Torsion pendulum measurements of normal ^{3}He in axially compressed aerogel

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A torsion pendulum was used to measure the dissipation (Q^{-1}) and period shift of ^{3}He confined in a 98% open aerogel, compressed by 10% along the axial direction. After subtraction of the bulk fluid inertial and dissipative contributions, the remaining Q^{-1} tends to a constant $\approx 2.5\times10^{-6}$ (about ten times larger than the empty cell background) below 10 mK. The behavior is consistent with an inelastic scattering time τ_{in} (due to quasiparticle-quasiparticle (qp-qp) scattering) limited by an elastic scattering time τ_{el} (due to qp-aerogel scattering). This gives us a mean-free-path $\lambda_{eff} = \mathrm{v}_F\tau_{eff}$, where $\tau_{eff}^{-1} = \tau_{in}^{-1} + \tau_{el}^{-1}$ and v_F is the Fermi velocity. The low temperature Q^{-1} arises from the finite velocity difference between aerogel and ^{3}He at their common interface that gives rise to a frictional drag force on the torsion pendulum. The drag force can be parameterized by a frictional relaxation time τ_F, which does not have a significant temperature dependence. The relative velocity profile across the aerogel-filled flow channel is temperature dependent only near the channel walls and is otherwise flat far from them. We find $\tau_F \approx 2\times10^{-7}s$ and a weakly pressure dependent crossover temperature $T^* \approx 10$ mK where $\tau_{el} = \tau_{in}$.