V201-P003 Room: Poster Session Hall Time: May 14

# Shear Deformation of Bubbles in Rhyolitic Melt

# Satoshi Okumura[1]; Michihiko Nakamura[2]; Akira Tsuchiyama[3]

[1] Earth&Space, Osaka Univ.; [2] Inst. Mineral. Petrol. Econ. Geol., Tohoku Univ.; [3] Earth and Space Sci., Osaka Univ.

Deformation of bubbles in magma through volcanic conduits is a controlling process of degassing and magma flow dynamics, because the bubble deformation influences the formation of bubble network and magma rheology. In the magma, the bubble deformation is governed by the relative magnitude of shear stress that works to deform bubbles compared with surface tension stress that acts to keep bubbles spherical, which is characterized by the capillary number. The relationship between the capillary number and bubble shapes and orientations in shear flows has been investigated by theoretical and experimental studies. However, the relationship in actual magma is not demonstrated experimentally and the effect of the bubble deformation on degassing is not investigated quantitatively. Hence, to perform high temperature deformation experiments for bubbly magmas, we set up a piston cylinder apparatus with a rotational piston. In the cylinder, the samples are twisted by rotating lower piston.

This study performed deformation experiments for natural obsidian at 950C by rotating the piston with the rotation speed of 0.5 rotation per minute. Cylinder shape obsidian with 0.5 wt% initial water content was used as a staring material. Before the deformation experiment, the obsidian was heated in the piston cylinder at 950C for 3 minutes, resulting in the bubble formation due to dehydration of obsidian. The vesiculated samples were twisted by rotating the lower piston, and then the sample was quenched with turning off heater power. The relaxation of bubble shape during sample cooling is assumed to be negligible for bubbles studied here, because bubble relaxation time scale is longer than the time scale of sample cooling. The shape of bubbles in the quenched samples was measured by using a X-ray CT technique. In the determination of the shape, the bubbles were approximated as ellipsoids. It is difficult to determine the shapes of bubbles with irregular shapes that result from bubble coalescence, and hence we used only bubbles that show similar volume with the volume calculated from the approximated ellipsoid. The bubble shape was characterized by using some parameters, [l-b]/[l+b] and l/a, where l and b are the semi-major and semi-minor axes of the deformed bubble, respectively, and a is the radius of the undeformed bubble. The results show that larger deformation is induced at the outer and lower parts of the sample. The deformation also seems to become large at upper parts.

In this study, we set up the new deformation experimental apparatus and performed the deformation experiments for bubbly rhyolitic melts at high temperature, and measured the shape of the deformed bubbles by using the X-ray CT technique. These experimental studies for actual magma, not analog materials, seem to provide further constraints on the deformation process of bubbles in magma, and consequently the data obtained might be useful to the modeling of degassing and magma flow dynamics.