

Pb ISOTOPE COMPOSITIONS OF PYRITE FROM THE C QUARTZ-TOURMALINE VEIN OF THE SISCOE GOLD DEPOSIT, VAL D'OR, QUEBEC: CONSTRAINTS ON THE ORIGIN AND AGE OF THE GOLD MINERALIZATION

GEMA RIBEIRO OLIVO,[†]

Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario, Canada K7L 3N6

HÉLÈNE ISNARD,

*Département des Sciences de la Terre et de l'Atmosphère, GEOTOP, Université du Québec à Montréal,
C.P. 8888, succ. Centre-ville, Montréal, Québec, Canada H3C 3P8*

ANTHONY E. WILLIAMS-JONES,

Department of Earth and Planetary Sciences, McGill University, 3450 University Street, Montreal, Quebec, Canada H3A 2A7

AND CLÉMENT GARIÉPY^{**}

*Département des Sciences de la Terre et de l'Atmosphère, GEOTOP, Université du Québec à Montréal,
C.P. 8888, succ. Centre-ville, Montréal, Québec, Canada H3C 3P8*

Abstract

The Siscoe mine was one of the richest in the Val d'Or mining camp, producing 27.5 tonnes (t) of gold and 9.5 t of silver from 1929 to 1949. The C quartz-tourmaline vein at the Siscoe mine, which is the youngest auriferous vein on the property, is an excellent example of a high-grade Archean lode gold deposit; it contains an average of 45 g/t Au and locally up to 221 g/t Au. This vein cuts all dikes, the main regional foliation (S₂), and several auriferous quartz-carbonate veins, and is interpreted to be a shear structure that formed during the development of a late- to post-D₂ reverse fault. The vein comprises mainly alternating tourmaline- and quartz-rich layers, and gold occurs commonly in late fractures cutting the vein. The visible wall-rock alteration is characterized by the occurrence of tourmaline, pyrite, and calcite.

In this study, we report the Pb isotope compositions of hydrothermal pyrite separates taken from the C quartz-tourmaline vein and its wall rock. Pyrite is abundant in the wall rock, where it occurs as grains with inclusions of chalcopyrite, gold, tetradymite, pyrrotite, rutile, silicates, and carbonates. In the vein, it forms euhedra generally devoid of inclusions. Locally, the euhedra are fractured, and the fractures are filled with native gold, calcite, and tetradymite. Textural relationships suggest that pyrite precipitated synchronously with and/or after gold in the wall rock, but predated gold in the vein. Pyrite separates from the vein and its wall rock yielded similar ²⁰⁶Pb/²⁰⁴Pb, ²⁰⁷Pb/²⁰⁴Pb, and ²⁰⁸Pb/²⁰⁴Pb ratios (13.63–13.83, 14.58–14.62, and 33.42–33.76, respectively), which are more radiogenic than those reported for volcanic supracrustal and syntectonic plutonic rocks of the southern Abitibi subprovince, but are very similar to those of the late- to posttectonic S-type granites in the Pontiac subprovince and Lacorne block. This suggests that the Pb originated from a reservoir similar to that of the magmas which produced these granites, or alternatively, that it was leached from the latter. The Pb ratios yield a model age of 2.57 ± 0.07 Ga, which is interpreted to date the cooling of the hydrothermal system that introduced and/or remobilized gold into the C quartz-tourmaline vein.

These results, when considered in the context of the evolution of the southern Abitibi, indicate that widespread hydrothermal circulation occurred between 2.64 and 2.55 Ga, after the collision of the Pontiac and Abitibi subprovinces, and was caused by dewatering and S-type magmatism in the thickened unstable continental crust. This long-lived hydrothermal system promoted remobilization of gold from earlier veins and possibly introduction of gold from deeper zones, enhancing gold resources in the Siscoe deposit.

[†] Corresponding author: e-mail, olivo@geol.queensu.ca

^{**} Deceased, April 14, 2004.