

# Tourmalinisation in peraluminous granitic context: from experiment to thermodynamic modelling

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#### **Tourmalinisation in peraluminous granitic context : from** experiment to thermodynamic modelling

Session GMPV5.1 : Solving geoscience problems using mineralogy

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#### Stability field and tourmaline textures **Experimental conditions** Metasomatic experiment using an internally heated gas apparatus. vt% B,O, initial fluid 1. 600°C • Temperature : 600°C (2 weeks), 500°C (1 month) and 400°C (2 months). • [B<sub>2</sub>O<sub>3</sub>]init : from 0 to 10 wt%, with changes in the order of 1 wt%. • Pressure : constant, at 200 MPa. Oxygen fugacity : included in the range ΔNNO +[1;2]. Tourmaline chemistry 5. Veisbrod et al., 198 Temperature (°C) Dravite solidius determined experim in Na-Mg-Al-Si-B-H-Cl-O system. Fibro-radiated tourmalines Dravite - Mg-Foitite solid solution. Sheaf of fibrous tourmalines Higher Na-content with increasing temperature Alb = Albite ; And = Andalusite ; Crd = Cordierite ; Qtz = Quartz ; Sme = Smectite ; Tur = Tourmaline O No tourmaline and increasing boron concentration. The boundaries of the stability field slightly change with temperature (1.) : No modification on the proportion of Mg-Fe from decreasing from 4 wt% at 600°C to 3 wt% at 400°C. 400 to 600°C. Variation at 500°C may be due to an First occurence of tourmaline : sheaf of fibrous crystal (4.), growing from cordierite experimental bias.

- and/or albite nucleus. At higher boron concentration : fibro-radiated aggregates (2.) and homogeneous crystallisation (3.)
- Presence of NaCl in the fluid (Weisbrod et al., 1986) seems to lower the boron concentration needed to precipitate tourmaline (1.).

### Comparison to natural and thermochemical data

- Boron concentration in natural fluid inclusion generally doesn't exceed 1wt%, even in systems known to present tourmaline as an hydrothermal alteration product (8.).
- In geochemical models, tourmaline crystalise even with just 500 ppm of H<sub>3</sub>BO<sub>3</sub> in the fluid and always as a Mg-foitite (9.).
- However, our experiments show a stability field requiring higher boron concentration to make tourmaline crystallise (1.).
- This difference with the fluid inclusion can be explained by the high salinities presented in those contexts
- The actual thermodynamic properties seem to overestimate tourmaline stability field.



analysed.

r' site content : Fe

No chemical variation between the different textures

Two main substitutions :

Mg (OH) 🗲

Mg Na  $\longleftrightarrow$  Al<sup>VI</sup> [],

→ AI Ő



7.

(Neall )

- 5000 ppm (0.28wt%

B<sub>2</sub>O<sub>3</sub> con

0 6 wt □ 8 wfN

500 ppm (0.03wt%) Alteration mineral phase diagram showing the condition of temperature and reaction ratio of a H<sub>2</sub>BO<sub>2</sub>+H<sub>2</sub>O fluid with an assemblage Crd + Alb. Created using CHIM (Reed et al., 2016) and reproducing Weisbrod et al. (1986) experiment

#### References

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