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Bose-Einstein Coherence in Two Dimensional Superfluid ^{4}He SOULEYMANE DIALLO, University of Delaware, JONATHAN PEARCE, National Physical laboratory,UK, RICHARD AZUAH, NIST Center for Neutron Research, JON TAYLOR, Rutherford Appleton Laboratory, HENRY GLYDE, University of Delaware — We present high-resolution measurements of the momentum distribution of atoms in liquid ^{4}He films adsorbed in nanoporous MCM-41, with 45 Å mean pore diameter. The measurements were performed at temperatures $T = 0.3$ K and $T = 2.3$ K and saturated vapor pressure (SVP) in the wavevectors range $24 \leq Q \leq 29$ Å^{-1} using the MARI time-of-flight (TOF) chopper spectrometer at the ISIS spallation neutron source. The main goal is to determine whether there is a Bose-Einstein condensate (or coherence) in a finite-size two dimensional (2D) Bose fluid at low temperatures. It is also to investigate the 2D-3D dimensional crossover in the condensate proprieties. We find clear evidence of a condensate parameter, n_0, at $T = 0.3$ K in the films investigated. In the thinnest film ($\sim$ approximately one atomic layer thick), the observed condensate fraction is greater than but consistent with the bulk superfluid 4he value of 7.25% within precision; i.e. $n_0 = (9.34 \pm 3.84)\%$. As more ^{4}He is adsorbed in the substrate pores, n_0 appears to decrease below the bulk value, possibly due to the disorder introduced by the confining media; i.e. $n_0 = (2.45 \pm 2.54)$ % near full pore filling.

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