Abstract Submitted
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Enhanced Methanol Diffusion in Homogeneous Isotropic and Anisotropic Silica Aerogels[1] JEONGSEOP LEE, A.M. MOUNCE, SANGWON OH, A.M. ZIMMERMAN, W.P. HALPERIN, Northwestern University — It has recently been shown that chiral superfluid ^{3}He states can be stabilized using stretched, anisotropic, high porosity silica aerogel.[2] We present a novel approach to characterize the aerogel structure using nuclear magnetic resonance measurement of the enhanced diffusion of methanol vapor, similar to previous reports of diffusion of water in partially filled porous glass.[3] The diffusion coefficient is determined by the molecular motion in the vapor phase in fast exchange with adsorbed phase. Consequently, the diffusion is enhanced by two orders of magnitude beyond that of the bulk fluid but is limited by the elastic mean free path λ for ballistic molecular motion in the aerogel. The mean free paths in the presence of global anisotropy in a stretched (radially shrunken) aerogel, were found to be larger in the direction of strain by an amount consistent with the strain amplitude measured independently.

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[2]New Chiral Phases of Superfluid ^{3}He Stabilized by Anisotropic Silica Aerogel, J. Pollanen, et al., Nature Physics 8, 317 (2012).
[3]Enhanced Self-Diffusion of Water in Restricted Geometry, F. D'Orazio, et al., Phys. Rev. Lett. 63, 43 (1989).

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