Evaluation of the controls on the distribution of scheelite and wolframite in mineralized zones at the Sisson Brook W-Mo-Cu deposit, west-central New Brunswick: a petrogenetic analysis

A.L. Bustard And D.R. Lentz

Department of Earth Sciences, University of New Brunswick, Fredericton, New Brunswick E3B 5A3

Sisson Brook is a porphyry-related W-Mo-Cu deposit located near the village of Stanley in west-central New Brunswick and is one of several notable W-Mo deposits in the northern Appalachians. The geological and mineral-chemical controls on the distribution of scheelite versus wolframite mineralization within the deposit are the focus of this study. The project is currently held by Northcliff Resources Ltd. and hosts a measured and indicated resource of 383 Mt grading 0.072% WO_3 and 0.024% Mo. The Sisson Brook deposit is a system of mineralized vein and replacement zones located near the eastern boundary of the Middle Devonian Nashwaak Granite. The deposit is hosted within the Silurian-Devonian Howard Peak Diorite and Gabbro and a sequence of late Cambrian–Ordovician metamorphosed tuff and psammite. Mineralization was discovered in 1979 by Kidd Creek Mines. Early work determined that mineralization occurred over two zones: Zone A and Zone B. Mineralization in Zone A is characterized by wolframite and chalcopyrite, whereas Zone B is primarily scheelite and molybdenite. In 1985, Heidi Nast determined that economic mineralization within the deposit is distributed across four vein sets showing different mineral proportions. Work by Nast and Williams-Jones in 1991 determined that wall rock composition was a major control on tungsten mineralization, evidenced by scheelite occurring in the calcium-rich metagabbro and metavolcanics, and wolframite occurring elsewhere. Current research is focussed on determining further controls on the distribution of scheelite versus wolframite mineralization with a focus on biotitization associated with many of the replacement zones mantling the vein systems. The formation of metasomatic biotite liberates calcium from primary mineral assemblages during mineralization, contributing to the formation of scheelite instead of wolframite. Scanning electron microscope examination has revealed small scheelite inclusions within coarser grained ilmenite, which is rimmed with titanite. Scheelite is also hosted in the vein selvages. Thus far, molybenite and wolframite seem to occur only in the axial quartz veins. This indicates that scheelite was the earliest phase to form hydrothermally, and fluid composition variations led to the formation of ilmenite via reaction with precursor Ti-bearing silicates. As iron in the system was depleted by sulphidation producing pyrite, titanite began to form on the rims of ilmenite grains. Metasomatic titanite grains and zircons within and outside reaction zones will be dated to assess the timing of mineralization relative to intrusive rocks in the area. This petrogenetic and geometallurgical research will assist in the development of the Sisson Brook deposit.

Atlantic Geology, 2012, Volume 48, Number 1