

## **Mineralogy and petrology of the petalite-subtype Prof pegmatite, Revelstoke, British Columbia, Canada**

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Supplementary. 7. Thin section scans of country rock adjacent to Prof pegmatite a) PPL scan of sample P24A showing silicate gneiss in lower portion and pegmatite contact and border zone in upper portion, b) XPL scan of sample P24A, c) PPL scan of sample P29A showing massive garnet and diopside band, d) XPL scan of P29A.

Supplementary. 8. Rock samples taken from the Prof pegmatite a) Sample from the overgrowth zone showing quartz and muscovite rimming garnet and tourmalines, b) Sample from the contact zone between the graphic and overgrowth zone showing spray tourmaline texture.

Supplementary. 9. Rock samples taken from the Prof pegmatite a) Sample of a monomineralic single crystal of petalite from the central zone, pink weathering products can be seen at the base of the sample, b) Sample of aplite band from the graphic zone comprised of tourmaline, feldspars and quartz.

## Supplementary. 1. EPMA Methods Feldspars, Micas, Garnets and Oxides

### **EPMA analytical conditions, 2023-12, Cat Breasley**

Quantitative analyses were acquired on a JEOL JXA-iHP200F field emission electron microprobe in the Department of Earth, Ocean, and Atmospheric Sciences at the University of British Columbia.

Compositional data was acquired for micas, feldspars, garnets and oxides and all X-ray intensities were processed together within the Probe for EPMA software (Probe Software Inc.).

### Oxides

The JEOL JXA-iHP200F field emission electron microprobe was operated at an accelerating voltage of 15 kV, a beam current of 20 nA, and the beam diameter was 2 microns.

Oxide compositions was acquired using the five wavelength-dispersive spectrometers with analyzing crystals LIFL for W  $\lambda$ , Ta  $\lambda$ , Fe  $\lambda$ , Mn  $\lambda$ , Ti  $\lambda$ , PETL for Sc  $\lambda$ , Sn  $\lambda$ , Nb  $\lambda$ , Zr  $\lambda$ , and TAP for Si  $\lambda$ , Mg  $\lambda$ . Oxygen was calculated by cation stoichiometry and included in the matrix correction.

The on and off peak counting time was 10 seconds for Zr  $\lambda$ , Sc  $\lambda$ , Si  $\lambda$ , 20 seconds for Nb  $\lambda$ , Fe  $\lambda$ , Sn  $\lambda$ , 30 seconds for Ti  $\lambda$ , Mn  $\lambda$ , and 50 seconds for W  $\lambda$ , Ta  $\lambda$ , Mg  $\lambda$ .

The off peak correction method was Multi-Point for all WDS elements.

Interference corrections were applied to W  $\lambda$  for interference by Ta, and to Nb  $\lambda$  for interference by Ta, and to Zr  $\lambda$  for interference by Sc, W, and to Sc  $\lambda$  for interference by Ta, Sn, W, and to Fe  $\lambda$  for interference by Sn, and to Ti  $\lambda$  for interference by Sc, and to Si  $\lambda$  for interference by Sn, Ta, W, (Donovan, J. J., Snyder, D. A., & Rivers, M. L. (1992). An improved interference correction for trace element analysis. In Proceedings of the Annual Meeting-Electron Microscopy Society of America (pp. 1646-1646). San Francisco Press.)

The data was quantified and corrected using the following standards: Ta (Astimex) for Ta  $\lambda$ , Scheelite (Taylor), CaWO<sub>4</sub> for W  $\lambda$ , Columbite, MnNb<sub>2</sub>O<sub>6</sub> for Nb  $\lambda$ , Mn  $\lambda$ , Cassiterite (Taylor), SnO<sub>2</sub> for Sn  $\lambda$ , ScPO<sub>4</sub>, NMNH168495 for Sc  $\lambda$ , Albite (SPI), NaAlSi<sub>3</sub>O<sub>8</sub> for Si  $\lambda$ , Magnetite (SPI), Fe<sub>3</sub>O<sub>4</sub> for Fe  $\lambda$ , Periclase (SPI), MgO for Mg  $\lambda$ , Rutile (SPI), TiO<sub>2</sub> for Ti  $\lambda$ , and Cubic Zirconia (SPI), ZrO<sub>2</sub> for Zr  $\lambda$ .

### Mica

The JEOL JXA-iHP200F field emission electron microprobe was operated at an accelerating voltage of 15 kV, a beam current of 15 nA, and the beam diameter was 10 microns to mitigate volatile loss.

Mica compositions was acquired using the five wavelength-dispersive spectrometers using analyzing crystals LIFL for Fe  $\lambda$ , Mn  $\lambda$ , Ti  $\lambda$ , Cs  $\lambda$ , PETL for K  $\lambda$ , Cs  $\lambda$ , Ca  $\lambda$ , TAPL for F  $\lambda$ , Na  $\lambda$ , Al  $\lambda$ , and TAP for Si  $\lambda$ , Mg  $\lambda$ . Oxygen was calculated by cation stoichiometry and hydrogen by difference and included in the matrix correction.

The on and off peak counting time was 10 seconds for Fe  $\lambda$ , Si  $\lambda$ , Mg  $\lambda$ , Na  $\lambda$ , Al  $\lambda$ , Ca  $\lambda$ , K  $\lambda$ , F  $\lambda$ , Mn  $\lambda$ , Ti  $\lambda$ , 80 seconds for Cs  $\lambda$ .

Off Peak correction method used linear background fits for Fe  $\lambda$ , Si  $\lambda$ , Mg  $\lambda$ , Na  $\lambda$ , Al  $\lambda$ , Ca  $\lambda$ , K  $\lambda$ , Mn  $\lambda$ , Ti  $\lambda$ , Cs  $\lambda$ , and exponential background fits for F  $\lambda$ . (Donovan, J. J., Lowers, H. A., & Rusk, B. G. (2011). Improved electron probe microanalysis of trace elements in quartz. *American Mineralogist*, 96(2-3), 274-282.)

The data was quantified and corrected using the following standards: Corundum (Taylor), Al<sub>2</sub>O<sub>3</sub> for Al  $\kappa\alpha$ , Wollastonite (Taylor), CaSiO<sub>3</sub> for Ca  $\kappa\alpha$ , Albite (SPI), NaAlSi<sub>3</sub>O<sub>8</sub> for Na  $\kappa\alpha$ , Si  $\kappa\alpha$ , Pollucite (SPI), CsSi<sub>2</sub>AlO<sub>6</sub> for Cs  $\lambda\alpha$ , Bustamite (SPI), (Mn,Ca)SiO<sub>3</sub> for Mn  $\kappa\alpha$ , Fluorite (SPI), CaF<sub>2</sub> for F  $\kappa\alpha$ , Hematite (SPI), Fe<sub>2</sub>O<sub>3</sub> for Fe  $\kappa\alpha$ , Periclase (SPI), MgO for Mg  $\kappa\alpha$ , Rutile (SPI), TiO<sub>2</sub> for Ti  $\kappa\alpha$ , and Orthoclase (SPI), KAISi<sub>3</sub>O<sub>8</sub> for K  $\kappa\alpha$ .

#### Feldspar

The JEOL JXA-iHP200F field emission electron microprobe was operated at an accelerating voltage of 15 kV, a beam current of 15 nA, and the beam diameter was 5 microns.

Elements were acquired using analyzing crystals LIFL for Fe  $\kappa\alpha$ , Ba  $\lambda\alpha$ , Cs  $\lambda\alpha$ , PETL for Sr  $\lambda\alpha$ , K  $\kappa\alpha$ , Cs  $\lambda\alpha$ , Ca  $\kappa\alpha$ , Pb  $m\alpha$ , TAPL for Na  $\kappa\alpha$ , Al  $\kappa\alpha$ , Rb  $\lambda\alpha$ , TAP for Si  $\kappa\alpha$ , Mg  $\kappa\alpha$ , TAPL for Na  $\kappa\alpha$ , Al  $\kappa\alpha$ , Rb  $\lambda\alpha$ , and TAP for Si  $\kappa\alpha$ , Mg  $\kappa\alpha$ . Oxygen was calculated by cation stoichiometry and included in the matrix correction.

The on and off peak counting time was 90 seconds for Cs  $\lambda\alpha$ , 20 seconds for Si  $\kappa\alpha$ , Mg  $\kappa\alpha$ , Na  $\kappa\alpha$ , Ca  $\kappa\alpha$ , K  $\kappa\alpha$ , Ba  $\lambda\alpha$ , Sr  $\lambda\alpha$ , Fe  $\kappa\alpha$ , Pb  $m\alpha$ , 40 seconds for Al  $\kappa\alpha$ , 50 seconds for Rb  $\lambda\alpha$ .

The off peak correction method used linear background fits for all WDS elements.

Interference corrections were applied to Si for interference by Rb, and to Cs for interference by Ba. (Donovan, J. J., Snyder, D. A., & Rivers, M. L. (1992). An improved interference correction for trace element analysis. In Proceedings of the Annual Meeting-Electron Microscopy Society of America (pp. 1646-1646). San Francisco Press.)

The data was quantified and corrected using the following standards: Corundum (Taylor), Al<sub>2</sub>O<sub>3</sub> for Al  $\kappa\alpha$ , Wollastonite (Taylor), CaSiO<sub>3</sub> for Ca  $\kappa\alpha$ , RbTiPO<sub>5</sub> (Astimex) for Rb  $\lambda\alpha$ , Albite (SPI), NaAlSi<sub>3</sub>O<sub>8</sub> for Si  $\kappa\alpha$ , Na  $\kappa\alpha$ , Barite (SPI), BaSO<sub>4</sub> for Ba  $\lambda\alpha$ , Pollucite (SPI), CsSi<sub>2</sub>AlO<sub>6</sub> for Cs  $\lambda\alpha$ , Celestite (SPI), SrSO<sub>4</sub> for Sr  $\lambda\alpha$ , Crocoite (SPI), PbCrO<sub>4</sub> for Pb  $m\alpha$ , Hematite (SPI), Fe<sub>2</sub>O<sub>3</sub> for Fe  $\kappa\alpha$ , Periclase (SPI), MgO for Mg  $\kappa\alpha$ , and Orthoclase (SPI), KAISi<sub>3</sub>O<sub>8</sub> for K  $\kappa\alpha$ .

#### Garnet

The JEOL JXA-iHP200F field emission electron microprobe was operated at an accelerating voltage of 15 kV, a beam current of 20 nA, and the beam diameter was 1 micron.

Elements were acquired using analyzing crystals LIFL for Ta  $\lambda\alpha$ , Fe  $\kappa\alpha$ , Mn  $\kappa\alpha$ , Ti  $\kappa\alpha$ , Cs  $\lambda\alpha$ , PETL for Sn  $\lambda\alpha$ , Ca  $\kappa\alpha$ , Sr  $\lambda\alpha$ , Nb  $\lambda\alpha$ , P  $\kappa\alpha$ , TAPL for Al  $\kappa\alpha$ , and TAP for Mg  $\kappa\alpha$ , Si  $\kappa\alpha$ . Oxygen was calculated by cation stoichiometry and included in the matrix correction.

The on and off peak counting time was 10 seconds for Sr  $\lambda\alpha$ , 20 seconds for Nb  $\lambda\alpha$ , Fe  $\kappa\alpha$ , Si  $\kappa\alpha$ , Mg  $\kappa\alpha$ , Ca  $\kappa\alpha$ , Sn  $\lambda\alpha$ , P  $\kappa\alpha$ , 40 seconds for Mn  $\kappa\alpha$ , Ti  $\kappa\alpha$ , Al  $\kappa\alpha$ , and 60 seconds for Cs  $\lambda\alpha$ , Ta  $\lambda\alpha$ .

The off peak correction method used linear background fits for all WDS elements.

Interference corrections were applied to Sr for interference by Si. (Donovan, J. J., Snyder, D. A., & Rivers, M. L. (1992). An improved interference correction for trace element analysis. In Proceedings of the Annual Meeting-Electron Microscopy Society of America (pp. 1646-1646). San Francisco Press.)

The data was quantified and corrected using the following standards: Nb (Astimex) for Nb  $\lambda\alpha$ , Ta (Astimex) for Ta  $\lambda\alpha$ , Wollastonite (Taylor), CaSiO<sub>3</sub> for Ca  $\kappa\alpha$ , Apatite (Taylor), Ca<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>F for P  $\kappa\alpha$ , Albite (SPI), NaAlSi<sub>3</sub>O<sub>8</sub> for Si  $\kappa\alpha$ , Pollucite (SPI), CsSi<sub>2</sub>AlO<sub>6</sub> for Cs  $\lambda\alpha$ , Bustamite (SPI), (Mn,Ca)SiO<sub>3</sub> for

Mn  $k\alpha$ , Cassiterite (SPI), SnO<sub>2</sub> for Sn  $l\alpha$ , Celestite (SPI), SrSO<sub>4</sub> for Sr  $l\alpha$ , Hematite (SPI), Fe<sub>2</sub>O<sub>3</sub> for Fe  $k\alpha$ , Pyrope (SPI), Mg<sub>3</sub>Al<sub>2</sub>Si<sub>3</sub>O<sub>12</sub> for Mg  $k\alpha$ , Al  $ka$ , and Rutile (SPI), TiO<sub>2</sub> for Ti  $k\alpha$ .

For all phases:

Unknown and standard intensities were corrected for deadtime using the Super High Precision (six terms) correction method (Donovan, J. J., Moy, A., von der Handt, A., Gainsforth, Z., Maner, J. L., Nachlas, W., & Fournelle, J. (2023). A New Method for Dead Time Calibration and a New Expression for Correction of WDS Intensities for Microanalysis. *Microscopy and Microanalysis*, 29(3), 1096-1110.)

Standard intensities were corrected for standard drift over time on an element by element basis.

Data reduction was done using the Pouchou and Pichoir (PAP) matrix correction algorithm and the mass absorption coefficients dataset was FFAST (Chantler (NIST v 2.1, 2005).

## Supplementary. 2. EPMA Methods Tourmalines

### **EPMA analytical conditions, 2022-08, Cat Breasley**

Quantitative analyses were acquired on a JEOL JXA-iHP200F field emission electron microprobe in the Department of Earth, Ocean, and Atmospheric Sciences at the University of British Columbia.

The JEOL JXA-iHP200F field emission electron microprobe was operated at an accelerating voltage of 15 kV, a beam current of 20 nA, and the beam diameter was 5 microns. Compositional data was acquired and processed within the Probe for EPMA software (Probe Software Inc.).

Tourmaline compositions was acquired using the five wavelength-dispersive spectrometers with analyzing crystals LIFL for Fe  $\alpha$ , Mn  $\alpha$ , Cr  $\alpha$ , Ti  $\alpha$ , Sc  $\alpha$ , Cu  $\alpha$ , PETL for Cl  $\alpha$ , Ca  $\alpha$ , Cs  $\lambda$ , K  $\alpha$ , TAP for Al  $\alpha$ , Si  $\alpha$ , Mg  $\alpha$ , TAPL for Na  $\alpha$ , F  $\alpha$ , Rb  $\lambda$ . Oxygen was calculated by cation stoichiometry and included in the matrix correction. Element H was calculated by difference from 100%. Element B was calculated by stoichiometry to oxygen with 0.097 atoms relative to 1.0 atom of oxygen.

The peak counting time was 20 seconds for Si  $\alpha$ , Mg  $\alpha$ , Fe  $\alpha$ , Ca  $\alpha$ , K  $\alpha$ , Cl  $\alpha$ , Al  $\alpha$ , Mn  $\alpha$ , Cr  $\alpha$ , Ti  $\alpha$ , Sc  $\alpha$ , Cs  $\lambda$ , F  $\alpha$ , Rb  $\lambda$ , Cu  $\alpha$ , and 30 seconds for Na  $\alpha$ .

Background intensities were acquired by the MAN (mean atomic number) method (Donovan, J. J., & Tingle, T. N. (1996). An improved mean atomic number background correction for quantitative microanalysis. *Microscopy and Microanalysis*, 2(1), 1-7; Donovan, J. J., Singer, J. W., & Armstrong, J. T. (2016). A new EPMA method for fast trace element analysis in simple matrices. *American Mineralogist*, 101(8), 1839-1853.) and the intensity data was calibrated and continuum absorption corrected for all elements except Cu  $\alpha$  which was acquired as traditional off-peak methods with a counting time of 20 seconds.

The data was quantified and corrected using the following standards: Albite (Taylor), NaAlSi<sub>3</sub>O<sub>8</sub> for Si  $\alpha$ , Na  $\alpha$ , Corundum (Taylor), Al<sub>2</sub>O<sub>3</sub> for Al  $\alpha$ , Spessartine (Taylor), Mn<sub>3</sub>Al<sub>2</sub>Si<sub>3</sub>O<sub>12</sub> for Mn  $\alpha$ , ScPO<sub>4</sub>, NMNH168495 for Sc  $\alpha$ , RbTiPO<sub>5</sub> (Astimex) for Rb  $\lambda$ , Pollucite (SPI), CsSi<sub>2</sub>AlO<sub>6</sub> for Cs  $\lambda$ , Chromium oxide (SPI), Cr<sub>2</sub>O<sub>3</sub> for Cr  $\alpha$ , Diopside (SPI), MgCaSi<sub>2</sub>O<sub>6</sub> for Ca  $\alpha$ , Mg  $\alpha$ , Fluorite (SPI), CaF<sub>2</sub> for F  $\alpha$ , Hematite (SPI), Fe<sub>2</sub>O<sub>3</sub> for Fe  $\alpha$ , Rutile (SPI), TiO<sub>2</sub> for Ti  $\alpha$ , Orthoclase (SPI), KAlSi<sub>3</sub>O<sub>8</sub> for K  $\alpha$ , Tugtupite (SPI), Na<sub>4</sub>BeAlSi<sub>4</sub>O<sub>12</sub>Cl for Cl  $\alpha$ , and Cu (JEOL) for Cu  $\alpha$ .

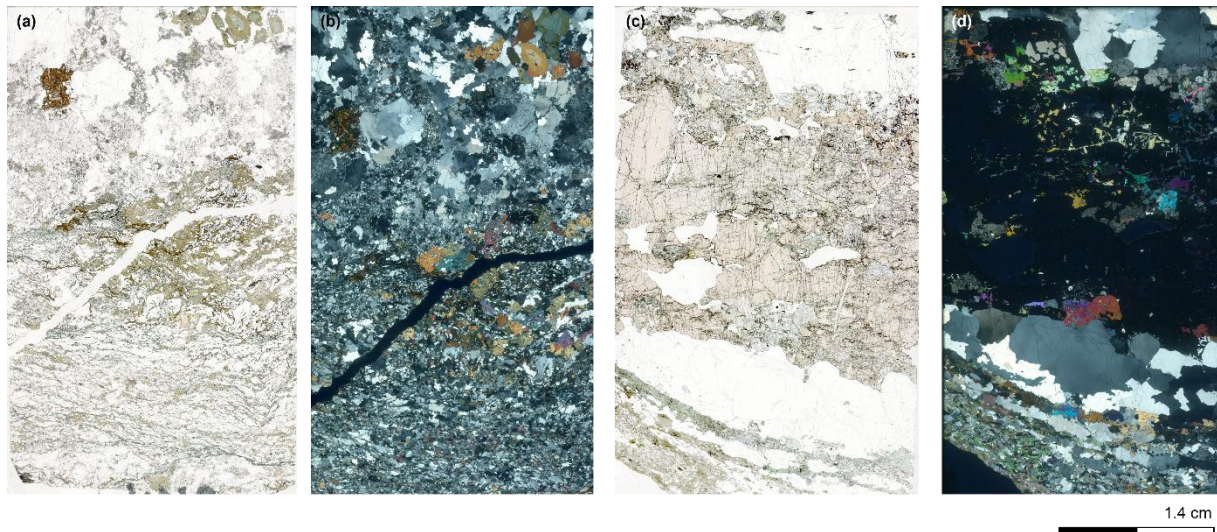
Unknown and standard intensities were corrected for deadtime using the Super High Precision (six terms) correction method (Donovan, J. J., Moy, A., von der Handt, A., Gainsforth, Z., Maner, J. L., Nachlas, W., & Fournelle, J. (2023). A New Method for Dead Time Calibration and a New Expression for Correction of WDS Intensities for Microanalysis. *Microscopy and Microanalysis*, 29(3), 1096-1110.)

Data reduction was done using the Bastin PROZA Phi (prZ) matrix correction algorithm (Bastin, G. F., Dijkstra, J. M., & Heijligers, H. J. M. (1998). PROZA96: an improved matrix correction program for electron probe microanalysis, based on a double Gaussian  $\phi$  ( $\rho z$ ) approach. *X-Ray Spectrometry: An International Journal*, 27(1), 3-10.) and the mass absorption coefficients dataset was FFAST (Chantler (NIST v 2.1, 2005) (Chantler, C.T., Olsen, K., Dragoset, R.A., Chang, J., Kishore, A.R., Kotochigova, S.A., and Zucker, D.S. (2005), X-Ray Form Factor, Attenuation and Scattering Tables (version 2.1). [Online] Available: <http://physics.nist.gov/ffast> [2023, May 16]. National Institute of Standards and Technology, Gaithersburg, MD.).

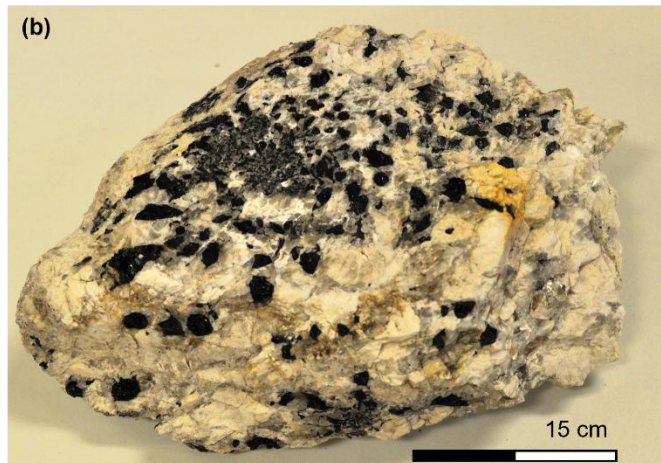
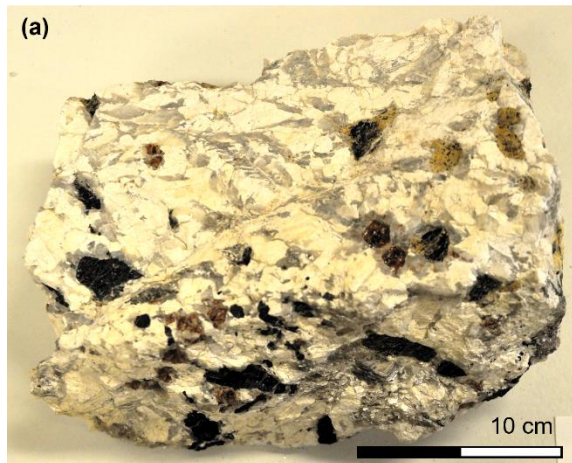
Supplementary. 3–6. EPMA Data for Feldspars, Micas, Garnets and other Oxides.

Excel files

Supplementary. 7. Thin section scans of country rock adjacent to Prof pegmatite a) PPL scan of sample P24A showing silicate gneiss in lower portion and pegmatite contact and border zone in upper portion, b) XPL scan of sample P24A, c) PPL scan of sample P29A showing massive garnet and diopside band, d) XPL scan of P29A.



Supplementary. 8. Rock samples taken from the Prof pegmatite a) Sample from the overgrowth zone showing quartz and muscovite rimming garnet and tourmalines, b) Sample from the contact zone between the graphic and overgrowth zone showing spray tourmaline texture.





Supplementary. 9. Rock samples taken from the Prof pegmatite a) Sample of a monomineralic single crystal of petalite from the central zone, pink weathering products can be seen at the base of the sample, b) Sample of aplite band from the graphic zone comprised of tourmaline, feldspars and quartz.

