Contrasting behavior in the viscosity and structure between anorthite and albite melts

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The viscosity and structure of the anorthite ($CaAl_2Si_2O_8$) melt has been measured up to 6.6 GPa and 2173 K using the *in-situ* falling sphere method with X-ray radiography for viscosity and energy-dispersive X-ray diffraction technique for structure at beamline 16-BM-B of the Advanced Photon Source (APS). We found contrasting behavior in the viscosity between anorthite and albite melts. Although albite melt is known to have high viscosity and strong decrease in viscosity with increasing pressure, anorthite melt is characterized by lower viscosity and smaller pressure dependence. Obtained structural information also demonstrate that an intermediate-range ordering (IRO) of anorthite melt is less sensitive to pressure: a smaller shrinkage of IRO in the anorthite melt with pressure is observed in the structure factor, *S(Q)* and the reduced pair distribution function, *G(r)*. The big difference in viscosity between anorthite (Ca-endmember plagioclase) and albite (Na-endmember plagioclase) melts has important implications for planetary differentiation. In particular, Na-poor astral bodies, such as Moon and 4 Vesta, have been dominated by low-viscous magma ocean and, eventually formed thick anorthite-rich crust.