

SIT042-01

会場: 101

時間: 5月25日09:00-09:15

共振法による単結晶スティショバイトの弾性定数測定

Elastic Constants of Single Crystal Stishovite Determined by Resonant Ultrasound Spectroscopy (RUS)

米田 明^{1*}, コレ タイタス¹, ソハグ ハサン¹

Akira Yoneda^{1*}, COORAY Titus¹, SOHAG Hasan¹

¹岡山大学地球研

¹ISEI, Okayama Univ.

Elastic properties of minerals plays an indispensable role in the studies of Earth's interior as it is essential for interpretation of seismic velocity structure of the Earth, due to its feasibility of comparison with the seismological observations. And it also provides information on structure, bonding, and the nature of phase transitions in minerals. Resonant Ultrasound Spectroscopy (RUS) has been one of the leading methods of determining elastic constants of materials by measuring number of natural vibration modes. Owing to developments of high frequency RUS up to 50 MHz (HRUS), it emerge as a powerful technique in study of high pressure phases of mantel minerals in which samples are restricted to be sub millimeter size.

In this study stishovite was selected due to exceptional interest on it as a prototype phase of the lower mantle silicates, because it exhibits silicon in six-fold coordination. Large single crystals (up to 0.8x0.8x1.5mm) of stishovite were synthesized at 12 GPa from single crystal quartz and water (SiO₂+15wt% H₂O) by slow cooling method (from 1450 C to 800 C) in Kawai-type uniaxial split sphere apparatus (USSA5000). Quality of the crystals was confirmed by polarized microscope study, micro focus x-ray diffractometry and precision x-ray diffractometry. From FTIR measurements water content in synthesized crystals was confirmed to be less than 7 wt. ppm. Crystal was grind and polished in to a rectangle, parallel to crystallographic axis having edges of 230x290x500 micron meter. Then it was measured with HRUS for 15 resonance peaks in 6-20 MHz region. From these peaks six independent ambient pressure elastic constants $C_{11} = 468$ GPa, $C_{33} = 752$ GPa, $C_{12} = 211$ GPa, $C_{13} = 192$ GPa, $C_{44} = 250$ GPa and $C_{66} = 326$ GPa were calculated

キーワード:高圧,弾性定数,共振法,スティショバイト

Keywords: high pressure, resonant ultrasound spectroscopy, Stishovite, elastic constant