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Ultrasound Attenuation in Normal Fluid ^{3}He in 98% Aerogel: Knudsen-to-Hydrodynamic Crossover[1] YOONSEOK LEE, H.C. CHOI, B.H. MOON, N. MASUHARA, M.W. MEISEL, NHMFL and Department of Physics, University of Florida, Gainesville, FL 32611, H. TAKEUCHI, S. HIGASHITANI, K. NAGAI, Graduate School of Integrated Arts and Sciences, Hiroshima University, Kagamiyama 1-7-1, Higashi-Hiroshima 739-8521, Japan, N. MULDERS, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716 — Mass flow in porous media is a widely occurring phenomenon as in water flow in aquifers, blood flow in vessels, and petroleum flow through sandstones. However, the understanding of these phenomena is a challenging task. In particular, when the mean free path of the fluid particles exceeds the pore size, the hydrodynamic description breaks down and the fluid mass is carried by the Knudsen diffusion. The ^{3}He-aerogel system offers an opportunity that allows a systematic investigation of a wide range flow phenomena from the hydrodynamic to Knudsen regime owing to the strongly temperature dependent mean free path in liquid ^{3}He at low temperatures. In this paper, we present ultrasound attenuation measurements of liquid ^{3}He in 98% aerogel. The Knudsen-hydrodynamic crossover is clearly demonstrated in a drastic change in the temperature dependence in attenuation observed in this system.
H. Takeuchi *et al.,* Phys. Rev. Lett. **108**, 225307 (2012).

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