, Ta, LREE contents of scheelite and right-dip REE_N patterns in Dahutang deposit reveal their close relationship with magmatic hydrothermal fluids.

The scheelite from Dahutang deposit has low (¹⁴³Nd/¹⁴⁴Nd)(t)(most <0.5123) and high (⁸⁷Sr/⁸⁶Sr)(t) values (between 0.723 and 0.766), which is unlike the Sr-Nd isotope compositions of scheelite from vein-type Au-(W) and W-(Sb-Au) deposits. The εNd(t) values in the range of -6.1 to -8.1 and (⁸⁷Sr/⁸⁶Sr)(t) values 0.7230 to 0.7657 in the Dahutang deposit, indicating that the ore-forming materials were mainly derived from the Neoproterozoic Shuangqiaoshan Group.