

The Côté Gold Au (-Cu) Deposit, Ontario, Canada: An Archean Large-Tonnage, Low-Grade Deposit centred on a Magmatic-Hydrothermal Breccia

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Abstract

The recently discovered (2009/2010) Côté Gold deposit, located in the Archean Swayze greenstone belt, Abitibi Subprovince is a large-tonnage, low-grade Au (-Cu) deposit with an indicated resource of 269 Mt averaging 0.88 g/t Au (7.61 M oz) and an inferred resource of 44 Mt averaging 0.74 g/t Au (1.04 M oz) at a 0.3 g/t Au cut-off grade. The deposit is hosted by the Chester intrusive complex, a high-level, multi-stage composite intrusion consisting of gabbro, diorite and tonalite; these phases are constrained to 2741 ± 1 Ma based on U-Pb high-precision zircon dating. Gold mineralisation is associated with disseminated sulfide and quartz-sulfide±carbonate vein arrays. A maximum age for this mineralisation, provided from Re-Os dating of molybdenite, including an auriferous sample, is 2739 ± 8 Ma which overlaps with the age of magmatism. Mineralisation is hosted by a multi-phase magmatic-hydrothermal breccia. The breccia is a largely continuous, discrete body containing variably sized (<1 cm to rarely 1 m) and shaped (angular to rounded), biotite-altered tonalite clasts within a dark, fine-grained hydrothermal matrix (biotite±amphibole-chlorite-quartz-carbonate±apatite±sulphides) or magmatic matrix (plagioclase-quartz-biotite-chlorite). Biotite alteration (biotite±magnetite±epidote±pyrite), the earliest type, occurs as disseminations or veins. Texture destructive silica-sodic alteration (quartz-albite) occurs as vein- and fracture-controlled alteration that coalesces to form a pervasive replacement with rare, localised episyenites due to silica leaching. Sericite alteration (sericite±quartz±carbonate±pyrite) occurs as haloes surrounding veins and fractures and also coalesces into pervasive alteration. This apparent ca. 2741 Ma mineralisation age is significant for several reasons: (1) it establishes a new, pre-main stage deformation, metallogenic event in the Abitibi Subprovince; (2) globally represents a rare example of an Archean intrusion-related, large-tonnage, low-grade Au deposit; and (3) the nature and style of mineralisation and alteration, and the overlap of magmatic and hydrothermal events suggests possible affinities to younger porphyry-style Au (-Cu) mineralisation.