

Introduction to igneous petrology

I. What are magmatic rocks?

Rocks formed from magmas = silicate liquids (\pm bubbles, \pm crystals)

Some are quite obvious (lavas)

Some are more difficult (plutonic rocks), and some are quite tricky (ashes)!

3 types of igneous rocks:

- Slow crystallization = **phaneritic** rocks = **plutonic** (or **intrusive**) rocks
- Fast crystallization = **aphanitic** rocks = **volcanic (extrusive)** rocks
Commonly **porphyritic: phenocrysts + groundmass** or glass
(NB: “**porphyroid**” = un-equigranular plutonic rocks)
- Explosions = cinders & ashes = **pyroclastic** rocks

II. A refresher on Earth's structure

Concentric structure: crust – mantle – core

Results from differentiation of the proto-Earth

The upper mantle + crust = lithosphere

Moving on a weak asthenosphere

Lithosphere made of different plates.

Plate boundaries:

- Rifts (divergent)
- Subduction and collision (convergent)

P and T increase with depth, but melting conditions are never reached. Melting is *not* a normal condition within the Earth!

III. Where and why are melts generated?

Plate boundaries are the sites of most magmatic activity (rare intra-plate magmas)

Solidus, liquidus and melting

IV. From melt generation to final emplacement

Melt is

- Formed
- Extracted
- Transported
- Emplaced

In addition, it undergoes chemical evolution as it rises.