

Petrology test 2 review sheet

MORB

- Alkaline vs. tholeiitic: depth of source and % melt
: phase diagrams explaining stability of olivine in the two
- Mineralogy crystallization sequence and ternary phase diagram
- trends on the AFM diagram, what crystallizes to cause the hairpin turn at F corner
- major element chemistry trends for minerals forming.
- NMORB vs. EMORB – not seen in major elements, but in traces and they have different sources
- Structure of slow vs. fast spreading ridge vs. plume at Iceland
- Model of MORB sources and generation of melt.

OIB's

- Hawaiian stages and model for these different melts forming: combine major and trace elements, and to achieve trend of alkaline to tholeiitic to alkaline.
- Influence of lithosphere thickness on tholeiite vs. alkaline basalts

Extrusive igneous structures & volatiles

- Types of eruptions
- types of effusive basaltic and felsic lavas
- cause of explosive eruptions, associated with which magmas?
- Pyroclasts, what they are and how they are transported
- Pyroclastic flows: ash-flow tuff, welded tuff, what they are, how to recognize
- Ignimbrite sequences and how they are zoned in composition
- Ash-fall tuff: description, importance of
- Caldera vs. crater
- Composite volcano

Island Arcs

- See handout from class
- Calc-alkaline vs. tholeiitic trends: differences in chemistry, mineralogy, phase diagrams
- subduction angle and location of volcanic chain
- Model of melt generation

Continental arcs

- impact of continental crust on magma chemistry (which elements more enriched?)
- Medicine Lake volcano: evidence of fractional crystallization, assimilation AND mixing
- longer travel path through crust, stalling out in crust leading to more assimilation and differentiation, stalling out magmas lead to possibility of melting the crust. These options not seen in island arcs, OIB's, and MORB's since no cont. crust
- Andes: age and thickness of crust in each zone, rock types erupted (in contrast to ocean island arcs), isotopes in each zone, different K₂O in each zone, % melt

- Cascades: unusual in mostly calc-alkaline basalt, LREE depleted, melting of subducted slab forming Adakites

Alkaline and carbonatite rocks

- alkaline occurrences, source of alkaline rocks
- carbonitites: source, how to get CO₂ into mantle
- Alkaline rocks on cratons:
 - o Lamprophyres and lamproites
 - o Kimberlites: emplacement model, model of diamond formation and how they ended up in kimberlites
- Anorthosites: model for generation of magma, trace element pattern

Generating magmas in the crust & granites

- Where we see granites, generalizations about granites
- Partial melting to form granites, how melt is generated?
- Melt compositions: peraluminous, metaluminous, peralkaline
- Which method makes the most melt?
- Assimilation into granites, what is observed, what isn't
- hypersolvus and subsolvus phase diagrams – feldspars generated, water content
- ascent of granites through crust, which can get farther?
- alphabet granites (S-, I-, A-), mineralogy, characteristics, magma source
- how to generate granites in subduction zones
- how to generate granites in collision zones