Fibrous tourmalines as indicators of fluid compositions

BARBARA L DUTROW[1*], DARRELL J. HENRY[1]

[1]Louisiana State University, Dept. Geology & Geophysics, Baton Rouge, LA, 70803, USA (*correspondence: dutrow@lsu.edu)

The tourmaline (tur) supergroup minerals are known to record and respond to different lithologic environments. In addition, fibrous tourmalines, an unusual morphology, effectively reflect fluid compositions. Most fibrous tur forms late in the paragenetic sequence of a geologic environment and typically where there is open fluid-filled space, e.g. at the end of the crystallization sequence in a pegmatite pocket or in a hydrous fluid-rich fracture. Fibrous tur compositions can be foititic, schorlitic, dravitic or elbaitic, reflecting the dissolved components in the fluxing aqueous fluids. Using numerical expressions relating X-site cationic occupancy to aqueous fluid compositions, Na and Ca contents in aqueous fluids in local equilibrium with fibrous tur suggest that in all petrologic settings studied, fibrous turs equilibrated with aqueous fluids having variable Na concentrations (0.07-0.48 mol/l Na) and generally low Ca concentrations (<0.16 mol/l Ca). When Na is less than ~ 30 mol/l, tur tends to be foititic; when Na is greater than ~0.35 mol/l, tur forms alkali species such as elbaite or schorl in assemblages coexisting with quartz and albite. Fibrous tur that contains high oxy-species components (e.g. oxy-dravite, oxy-schorl, oxy-foitite) are suggestive of formation in fluids with relatively high salinities. Fluor species reflect addition of F to the fluid phase, but its incorporation is subject to crystal chemical constraints. Many fibers are zoned, and zoning tracks the chemical evolution in the host environment. In some cases, zoned fibers developed in pegmatite pockets mirror the overall fractionation trend in the entire pegmatite. Thus, compositions of fibrous turs provide an additional method to decipher the evolution of hydrothermal environments, particularly those associated with a dynamic fluid phase that is no longer present.

This abstract is too long to be accepted for publication.