Real-Time Synchrotron Imaging of Silicic Magma Degassing: Insights into Bubble Nucleation and Growth Kinetics during Controlled Heating

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**ABSTRACT**

Synchrotron x-ray imaging has enhanced the understanding of magma degassing processes. Here, we present novel, time-resolved (4D) synchrotron microtomography (Beamline I12, Diamond Light Source, UK) of vesiculation in water-bearing (<1 wt.%) silicic melts, under isothermal and non-isothermal during heating (from 850 to 1250 °C) at constant rate (0.1 °C/s ±1) and ambient pressure. Preliminary observations suggest that bubble nucleation is typically delayed until high temperatures prompt lower melt viscosity. Nucleation is followed by rapid bubble growth, bubble coalescence, and the formation of permeable channels in the inner part of the samples due to water diffusion outside of the melt. This morphology of permeable foam facilities outgassing, and has previously been associated with effusive and/or low-explosive volcanic eruptions. These observations provide a pathway for future step-change 4D experiments under controlled pressures, elucidating degassing phenomena, crucial for understanding eruptive styles and intensities during eruptions of different magnitude and composition.

**EXPERIMENTAL SETTING**

**EXPERIMENTAL PLAN**

**INSIDE VOLCANIC ERUPTIONS**