Polarized Raman Spectroscopy Of v-SiO_2 Under Rare Gas Compression

C. Weigel[1], M. Foret[1], B. Hehlen[1], A. Polian[2], R. Vacher[1], B. Rufflé[1]

[1] *Laboratoire Charles Coulomb (L2C), UMR 5221 CNRS-Université de Montpellier, F-34095 Montpellier, France*

[2] *Sorbonne Universités, UPMC Univrsité Paris 6, CNRS UMR 7590, IMPMC, F-75005 Paris, France*

High-pressure polarized Raman spectra of vitreous silica are measured up to 8 GPa in a diamond-anvil cell at room temperature. The combined use of either a non-penetrating pressurizing medium, argon, or a penetrating one, helium, allows to separate density from stress effects on the Raman frequencies. In the framework of a simple central force model, the results emphasize the distinct role played by the shrinkage of the inter-tetrahedral angle Si-O-Si and the force-constant stiffening during the compression. The polarization analysis further reveals the existence of an additional isotropic component in the high frequency wing of the Boson peak. The pressure dependence of the genuine Boson peak frequency is found to be much weaker than previously reported and even goes through a minimum around 2 GPa in a remarkable coincidence with the anomalous compressibility maximum of silica. [1]

1. C. Weigel, M. Foret, B. Hehlen, M. Kint, S. Clément, A. Polian, R. Vacher, B. Rufflé, *Polarized Raman Spectroscopy Of v-SiO_2 Under Rare Gas Compression*, Phys. Rev. B (2016) submitted