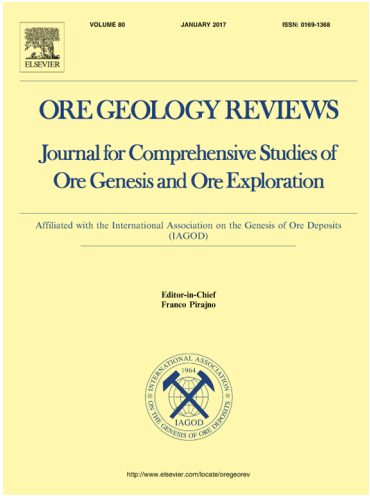
Accepted Manuscript



Changes in tourmaline composition during magmatic and hydrothermal processes leading to tin-ore deposition: The Cornubian Batholith, SW England

M. Duchoslav, M.A.W. Marks, K. Drost, C. McCammon, H.R. Marschall, T. Wenzel, G. Markl

PII: S0169-1368(16)30225-6
DOI: http://dx.doi.org/10.1016/j.oregeorev.2016.11.012
Reference: OREGEO 2013

To appear in: *Ore Geology Reviews*

Received Date: 21 April 2016
Accepted Date: 16 November 2016

Please cite this article as: M. Duchoslav, M.A.W. Marks, K. Drost, C. McCammon, H.R. Marschall, T. Wenzel, G. Markl, Changes in tourmaline composition during magmatic and hydrothermal processes leading to tin-ore deposition: The Cornubian Batholith, SW England, *Ore Geology Reviews* (2016), doi: http://dx.doi.org/10.1016/j.oregeorev.2016.11.012

Changes in tourmaline composition during magmatic and hydrothermal processes leading to tin-ore deposition: The Cornubian Batholith, SW England

M. Duchoslav[a,*], M.A.W. Marks[a], K. Drost[a], C. McCammon[b], H.R. Marschall[c], T. Wenzel[a], G. Markl[a]

a = Eberhard Karls Universität Tübingen, FB Geowissenschaften, Wilhelmstrasse 56, D-72074 Tübingen, Germany, marguerita.duchoslav@uni-tuebingen.de

b = Bayerisches Geoinstitut, Universität Bayreuth, 95440 Bayreuth, Germany, catherine.mccammon@uni-bayreuth.de

c = Goethe-Universität Frankfurt, Campus Riedberg, Altenhöferallee 1, 60438 Frankfurt am Main, Germany, marschall@em.uni-frankfurt.de

Abstract

To investigate the potential of tourmaline as a geochemical monitor, a comprehensive dataset on major, minor and trace element concentrations as well as $Fe^{3+}/\Sigma Fe$ ratios of tourmaline is presented. The dataset includes samples from five plutonic complexes related to diverse magmatic to hydrothermal stages of the Cornubian Batholith (SW England). Tourmaline composition found in barren and cassiterite-bearing samples include all three primary tourmaline groups and tourmaline species with the general endmembers schorl, dravite, elbaite, uvite, feruvite, foitite and Mg-foitite.

Based on textures and compositions, it is possible to distinguish not only between late-magmatic and hydrothermal tourmaline, but also between several formation stages. Hence, tourmaline monitors late-magmatic processes and the partitioning of elements during exsolution of an aqueous phase. For example, in hydrothermal tourmaline Sn is strongly enriched, while Ti, Cr, V and Sc are depleted compared to late-magmatic tourmaline of the same sample. Several tourmaline generations that precipitated from magmatic fluids can be distinguished with differing major and minor elements and REE patterns depending on the composition of the melt from which they were expelled from. Strongly zoned tourmaline allows for unraveling the hydrothermal history of a distinct location including ore precipitation. The precipitation of SnO_2 in the study area was probably caused by mixing between acidic, reduced, Sn-bearing magmatic fluids and oxidized meteoric fluids, which is in agreement with London and Manning (1995) and Williamson et al. (2000). Hence, the ability of tourmaline composition to monitor changes in Sn concentration and redox conditions in hydrothermal fluids has potential as an exploration tool.