

## **Volcanic eruptions: Geomaterials under physical and chemical stress**

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The cataclysmic process by which molten lithosphere breaches the Earth's surface is one of the most spectacularly complex physico-chemical events on our planet. The multitude of phenomena accompanying this transit all leave to a greater or lesser extent, their mark on the Earth's hydrosphere, atmosphere and biosphere.

Substantial progress has been made in the description of the processes immediately preceding and accompanying the eruptive process. A full description of these processes must cover the complex materials transition from petrological reactions up to ascent through physical failure in explosions to chemical interactions between the eruptive products.

All of this takes place in a system that is more-or-less melt-hosted, with the spectacular added complexity that this hosting phase transforms from fluid to solid during the event.

Sorting out the relative efficiency of petrological, physical and chemical processes in eruption scenarios is aided by a number of sources of information in the geomaterials; including the analysis of phase state, proportions and texture; particles, fractures and glass state; and chemical gradients, reaction products and glass stability.

All of these fronts are now the subject of intense experimental investigations. Many qualitatively profound observations are being generated. They all shed light on the remarkable diversity of melt-based system response in both the liquid and glassy states. One of the defining features of a "living" as opposed to a dead planet.