

Stibnite scaling within New Zealand geothermal power stations

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Stibnite (Sb₂S₃) scaling is a problem at several New Zealand geothermal power stations. The phenomenon is restricted to ORMATTM binary stations, and only occurs with any significance in heat exchangers where circum-neutral brines mix with acidic condensates. Stibnite scaling within power stations is a rare occurrence, and such instances present an exceptional opportunity to test theoretical thermodynamic data in a natural high temperature system.

Aqueous samples were collected and analysed for antimony from a number of sampling points along the two power stations in the North Island of New Zealand: Rotokawa (north of Lake Taupo) and Ngawha (in Northland). Fluxes for the systems were calculated, and the difference between incoming and outgoing fluxes for both power stations were in reasonable agreement with the amount of stibnite removed from the stations during previous shutdowns. This conformity confirmed that the sampling techniques were appropriate and the data were accurate.

With the use of supplementary data such as pH and major ion concentrations, the system was modelled using the SOLVEQ/CHILLER software suite and thermodynamic data for antimony published by Zotov et al in 2003 [1,2]. The results of the modelling showed that pH and temperature were the primary influences upon scale formation, and that saturation indices predicted scaling to within \pm one log unit.

References

- [1] Spycher, N.F. and Reed, M.H. (1989) *Economic Geology* **84** (2): 328-359
- [2] Zotov, A.V., Shikina, N.D. and Akinfiev, N.N. (2003) *GCA* **67** (10): 1821-1836