Density of carbonated basaltic melt at the conditions of Earth's upper mantle.

S. GHOSH E. OHTANI K.D. LITASOV AND A. SUZUKI

Inst. Mineral. Petrol. Econ. Geol., Tohoku University, Sendai, Japan; sujoy@ganko.tohoku.ac.jp

Seismological observations of low velocity zones (LVZ) at the top of 410-km discontinuity reveal possible existence of dense melt at this boundary. Density measurements of anhydrous basaltic melts indicate that it is denser than surrounding mantle near 410-km depth [1]. However, melting temperature of peridotite is much higher than about 1400°C, estimated at 410 km. It has been shown recently, that hydrous melt containing up to 2 wt.% H_2O is denser than peridotite and therefore can be accumulated at the base of upper mantle [2]. Next to H_2O, CO_2 is another major volatile component in the mantle and it could be also important for explanation of LVZ near 410 km. Here, we present preliminary results of density measurements of carbonated basaltic melt and discuss its possible stability at the base of upper mantle.

The density of melt was determined using sink/float technique. Starting materials were synthetic MORB glass. 5 and 10 wt.% CO_2 were added to the glass as $CaCO_3$ and Na_2CO_3, adjusting to the proportions of related oxides. Single crystals of natural diamond were used into a Pt/Re double capsule as a density marker, placed together with a powder of starting materials. Experiments were carried out at 16-22 GPa and 2200-2300°C.

We observed neutral buoyancy of diamond density marker in MORB+5 wt.% CO_2 at 18 GPa and 2300°C. However, we observed sinking of diamond in MORB+10 wt.% CO_2 at these conditions and neutral buoyancy point is located at higher pressure.

Although we have not yet calculated the equation of state for carbonated basaltic melt, we can compare our results with those reported for hydrous melt. Assuming dK/dP is same for dry, hydrous and carbonated MORB and we can suggest that the effect of CO_2 on density of basaltic melt is nearly the same as effect of water and carbonated melt is denser than surrounding mantle near 410 km if amount of CO_2 in the melt does not exceed 2-3 wt.%.

References

[1] Ohtani E. and Maeda M. (2001) *EPSL* 1**93,** 69-75.
[2] Sakamaki T. et al. (2006) *Nature* **439**, 192-194.