Geophysical Research Abstracts, Vol. 8, 05373, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05373


# Quench Rates of Hyaloclastite Glasses from the HSDP Drill Core compared to Synthetic and Natural Hyperquenched Glasses

**A. R. L. Nichols** (1,2), D. B. Dingwell (1), M. Potuzak (1)

(1) Department of Earth and Environmental Sciences, University of Munich, Germany, (2) Now at Institute For Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan (nichols@jamstec.go.jp / Fax: +81-46-867-9625 / Phone: +81-46-867-9783)

Fresh basaltic glasses from the matrices and clasts of hyaloclastite sequences in the Hawaii Scientific Drilling Project (HSDP) drill core have been analysed using differential scanning calorimetry (DSC). After initial heating at 5 K.min$^{-1}$, the samples were cooled and heated at matched rates of 20, 10 and 5 K.min$^{-1}$ to provide a series of *Cp*-temperature paths across the glass transition. These exhibit the glassy state and the peak in *Cp* associated with the glass transition. Notably, on initial heating, the transient *Cp* forms a trough before the glass transition peak; the trough is absent in subsequent controlled cooling-heating paths. This trough makes it impossible to determine the quench rates using the relaxation geospeedometer, which has been successfully used to determine cooling rates up to 2.5 K.s$^{-1}$. The trough has also been observed in DSC experiments on compositionally similar glasses created synthetically using the splat-quench, and fibre spinning techniques, which generate quench rates of up to $10^6$ K.s$^{-1}$. The trough represents the total enthalpy released during the heating process and is believed to be, at least partly, a result of these extremely rapid quench rates. We have also observed similar excess energy release in other natural glasses (bubble-wall fragments (limu-o Pele) and Pele's hair) from the Loihi Seamount. The HSDP hyaloclastite glasses have shallower troughs, and deviate from the glassy state at higher temperatures, (i.e. release less energy) than either the hyperquenched synthetic or Loihi glasses. This suggests that although the HSDP glasses quenched rapidly, faster than those glasses successfully modelled by the relaxation geospeedometer, they did not quench as rapidly as the synthetic hyperquenched and the Loihi glasses.