

ARCHEAN GOLD MINERALIZATION IN AN INTRUSION-RELATED, GEOCHEMICALLY ZONED
DISTRICT-SCALE ALTERATION SYSTEM IN THE CAROSUE BASIN, WESTERN AUSTRALIA

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Abstract

The Carosue basin, in the Eastern Goldfields of the Archean Yilgarn craton, Western Australia, is a late-stage, syntectonic sequence of feldspathic volcanoclastic sedimentary rocks that unconformably overlies deformed greenstones. It was intruded by a suite of monzonitic, syenitic, and lamprophyric magmas that form numerous plugs and dikes within the Carosue basin.

The intrusions are most voluminous at Carosue Dam, where the basin and underlying greenstones are cut by a swarm of north-south-trending faults. A large hydrothermal alteration system, several kilometers wide and at least 10 km long, is centered on this area. Zones of sodic (albite) and potassic (biotite) alteration are enveloped sequentially by phyllic (muscovite) and propylitic (chlorite) alteration. A central zone of anomalous Bi-W-Mo-Cu-Pb-Ag enrichment is enveloped by a zone of relative Zn and As enrichment, more or less coincident with the muscovite alteration zone. The district-scale potassic alteration is attributed to magmatic fluids derived from the intermediate to felsic intrusions. The origin of the sodic alteration is uncertain but could be attributed to a magmatic fluid or a mesothermal (orogenic) fluid.

Two styles of gold mineralization are present within the Carosue Dam area. Both types are associated with north-south faults. The most common type (Karari-type mineralization) is best developed in the sodic and potassic alteration zones and is further associated with subvolcanic intrusions, disseminated hematite in sodic alteration zones, and disseminated pyrite. There is a poor correlation between gold grades and quartz (\pm carbonate) veins.

The second style of mineralization, represented by the Twin Peaks deposit, occurs in a sequence of more mature, siliciclastic metasedimentary rocks that lie just outside the Carosue basin, within the district-scale muscovite alteration zone. Intrusions and hematite are volumetrically minor or absent at Twin Peaks. Gold occurs in quartz-carbonate veins and is associated with intense carbonate alteration and arsenopyrite.

The Carosue Dam district represents an important example of a large, Archean, intrusion-related hydrothermal system with contrasting styles of associated gold mineralization. The origin of Karari and other deposits of this class is equivocal and could be related to magmatic fluids or reaction of a mesothermal orogenic fluid with feldspar-rich host rocks. Twin Peaks is an example of an orogenic gold deposit that has been superimposed on the distal parts of the intrusion-related alteration system.

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