Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.15035

A newly recognized 2.4 Ga mafic sill-hosted Ni-sulfide deposit, Yilgarn Craton, Western Australia

CORALIE SIEGEL[1], LOUISE SCHONEVELD[1], CATHERINE SPAGGIARI[1], MARGAUX LE VAILLANT[1], STEPHEN BARNES[1], BELINDA GODEL[1] AND DAVID MAHON[2]

[1]CSIRO Mineral Resources
[2]St George Mining Limited
Presenting Author: coralie.siegel@csiro.au

The Cathedrals intrusion is a sulfide-bearing mafic-ultramafic body close to the western margin of the Eastern Goldfields Superterrane of the Yilgarn Craton of Western Australia. This study uses textural, mineralogical, geochemical and geochronological investigations to increase our knowledge on the formation, emplacement style and age of the Cathedrals intrusion.

The mafic intrusion is interpreted as a NiS bearing sill. It is typically differentiated into a lower ultramafic cumulate layer, representing downward accumulation (probably by settling) of dense olivine crystals, overlain by a dolerite unit containing xenoliths of partially assimilated granite in its upper portion. The presence of mixed compositional rocks directly beneath the top contact of the sill is interpreted as sill stoping and melting of the granitic hanging wall.

Ni-Cu-Fe sulfides are increasingly abundant with depth, ranging from globular disseminated sulfides to matrix disseminated and massive sulfides at the basal contact. The massive sulfides commonly exhibit loop textures with pyrrhotite grains surrounded by pentlandite and chalcopyrite. The presence and orientation of sulfide globule-bubble pairs indicates a primary near-horizontal orientation. The Cathedrals intrusion is thus interpreted as a sill complex fed by mafic magmas that utilised the nearby Ida Fault as a conduit.

Laser ablation (LA-ICP-MS) U-Pb dating of apatite from the sill yielded a date of 2385 ± 110 Ma, inferring an association of sill emplacement and associated Ni mineralization with the 2408–2401 Ma Widgiemooltha dyke swarm. This is consistent with the east-northeast orientation of the intrusion. To date, there are no other known magmatic deposits of this age in Western Australia. This discovery suggests that sills of this age may be more prospective than previously recognised.