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The *in-situ* formation and structure of a dense glass and the prospects for high-pressure neutron micro diffraction

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We have performed in-situ neutron (ToF) diffraction experiments using large volume P-E pressure cells; monochromatic x-ray (λ=0.1027Å) diffraction experiments using a much smaller volume gem anvil (SiC) cell; and molecular dynamics simulations of GeO_2glass. This glass is an archetypal network-forming glass under pressure. Below 5 GPa, additional atoms encroaching on the first tetrahedral shell are seen to be a precursor of local coordination change. Between 6 and 10 GPa, we observe structures with a constant average coordination of $\sim$5, indicating a new metastable, intermediate form of the glass. At 15 GPa, the structure of a fully octahedral glass has been measured. This structure is not retained upon decompression and, therefore, must be studied *in situ*.

Additionally, the prospects for neutron diffraction from micro-samples held in gem anvil devices will be briefly discussed. This will include recent developments using neutron micro focusing devices and the design of the SNAP beamline at the Spallation Neutron Source.