H_2O-vesicle formation in the hybrid region of a bimodal melt system. An experimental progress.

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Objectives of the study:

(i) Synthesis of a glass simulating the hybrid zone in a bimodal melt system.

(ii) An in-depth exploration of the mechanisms driving enhanced H_2O vesicle formation in the hybrid melt.

Geological background

volcanic eruption triggered by magma injection

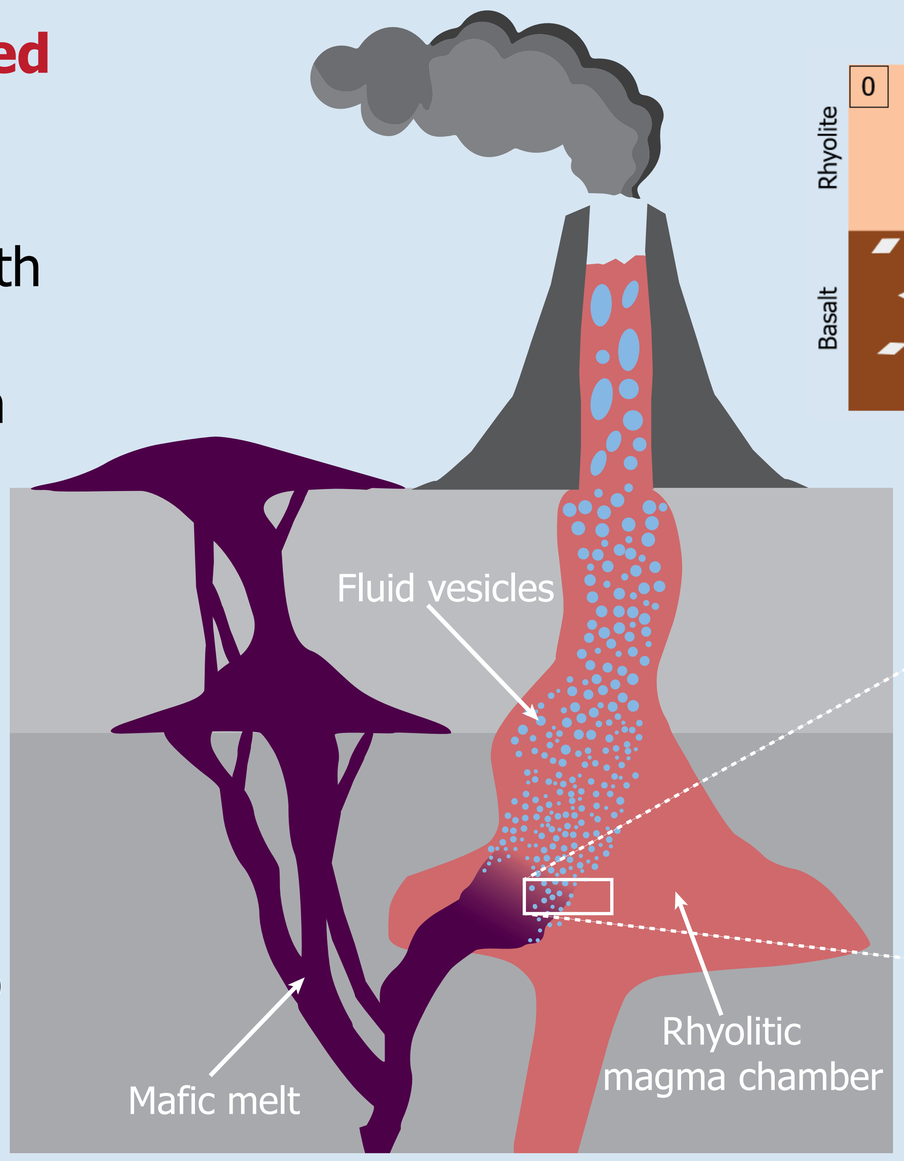
H_2O vesicle formation & growth

Reduction of H_2O-solubility in the hybrid zone[(1)]

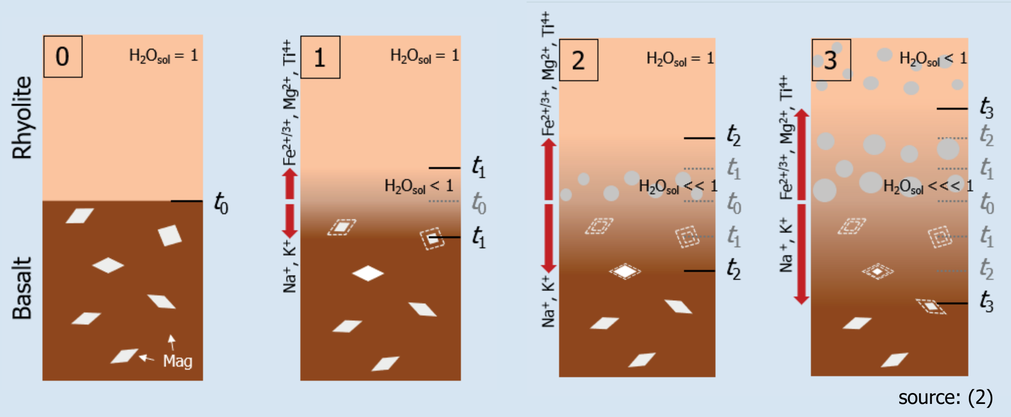
Alkali depletion in the hybrid zone[(2)]

Magma mixing & magma mingling

Injection of a mafic melt into a rhyolitic magma chamber



Melt injections wrapped up in capsules



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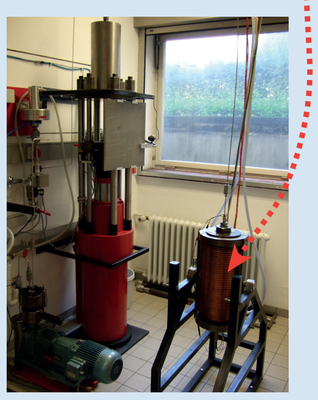
H_2O-solubility experiments

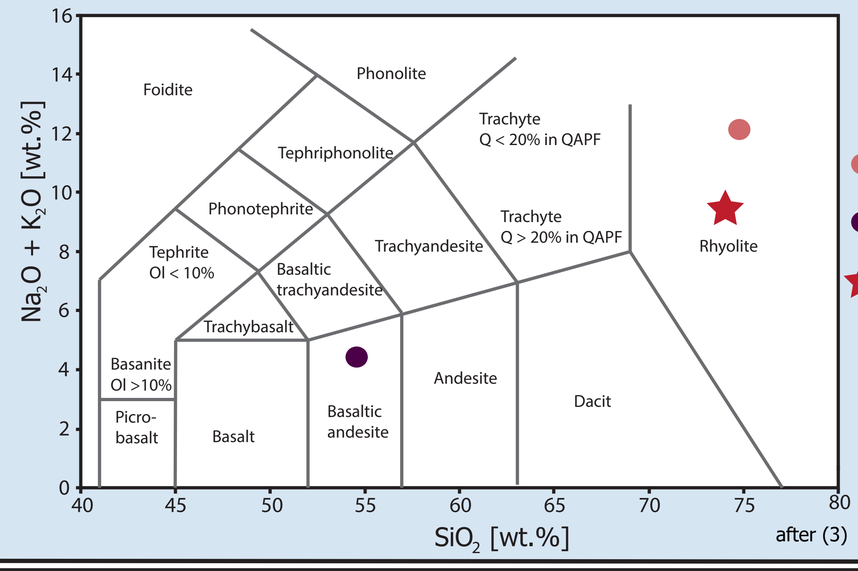
(i) Melt hydration with H_2O excess in an internally heated argon pressure vessel (1523 K, 60 - 200 MPa, 96 h)

(ii) 0.5 h equilibration at 1323 K

(iii) Isobaric quench (16 or 97 K/s)



Hybrid melt composition

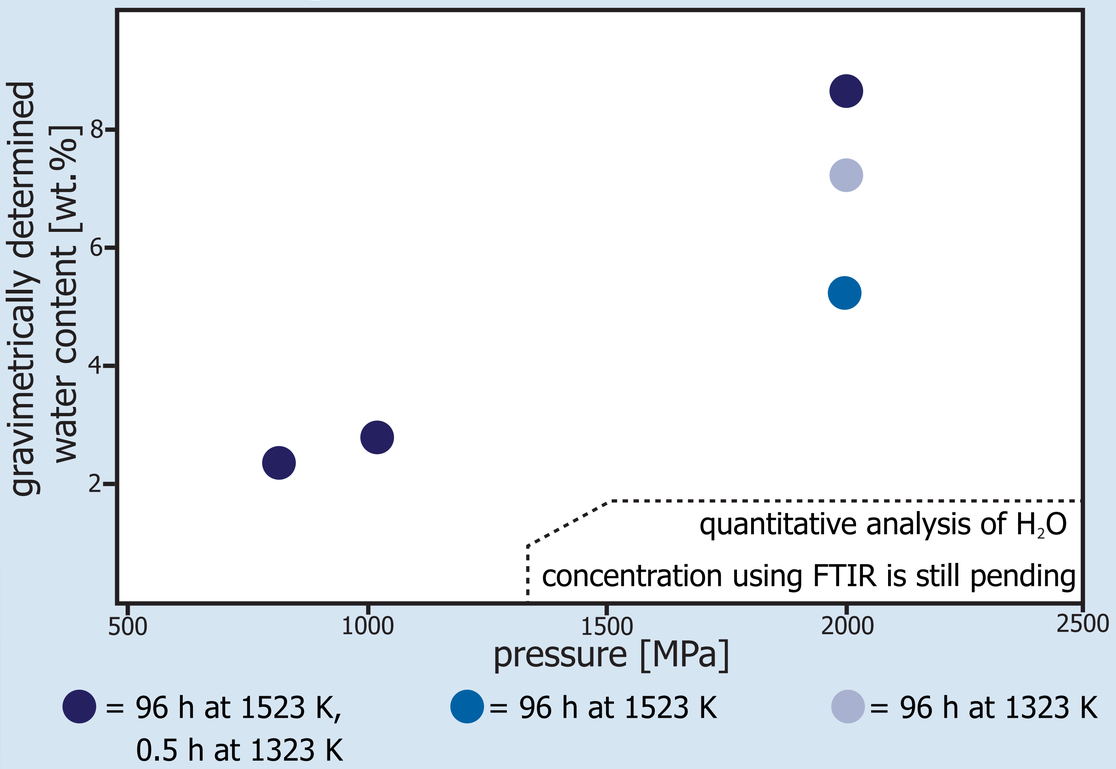


after (3)

Oxide	Wt. %
SiO_2	74.08
TiO_2	0.02
Al_2O_3	12.63
FeO	1.76
MnO	0.07
MgO	0.68
CaO	1.50
Na_2O	4.77
K_2O	4.50
Sum	100.00

→ NBO/T = 0.1

Preliminary results



Outlook

(i) Decompression experiments of initially slightly H_2O - undersaturated melts at rates of 1.7 - 0.17 MPa/s to final pressures of 60 - 100 MPa.

(ii) Analysis of H_2O vesicle number density, spatial distribution and H_2O contents in decompressed and quenched melts with quantitative image analysis, FTIR - spectroscopy & calculation of equilibrium porosity

→ Comparison of data with bimodal decompression experiments[(2)]

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sources: (1) Allabar, A. et al. (2022) Mineral. Petr., 177(52)., (2) Marks, P. L. et al. (2023) J. Mineral., 35(4), 613-633., (3) Bas, M. L., et al. (1986) J. Petrol., 27(3), 745 - 750.