Ore Geology Reviews 75 (2016) 1–15

Contents lists available at ScienceDirect

Ore Geology Reviews

journal homepage: www.elsevier.com/locate/oregeorev

Shear-zone hosted copper mineralisation of the Omitiomire deposit — Structural controls of fluid flow and mineralisation during subduction accretion in the Pan-African Damara Belt of Namibia

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ARTICLE INFO

Article history:
Received 28 August 2015
Received in revised form 15 October 2015
Accepted 16 October 2015
Available online 2 December 2015

Keywords:
Copper mineralisation
Chalcocite
Shear zone hosted
Amphibolite
Retrograde biotite–epidote schists
Damara Belt
3D modelling
Exhumed basement dome

ABSTRACT

The Omitiomire copper deposit is a relatively recent discovery in the Pan-African Damara Belt of central Namibia. The deposit is situated in Mesoproterozoic gneisses and amphibolites of the Ekuja Dome overlain by amphibolite-grade metaturbidites of the Southern Zone accretionary prism that formed during northward subduction of the Kalahari Craton below the Congo Craton between ca. 580–520 Ma. Copper mineralisation is confined to an anastomosing system of shallowly-dipping, retrograde mylonitic shear zones within the Ekuja Dome. The shear zones are centred around a lithologically heterogeneous amphibolite-gneiss sequence. Mylonitisation and copper mineralisation are closely associated with the retrogression of particularly amphibolites and the partial or complete replacement of amphibolites by biotite–epidote and biotite–chlorite–epidote schists that host the chalcocite-dominated mineralisation.

Deformation and mineralisation in the heterogeneous shear-zone system can be shown to describe a progression. Initial strain localization is confined to lithological (amphibolite-gneiss) contacts and associated quartz veining and fluid flow are preferentially developed around the margins of competent amphibolite units. Fluid infiltration and the retrogression of amphibolites to biotite–epidote schists leads to strain localization into the marginal schists that envelop amphibolites. Further veining and fluid flow are localised into the central parts of amphibolite units leading to the pervasive retrogression to biotite–epidote schists that dominate the central parts of the shear-zone system. Earlier quartz-vein generations appear as isoclinally folded and dismembered ribbons or boudins in mineralised schists. The clearly syntectonic introduction of the copper mineralisation is underlined by the inter-growth of chalcocite with the retrograde assemblages and chalcocite forming part of the mylonitic shear-zone fabric. 3D modelling of drillhole data combined with limited surface exposure delineates a shallow east dipping, gently undulating ore body parallel to the regional gneissosity of the Ekuja Dome. The ore body comprises several mineralised lenses varying in thickness from 10 m to >100 m. Prominent ore shoots are gently doubly plunging to the N and S and parallel to the regionally developed L > S fabric in the gneisses. Kinematic indicators in the mineralised shear zone system point to a top-to-the S sense of shear, parallel to the regional L fabric and parallel to the southverging transport recorded in the structurally overlying prism metasediments.

The regional setting of the Omitiomire deposit, kinematics, and retrograde, but high-temperature overprint of original mineral assemblages in the mineralised shear zones indicate deformation and fluid flow during the expulsion of the basement gneisses during N-ward direction subduction of the Kalahari Craton below the Congo Craton. Lithological, geochronological, structural and P–T data suggest numerous similarities and, indeed, correlations between the Omitiomire-style copper mineralisation of the Damara Belt with the large copper deposits hosted by basement gneisses in the Domes Region of the Lufilian Arc in Zambia.

1. Introduction

Copper has traditionally been a most important commodity in Namibia with a wide range of different deposit styles (Miller, 1983; Anhaeusser and Maske, 1986; Schneider and Seeger, 1992). This includes the platform carbonate-hosted mineralisation of the Tsumeb

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http://dx.doi.org/10.1016/j.oregeorev.2015.10.035
0169-1368/