

X-ray and neutron diffraction experiments on hydrous silica glass under pressure

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We have studied structure of hydrous silica glass by using X-ray and Neutron diffraction experiments up to 10 GPa at ambient temperature. Hydrous silica glass was synthesized by quenching from melts under pressure, which contains 13 wt % of D₂O. X-ray diffraction experiments were conducted at BL04B2 of SPring-8 and AR-NE5 of Photon Factory. Neutron diffraction experiments were carried out at BL11 of MLF, J-PARC. Both X-ray and neutron diffractions show the shift of the FSDP of structure factor toward higher Q with increasing pressure, indicating the shrinkage of the intermediate range order with pressure. The radial distribution functions shows that the SiO₄ unit does not change up to 10 GPa but the Si-Si distance decrease with pressure. These also indicate the change of the intermediate range order. D-O distance in the hydrous silica glass is nearly constant, 0.92 Å. The changes of silica framework with pressure in hydrous silica glass are similar to those in dry silica glass.

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