Applications of Multielement Epidote and Chlorite Mineral Chemistry to Locate Mineralized Centers: A Case Study from the Batu Hijau Porphyry Cu-Au District, Indonesia

David R. Cooke[1], Matthew J. Cracknell[1], Ivan Belousov[1], Shaun Barker[2], Michael J. Baker[1], Stephen A. Cooke[1], Jamie J. Wilkinson[3], Zhaoshan Chang[5], Jennifer Thompson[1], Noel C. White[1]
1. CODES, University of Tasmania, Hobart, TAS, Australia, 2. Mineral Deposit Research Unit, University of British Columbia, Vancouver, BC, Canada, 3. LODE, Natural History Museum, London, United Kingdom, 4. Department of Earth Science and Engineering, Imperial College London, London, United Kingdom, 5. Colorado School of Mines, Golden, CO, USA

The Batu Hijau porphyry Cu-Au deposit is located in SW Sumbawa, East Sunda arc, Indonesia, and has a mineral resource of 1.64 Gt @ 0.44% Cu and 0.35 g/t Au. Batu Hijau is hosted primarily by a geochemically homogenous protolith of Late Miocene basaltic andesites that were intruded by diorites and mineralised tonalites. There are other porphyry prospects (Sekongkang, Nangka) and intermediate sulfidation epithermal prospects (Bambu) in the district, although Batu Hijau is the only economic ore deposit

A previous study of the Batu Hijau district (Wilkinson et al., 2015) identified systematic compositional variations in chlorite chemistry that allowed for the development of ‘proximitor’ equations that can be used to predict the distance from the mineralised center, providing new tools for mineral exploration. That study was based on 512 chlorite spot analyses. We have generated an additional 715 chlorite spot analyses from the district, including reanalysis of many samples from the previous study, and have also generated 1,260 epidote analyses. In addition to successfully reproducing the results from Wilkinson et al. (2015) through sample reanalysis, our results illustrate how multielement mineral chemistry using epidote and chlorite data from Batu Hijau can be used in assessments for exploration vectoring (how far and in what direction?) and fertility assessments (potential size of the mineral resource). Our results illustrate the geological controls on mineral chemistry variations in the Batu Hijau district and have significant implications for the formation of alteration and geochemical footprints to porphyry deposits.

Reference

Wilkinson, J.J., Chang, Z., Cooke, D.R., Baker, M.J., Wilkinson, C.C., Inglis, S., Chen, H., and Gemmell, J.B., 2015, The chlorite proximitor: A new tool for detecting porphyry ore deposits: Journal of Geochemical Exploration, v. 152, p. 10–26.