
Form, distribution, and genesis of gold within the contact metasomatic aureole of the Early Devonian Lake George granodiorite, southwestern New Brunswick

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The Early Devonian Lake George granodiorite stock is located approximately 40 km southwest of Fredericton. It intruded turbiditic Silurian metasedimentary rocks of the Kingsclear Group. The contact metasomatic aureole is known to contain tungsten, molybdenum, antimony, and gold mineralization. The W, Mo, and Sb mineralization has been characterized in various publications and publicly available gold numbers have been reported. However, no published ore mineral studies have been conducted in an effort to better understand gold mineralization in this deposit. Analyses conducted on sulfide-rich quartz-iron carbonate veins yielded significant gold results as published in an open file report. These veins possess sericitic alteration envelopes 1 to 10 cm wide, with sulfide assemblages containing variable amounts of pyrite, arsenopyrite, and pyrrhotite. Studies to date have not identified any gold-silver-bismuth alloys which are normally associated with intrusion-related deposits. The mineralization, therefore, appears to be “invisible gold” hosted in the crystal lattice of the sulfides. Backscattered electron imaging of the sulfide assemblages reveals that many of the sulfide minerals in the veins are zoned. Some of the pyrite grains possess arsenian pyrite rims. Several studies have demonstrated higher gold solubility in arsenian pyrite and arsenopyrite and preliminary results from laser ablation elemental mapping of the arsenopyrite in quartz-carbonate-sericite veins yielded an average of 2 ppm gold. Gold is known to occur in multiple generations of veins in the Lake George metasomatic aureole, although the gold distribution in this polymetallic system has not been investigated fully. Quartz-iron carbonate veins appear to have played a significant role in the gold mineralization history in the development of this potentially multi-phased hydrothermal system, although gold is also present within some of the generations of antimony mineralization. Determining the style and location of gold mineralization and quantifying it is a crucial component in determining the challenges for processing the sulfides and estimating the resources in the area.