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Superfluidity, Bose-Einstein condensation and dimensions of liquid ^{4}He in nanopores[1] LEANDRA VRANJEŠ MARKIĆ, Faculty of Science, University of Split, HR-21000 Split, Croatia, EU, HENRY GLYDE, Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716-2593, USA
— Path integral Monte Carlo (PIMC) calculations of the superfluid fraction, ρ_S/ρ, and the one-body density matrix (OBDM) (Bose-Einstein condensation (BEC)) of liquid ^{4}He confined in nanopores are presented. The goal is to determine the effective dimensions of the liquid in the nanopore. We simulate a cylinder of liquid of diameter d_L surrounded by 5 Å of inert solid ^{4}He in a nanopore of diameter d; $d = d_L + 10$ Å [1]. The PIMC $\rho_S(T)/\rho$ and OBDM scales as a 1D Luttinger Liquid at extremely small liquid pore diameters only, $d_L = 6$ Å where the liquid atoms form a 1D line at the center of the pore. In the range $8 \leq d_L \leq 22$ Å the PIMC $\rho_S(T)/\rho$ scales as a 2D liquid. In this d_L range the liquid fills the pores in cylindrical layers. There is a cross over from 2D to 3D scaling at larger $d_L \simeq 22$ Å. In the range $8 \leq d_L \leq 22$ Å , the T_C predicted using the Kosterlitz-Thouless 2D scaling criterion of the OBDM agrees well with the T_C obtained from $\rho_S(T)/\rho$. Superflow observed in pores of diameter ($18 < d < 32$ Å) is apparently standard static superflow with the low T_C arising from its 2D character.
1. L. Vranješ Markić and H. R. Glyde, Phys. Rev. B92, 064510 (2015)

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