Economic Geology
Vol. 98, 2003, pp. 1637–1666

The Ridgeway Gold-Copper Deposit: A High-Grade Alkalic Porphyry Deposit in the Lachlan Fold Belt, New South Wales, Australia

Alan J. Wilson,[†,*] David R. Cooke, and Benjamin L. Harper[**]

Centre for Ore Deposit Research, University of Tasmania, Private Bag 79, Hobart, Tasmania 7001, Australia

Abstract

Ridgeway is a high-grade gold-copper porphyry deposit (54 Mt at 2.5 g/t Au and 0.77% Cu), related to an alkalic intrusive complex of monzonitic composition. The deposit occurs within the Cadia district of New South Wales, Australia, which consists of a cluster of four Late Ordovician gold-copper porphyry deposits and two iron-copper-gold skarn deposits with a combined gold resource in excess of 574 metric tonnes (t). The deposits lie on a 7-km-long, northwest-oriented corridor of alteration and mineralization, transverse to the axis of the postulated volcanic arc.

Alteration and mineralization at Ridgeway are zoned around a vertically attenuated intrusive complex of monzodioritic to quartz monzonitic composition. Distinct styles of veining and alteration are related to different intrusive phases of the monzonite complex, with the intensity of alteration and grade of mineralization decreasing from early- to late-mineral intrusions. Early-mineral intrusions are associated with intense actinolite-magnetite-biotite (calc-potassic) alteration and up to four stages of high-grade quartz-magnetite-sulfide veining. Bornite is the most abundant sulfide formed during early-stage alteration and correlates well with gold. Moderate- to weak-intensity orthoclase-biotite ± magnetite (potassic) alteration accompanies the inter- and late-mineral intrusions, this alteration being associated with chalcopyrite- and pyrite-rich quartz-orthoclase veins. Propylitic and sodic (albite-pyrite) alteration assemblages are peripheral to, and locally overprint, the potassic alteration. Phyllic alteration is restricted to the margins of late-stage faults.

The fluid inclusion assemblage comprises one and two salt-bearing brine inclusions, in addition to aqueous liquid-vapor inclusions of low to moderate salinity. No low-density, vapor-rich inclusions are present, indicating that the fluids from which the quartz veins precipitated did not enter the liquid-vapor field of the H_2O-NaCl system. The brine inclusions undergo final homogenization to liquid via halite dissolution. This phenomenon, in addition to the absence of low-density vapor inclusions, suggests that the mineralizing fluids at Ridgeway were nonboiling hypersaline brines that exsolved directly from the crystallizing magma. The presence of mineralized aplitic vein dikes and comb quartz layering are interpreted to indicate that the early and transitional stages of mineralization at Ridgeway formed at the transition between magmatic and hydrothermal conditions.

[†] Corresponding author: e-mail, wilsonal@newcrest.com.au

[*] Present address: Newcrest Mining Limited, Level 2, Hyatt Business Centre, 20 Terrace Rd., East Perth, WA 6004, Australia.

[**] Present address: Newcrest Mining Limited, Cadia Road, Orange, NSW 2800, Australia.

0361-0128/01/3396/1637-30 $6.00