Workshop on Melt Inclusions Introduction

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Oregon State

Melt inclusions: An introduction



"Parcels" of melt trapped in igneous crystals

 \equiv Fluid inclusions

Occur in basaltic and related rocks wherever they are found:

Arcs, OIB, CFB, MORB, LMI, ET's

Silicic and Plutonic Rocks Xenoliths Meteorites





"There is no necessary connexion between the size of an object and the value of a fact, and...though the objects I have described are minute the conclusions to be derived from the facts are great "

Sorby 1858

Geol. Soc. London. Quart. Jour. 14 453-500 [from Roedder (1979) Bull. Mineral.]

Why study melt inclusions?

Melt inclusions preserve compositions that are different from those of erupted lavas/tephra

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1. More variable than host and associated lavas

- Bulk rock, Matrix glass = "Averages"
- Provide larger data sets per rock
- Preserve low volume or low survivability melts
 - Primitive Melts
- 2. Trap volatile elements
 - Compare volatile and non volatile behaviour
- 3. Provide melt samples in altered rocks



Wallace 2005



CO₂ (ppm)

Exponential Growth of Melt Inclusion Research



Compiled by A. Sobolev



PHENOCRYSTS AND GLASS INCLUSIONS AND THEIR BEARING ON OXIDATION AND MIXING OF BASALTIC MAGMAS, KILAUEA VOLCANO, HAWAII¹

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The Before-eruption Water Content of Some High-alumina Magmas

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Evidence for a Picritic, Volatile-rich Magma beneath Mt. Shasta, California

by Alfred T. Anderson, Jr.

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(Received 22 July 1973; in revised form 15 September 1973)

Water by difference using electron microprobe





Tephra deposits near Mt. Shasta





Nanos gigantum humeris insidentes

Bernard of Charles, 1159

Sorby, Roedder, Anderson, Sobolev, Danyushevsky, Kamenetsky, Gurenko, Portnyagin, Shimizu, Nielsen, Schiano, Clocchiatti, Frezzotti, Lowenstern, Bodnar, Blundy, Hauri, Saal, Heinrich, Metrich, Sisson, Moore, Roggensack, Thordarsson & many others





Paul Wallace

Volatiles, Volcanism, Melt inclusions, Subduction, Oceanic Plateaux, FTIR



Adam Kent

Melt Inclusions, basalt genesis, volatiles, subduction, volcanism, laser ablation and SIMS





Schedule - it's flexible

- Melt Inclusion Formation (Kent)
- Evolution and modification after trapping (Kent)
 - Exercise calculating corrections
- Sample Preparation (Kent)
- Melt Inclusion Analysis
 - Microprobe and FTIR (Wallace)
 - Exercise FTIR data
 - Laser ablation and SIMS (Kent)
 - Exercise LA data
- Solubility and degassing (Wallace)
 - Exercise volatile calculations
- Melt Inclusions in Primitive Basalts (Kent)
- Volatiles in Mafic Magmas (Wallace)
- Melt inclusions in silicic magma systems (Wallace)
- Case Studies (Wallace, Kent)

• We are just everyday working folks!

