# Behavior of basalt-carbonate melts at high pressures
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*Kono Yoshio[1]、Ohfuji Hiroaki[2]、Stagno Vincenzo[2]、Kenney-Benson Curtis[1]、Wang Yanbin[3]、Shen Guoyin[1]
*Yoshio Kono[1], Hiroaki Ohfuji[2], Vincenzo Stagno[2], Curtis Kenney-Benson[1], Yanbin Wang[3], Guoyin Shen[1]

1.Carnegie Institution of Washington、2.Ehime University、3.The University of Chicago
1.Carnegie Institution of Washington, 2.Ehime University, 3.The University of Chicago

Knowledge of the occurrence and mobility of carbonate-rich melts in the Earth's mantle is important for understanding the deep carbon cycle and related geochemical and geophysical processes. Recently, Kono et al. (2014) find that viscosities of carbonate melts are surprisingly low, in the range of 0.006-0.010 Pa s, which are ~2 to 3 orders of magnitude lower than those of basaltic melts in the upper mantle. As a result, the mobility of carbonate melts (defined as the ratio of melt-solid density contrast to melt viscosity) is ~2 to 3 orders of magnitude higher than that of basaltic melts. Such high mobility of carbonate melts may have significant influence on several magmatic processes, such as fast melt migration and effective melt extraction beneath mid-ocean ridges. However, the behaviour of carbonate-rich silicate melt may be complex, as demonstrated in the reported immiscible behaviour of silicate-carbonate melts. To predict potential implications of carbonate-rich silicate melt as they migrate up in the upper mantle, the stability should be investigated at those pressures. Here we investigate behavior of basalt-dolomite melts with 20-61 vol.% dolomite compositions at high pressures to 7.3GPa by using newly developed X-ray phase contrast imaging technique in Paris-Edinburgh cell at beamline 16BMB, HPCAT, in the Advanced Photon Source. We find that basalt plus 32-61 vol.% dolomite becomes single melt at pressure >~5.5 GPa, while it separates into silicate-dominant melt plus $CO_2$ at lower pressures. The abrupt change of stability of carbonate-rich silicate melt may play a role of paramount importance in migration velocity of upwelling carbonate-silicate magmas due to separation of carbonate component from silicate melt, with 2-3 orders of magnitude difference of viscosity between basalt and carbonate melts.

Reference
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