

## Application of Topaz-Muscovite F-OH Exchange as a Geothermometer

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### Abstract

Recently reported thermodynamic data for the F end member of muscovite permitted calibration of a geothermometer based on the F-OH exchange between muscovite and topaz. The geothermometer provides estimates for the temperature of greisen-forming systems that are essentially independent of pressure. At pressures between 500 and 4,000 bars, the temperature can be calculated using the equation  $T(^{\circ}\text{C}) = (-0.0131P - 1323)x - 185$ , where  $x$  is equal to  $1 / [2 \log (X_{\text{OH-Topz}}/X_{\text{F-Topz}}) + 2 \log (X_{\text{F-Ms}}/X_{\text{OH-Ms}})]$ , using an ideal mixing model between topaz and muscovite end members.

This geothermometer was tested with samples from four different localities where there had been previous estimates of the temperature. Calculated temperatures compared well with the previous estimates provided that the total content of doubly charged cations ( $\text{Fe}^{2+}$ ,  $\text{Mg}^{2+}$ , and  $\text{Mn}^{2+}$ ) in the muscovite was less than 0.4 cations per formula unit (based on 22 oxygens).