

IS THERE AN INTERACTION BETWEEN PAHOEHOE LAVA FLOWS?

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Pahoehoe lava is a dominant product of subaerial volcanism to cover most of the surface of the Earth and other terrestrial planets, and even most submarine flows have a similar nature to these subaerial flow types. To obtain a principle notion about possible interactions between flows due to re-heating, synthetic heat treatment experiments were carried in air on pahoehoe lava, collected by hammer-dipping in the 1996-eruption flow of the Pu'u O'o crater at the East Rift of Kilauea, Hawaii (tholeiitic in composition). Treatment of chunks (and powder) in air at various temperatures and length of time show: 1. Crystallization occurs at two temperatures, around 850 °C pyroxene and Fe(Ti) oxides, and around 920 °C plagioclase, whereby the chemistry of each phase varies as a function of temperature of treatment, up to 1090 °C. 2. If the heat treatment is in air, samples oxidize, in contrast to lava that cooled in place and had produced a chilled margin. 3. $\delta^{18}\text{O}$ of heat treated products illustrate that oxidation must have proceeded without atmospheric oxygen; extensive cationic diffusion to the sample surfaces, occurring in the outer 10 - 20 micron zone, may suggest that at least surface controlled oxidation proceeds via cationic diffusion, in contrast to the commonly expected anionic diffusion of O^{2-} . Despite many open questions as to the processes involved, these experiments might simulate natural heat treatment occurring as interaction between flows. Specifically, one may question to what extent crystalline products and redox state (FMQ) commonly observed in basalt, might have developed after emplacement. The possible relevance will be discussed based on field studies at the contact between pahoehoe flows from Kilauea.