

## **Spatial and Temporal Distribution of Tin Deposits in the Southern Great Xing'an Range, Northeast China**

Lijie Liu,\* Taofa Zhou, Dayu Zhang, Guangxian Liu, and Noel Clarence White

School of Resources and Environmental Engineering, Hefei University of Technology, Hefei, China, \*e-mail, 623162706@qq.com

The Great Xing'an Range (GXR) is located in the eastern part of the Central Asian Orogenic Belt. The range hosts an important polymetallic belt that includes the most important tin belt in northern China. The southern part of the GXR can be broadly divided into four zones: the Xilinhote-Huolin'guole Ag-polymetallic, Linxi-Ganzhu'ermiao Sn-Cu-polymetallic, Tianshan Mo-polymetallic, and Tuquan Cu-polymetallic zones. Most ore deposits in this region are temporally and spatially associated with Jurassic and Cretaceous intrusions. The Linxi-Ganzhu'ermiao Sn-Cu-polymetallic deposits are situated along a NE-trending normal fault system in the central southern GXR. Nearly 90% of deposits are hosted in Permian strata. Two large Sn and Sn-polymetallic deposits (Dajing Sn polymetallic deposit, Huanggang Fe-Sn deposit), three medium-sized tin deposits (Aonao'daba Sn-Ag-Cu deposit, Anle Sn-Cu deposit, Maodeng Sn-Cu deposit), two large Sn-bearing Pb-Zn polymetallic deposits (Baiyin'nuoer Pb-Zn deposit, Haobugao Pb-Zn-Sn deposit) and more than 30 small tin polymetallic deposits have been found in this part of the range. The deposits are diverse, including skarn, hydrothermal vein, and porphyry type ores.

Deposits in this region can be classified into granite-related Cu-Ag and Pb-Zn-Cu deposits with mineralization ages ranging from 177 to 160 Ma, granite-related Sn-Cu-Pb-Zn and Sn deposits clustered around 140 Ma, and an Nb-Y-Zr deposit with an age of 127 Ma. The age of the Dajing Sn polymetallic deposit, determined by LA-MC-ICP-MS on cassiterite, is  $144 \pm 16$  Ma. The Late Jurassic-Early Cretaceous intrusions in the Dajing Sn polymetallic deposit are 146 to 133 Ma. The molybdenite Re-Os age of Huanggang Fe-Sn deposit is  $135.31 \pm 0.85$  Ma, and the zircon LA ICP-MS U-Pb ages of mineralization-related alkali feldspar granite and granite porphyry are  $136.8 \pm 1.1$  and  $136.8 \pm 0.57$  Ma, respectively. The molybdenite Re-Os age of the Haobugao Sn polymetallic deposit is  $142 \pm 1$  Ma, and the zircon LA ICP-MS U-Pb ages of mineralization-related granite are 142.9 to 140.2 Ma. The K-Ar age of the mica in tin veins in the Baogaigou Sn deposit is 138.6 Ma, and the age of the related granites is 141.0 to 136.6 Ma. The Rb-Sr age of the granite porphyry associated with the Anle Sn-Cu deposit is 132.8 Ma and the K-Ar age of the sericite is  $133 \pm 3$  Ma. The Rb-Sr age of the granite porphyry in the Aonao'daba Sn-Ag-Cu deposit is 148 Ma. In summary, tin deposits in the SGXR formed at 148 to 133 Ma. It is not clear whether there are multiple stages of tin mineralization, but the similar ages of the deposits and the associated intrusions and their geologic characteristics indicate that the tin mineralization is related to an episode of Early Cretaceous magmatic hydrothermal activity.