

## 12.480 Handout #4

Ghiorso (1984) *Contrib Mineral Petrol* 87:282-296.  
Fuhrman and Lindsley (1988) *Amer. Mineral.* 73:201-215.  
Elkins and Grove (1990) *Amer. Mineral.* 75: 544-559.

Wen and Nekvasil (1994) *Comp Geosci* 20: 1025-1040.  
Kroll et al. (1993) *Contrib Mineral Petrol* 114: 510-519.  
Green and Udansky (1986) *Amer. Mineral.* 71:1100-1108.  
Stormer and Whitney (1985) *Amer. Mineral.* 70:52-64.  
Brown and Parsons (1981) *Contrib Mineral Petrol* 76:369-377.  
Johannes (1979) *Contrib Mineral Petrol* 68:221-230.  
Seck (1971a) *Neues Jahrb. Mineral. Abh.* 115:315-345.  
Seck (1971b) *Contrib Mineral Petrol* 31:67-86

### Ghiorso (1984)

In this paper Ghiorso expanded the Al-avoidance configurational entropy model of Kerrick and Darken (1975) and Newton et al. (1980) to ternary feldspars. The Kerrick and Darken approach is intended to provide an approximation of the ideal part of the activity when mixing takes place with charge balance constraints. We know this as coupled substitution. These models for the ideal part of the activity give larger negative values to the entropy of mixing term ( $-T\Delta S_{\text{mix}}$ ).

Ghiorso used the constraints from all three equilibria to estimate equilibration temperature.

Ghiorso's analysis of Seck's (1971) experimental data resulted in a negative  $W_s$  term for the  $W_{\text{oran}}$  excess parameter.

### Green and Udansky (1986)

In this paper Seck's 1, 5 and 10 kbar data were used to derive a  $W_v$  term for the An-Or excess free energy term. The magnitude of this term was large and led Green and Udansky and others to suggest a pressure sensitivity to feldspar equilibria. Therefore, coexisting feldspars might serve as a barometer and a thermometer.

Stormer and Whitney (1985) estimated a pressure for the Fish Canyon tuff of 8 to 9 kbar (24-27 km depth). They cite a pressure dependence of  $18^\circ\text{C}/\text{kbar}$  on feldspar equilibria. This pressure dependency comes from Brown and Parsons (1981) *CMP* 76:369-377. B&P fit a pressure dependency to the Ab-Or solvus using a variety of experimental data, and derive this pressure dependency.

Fuhrman and Lindsley (1988)

In response to the G&U and S&W papers, F&L remodeled the Seck 1 kbar experimental data. Their contribution to evolution of these models was to fit x-ray data for ternary feldspars to derive an expression for  $W_v$ . They also evaluate critically the utility of two feldspar thermometry and provide a calculation procedure for estimating two-feldspar temperatures.

Elkins and Grove (1990)

New experimental data on coexisting ternary feldspars and a model for excess free energy that uses the simpler  $X \ln X$  formulation for  $-T\Delta S_{\text{mix}}$ .