Abstract Submitted
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Bose-Einstein Condensation and atomic kinetic energies in liquid ^{3}He-^{4}He mixtures[1] SOULEYMANE DIALLO, University of Delaware, JONATHAN PEARCE, Institut Laue Langevin, RICHARD AZUAH, NIST Center for Neutron Research, HENRY GLYDE, University of Delaware — We present neutron scattering measurements of the momentum distribution of liquid ^{3}He-^{4}He mixtures. The experiments were performed at wavevectors Q, $26 \leq Q \leq 29$ Å^{-1}, on the MARI time-of-flight spectrometer at the ISIS pulsed spallation neutron source. Mixtures with ^{3}He concentrations x between 0 and 20% were investigated both in the superfluid and normal phases. From the data, we extract, to new accuracy, the Bose-Einstein condensate fraction n_0 and the momentum distributions of ^{3}He and ^{4}He atoms. We find an increase in n_0 above the pure ^{4}He value; from 7.25±0.75% ($x = 0\%$) to 11.2±1.85% at $x = 15\%$, in agreement with theoretical calculations but in disagreement with the only other measurement. The ^{4}He kinetic energy, \kef, is found to be largely independent of x. The ^{3}He momentum distribution $n(\mathbf{k})$ is not well fitted with a Fermi step function alone. A high momentum tail in $n(\mathbf{k})$ is needed to get a good fit - a tail that is consistent with calculated tails in $n(\mathbf{k})$. The ^{3}He atomic kinetic energy, K_3, is determined almost entirely by this tail. It is therefore not a well determined single property for comparing theory and experiment. This finding resolves a long-standing discrepancy on K_3 between theory and experiment.

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