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# Melting experiments on young alkalic basalt erupted on old Pacific plate in the east of Japan Trench

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Hirano et al.(2001) first reported the occurrence of very young(-6Ma) alkalic basalt on the east wall of Japan Trench east of Sendai. After that, detail study on the deep sea floor has been carried out in 2003 and 2004. On the Pacific Plate of about 800km to the east of Sendai, Hirano et al.(2006) discovered small volcanic cones made of very young(0.05-1 million years) alkalic basalts. These basalts characteristically show very high vesicularity, 40-70%, although erupted at 5500-6000m depth. In addition, it is also peculiar that they include abundant mantle xenoliths up to several centimeters in size. These newly discovered volcanic cones seem to be the product of low degree of partial melting in the asthenosphere. The magma may have erupted through fracture of Pacific Plate due to its flexure at the east of Japan Trench. In other words, this volcanism is different from known three categories of volcanisms on the Earth: i.e., those at divergent plate boundaries, convergent plate boundaries, and hot spots. High vesicularity even at 5000m water depth indicates that the primary magma of the newly found volcanoes include significant amount of $CO_2$ as well as $H_2O$. Presence of mantle xenoliths implies that the erupted magma have not experienced complex crystallization during magma ascending. To study the generation, fractionation, degassing, and erupting process of the alkalic basalt magma recovered from eastern area of Japan Trench, we carried out melting experiments using one atmosphere furnace and piston cylinder apparatus. For the melting experiments, two representative primitive basalts (JPT-1 and JPT-2) were selected from east wall of Japan Trench area. The JPT-1(MgO=10.08wt%) is the most MgO-rich lava recovered from this area. The JPT-2(MgO=6.88wt%) belongs to the high-K2O group in this area. Liquidus temperatures under 1atm are between 1260 and 1300 degree C and between 1140 and 1160 degree C for JPT-1 and JPT-2, respectively. In both rocks, liquidus phase is olivine. At lower temperatures, JPT-1 subsequently crystallizes clinopyroxene and plagioclase, whereas JPT-2 crystallizes clinopyroxene, leucite, and magnetite. To study the condition of magma genesis, JPT-1 and JPT-2 are mixed with $Fo_{90}$ olivine until they coexist with mantle peridotite using the Mg-Fe partitioning coefficient of Takahashi(1986). The olivine added samples are JPT-1∗(bulk MgO=18.43wt%) and JPT-2∗(bulk MgO=17.73wt%), respectively. Under 1atm, both JPT-1∗and JPT-2∗have olivine liquidus temperatures between 1400 and 1450 degree C. High-pressure experiments were carried out using a Kennedy-type piston-cylinder apparatus up to 3 GPa. At 3 GPa, which is close to the bottom of Pacific plate or the uppermost part of the asthenosphere, JPT-2∗has liquidus temperature between 1425 and 1450 degree C and crystallize both olivine and omphacitic pyroxene as liquidus phases. At temperatures below 1350 degree C, JPT-2∗subsequently crystallizes garnet. After the calculating methods of volatile composition of the primary magma of North Arch Volcanic Field in Hawaii (Dixon et al., 1997), volatile composition of the primary magma of the Japan Trench region have been estimated. Using this estimate, a volatile bearing starting material that has composition similar to JPT-2∗(JPT-CW, 1.6wt% $H_2O$ and 1.9wt% $CO_2$ ) was synthesized. At 3 GPa, liquidus temperature for the volatile-rich JPT-CW (between 1350 and 1400 degree C) is about 50 degree lower than that of the dry JPT-2∗. In JPT-CW, only slightly below the liquidus temperature (1350 degree C), melt fraction decreases dramatically and three crystal phases (olivine, omphacite and garnet) coexist with melt. This condition (3GPa and 1350 degree C) may be close to the multiple saturation point of the volatile-rich JPT-CW magma. In other words, it is suggested that the volatile rich JPT-CW like partial melt may exist at the topmost part of the asthenosphere under the old Pacific plate.