

Chemistry of Igneous Rocks

- Characterization of different types (having different chemistries):
 - Ultramafic → Mafic → Intermediate → Felsic
- Composition commonly presented in weight % of the oxides
 - 40-78% SiO_2
 - 12-18% Al_2O_3

Melts

- Liquid composed of predominantly silica and oxygen. Like water, other ions impart greater conductivity to the solution
- Si and O is polymerized in the liquid to differing degrees – how ‘rigid’ this network may be is uncertain...
- Viscosity of the liquid → increases with increased silica content, i.e. it has less resistance to flow with more SiO_2 ... related to polymerization??
- There is H_2O in magma → 2-6% typically – H_2O decreases the overall melting T of a magma, what does that mean for mineral crystallization?

Thermodynamic definitions

- $G_{i(\text{solid})} = G_{i(\text{melt})}$
- Ultimately the relationships between these is related to the entropy of fusion (ΔS^0_{fus}), which is the entropy change associated with the change in state from liquid to crystal

$$\left[\frac{dT}{dX_i} \right] = \frac{RT_{\text{fus}}}{\Delta S^0_{\text{fus}}}$$

- These entropies are the basis for the order associated with Bowen's reaction series \rightarrow greater bonding changes in networks, greater entropy change \rightarrow lower T equilibrium