Oral | Symbol S (Solid Earth Sciences) | S-CG Complex & General

[S-CG62_2AM2]Geofluids and dynamics in subduction zones

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Fluids from subducting slabs trigger earthquakes and low frequency tremors, and return back as springs in for-arc regions and produce magmas beneath volcanic arcs. Geofluids can be present everywhere and migrate in subduction zones and produce spatial and temporal variations in physical and chemical properties of materials. Thus the geofluids play an important role in the subduction-zone dynamics. This interdisciplinary session aims to promote the exchange of knowledge from cutting edge studies on geofluids and give perspectives to each participant. We continue to strongly encourage young researchers to participate in this session, because understanding geofluids can be essential in many geological and geophysical processes.

12:30 PM - 12:45 PM

[SCG62-P04_PG]Equation of state of topaz-OH in the subducted sediment under high pressure and high temperature

3-min talk in an oral session

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Dehydration reactions of hydrous minerals in the subducted sediment produce a H_2O-rich fluid which causes generations of magma, decreases of melting temperature of sediment, and variations of magma compositions. Topaz-OH [$Al_2SiO_4(OH)_2$], which is one of hydrous minerals, is considered to be existed in the sediment of the subducting slab. Topaz-OH is the end-member of natural topaz [$Al_2SiO_4(OH,F)_2$]. The stability field of topaz-OH extends to 1500 degree C at 5-10 GPa (Wunder *et al.*, 1993; Ono. 1998; Schmidt *et al.*, 1998). The equation of state (EoS) for the natural topaz has been also estimated (Komatsu *et al.*, 2003; Gatta *et al.*, 2003). However, the EoS of the end-member topaz-OH has not been performed yet. In this study, we performed *in situ* X-ray diffraction (XRD) experiments under high pressure and high temperature for determining the thermal elastic properties of topaz-OH.The starting material of topaz-OH was synthesized at 10 GPa and ~1000 degree C from the quench experiment using multi-anvil apparatus. The high pressure (3-8 GPa) and high temperature (up to 800 degree C) *in situ* XRD experiments were carried out using MAX80 installed at beam-line NE5C at PF-AR, KEK, Japan. These XRD patterns were collected by the energy dispersive method. Thermal elastic properties were calculated from EoS fit v5.2 software (Angel, 2000) using 3rd order Birch-Murnaghan EoS.From *in situ* XRD experiments, we successfully determined thermal elastic properties using all-data for fixed K'=4 as below: V_0=354.7(1)Å^3, K_0=169.8(22)GPa, $(dK_T/dT)_P$=-0.013(7) GPaK^{-1}, a_0=1.61(23)×10^{-5}K^{-1}, b_0 =1.36(41)×10^{-8}K^{-2}. From the detailed analysis of compression data, we found the change of the compression properties near 7 GPa. This change was also seen in a- and b-axis. Therefore we re-calculated the thermal elastic properties using two data sets: (I) below 7 GPa (II) above 7 GPa at room

temperature. These calculation results from low pressure data show V_0=355.2(1)Å^3, K_0=160.1(2)GPa, however those from the high pressure data show V_0=356.5(9)Å^3, K_0=153.1(89) GPa (K'=4 fixed). Compared to the natural topaz, topaz-OH shows relatively large volume and bulk modulus. This shows that the volume and bulk modulus increase with increasing OH content. Compared bulk modulus with density, topaz-OH locates near the line for Birch's law and indicates large bulk modulus and density as same as Phase D [$Mg_2SiO_4(OH)_2$]. We suggest that high density topaz-OH enhances the slab subduction and transports water to deeper earth's interior.