

Textures and grain size of scheelite as a potential byproduct, Macraes Au mine, New Zealand

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Abstract

The Macraes gold mine in East Otago, operated by OceanaGold, is New Zealand's largest gold mine and has produced over 4.29 Moz of gold from its open pit and underground operations since modern mining began in 1990. However, gold has not always been the sole target for production and the area was worked for scheelite several times in the past, especially during World War I and II. Although operations at Macraes are not currently recovering tungsten, significant potential resources of scheelite are identified and OceanaGold is conducting a feasibility study into the future recovery of both gold and tungsten. Scheelite processing and tungsten recovery is directly dependent on grain size with 50 microns being the nominal cutoff that delineates successful recovery. This study identified five different textural types of scheelite that are distinguished on the basis of their host structure and style of occurrence. In analysed drill core, textural Type 1 occurs as fine mm-scale blebs of scheelite in early white quartz veins, Type 2 is coarser grained and occurs as cm-scale patches in low angle shear veins, Type 3 occurs as sub mm-scale, disseminated grains in subtle quartz-sulphide veins and replacement zones in the matrix of breccias, Type 4 occurs in symmetrically banded high angle extension veins and Type 5, the least volumetrically important, is scheelite that has been remobilised into fine mm-scale fractures. The textural types are not evenly distributed throughout the gold deposits with Type 2 proportionally higher in some of the pits and Type 3 proportionally higher in others. Quantitative analysis of scheelite grain size distribution shows that Type 2 scheelite forms the coarsest proportion of scheelite with over 93 mass% attributed to grains with diameters greater than 53 microns, compared with Type 3 at 69%, Type 1 at 48% and Type 4 at 7%.