Shear and Bulk Viscosity of Water up to 1.5 GPa

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Liquid water flows under high pressure in the Earth's crust, and is involved in subduction and ore formation. Despite this major role of water in natural processes, viscosity measurements under high pressure are scarce and report conflicting values [1-3]. Here we present shear viscosity data deduced from the Brownian motion of 350 nm polystyrene spheres [4]. Our measurements using a diamond anvil cell extend up to 1.5 GPa, i.e. reach the metastable liquid above its freezing pressure. Our results agree with values from [1,2]. By simultaneously recording Brillouin spectra from water, we also obtain the bulk viscosity of the liquid. The ratio of bulk to shear viscosity, nearly constant around 2.8 at low pressure, shows a marked decrease at elevated pressure.

References

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