Three-Dimensional Superfluid Transition of ^{4}He Films Formed in 3D Nanopores of HMM-2

A. Ohma, T. Matsushita, M. Hieda, and **N. Wada**

Department of Physics, Graduate School of Science, Nagoya University, Nagoya 464-8602, Japan

Superfluid onset by the torsional oscillator experiment and heat capacity peak have been observed at experimentally the same temperature T_C for the ^{4}He films formed in three-dimensional (3D) nanopores of HMM-2 of which pores about 2.7 nm in diameter are connected in the 3D period 5.5 nm [1]. It indicates the 3D superfluid transition of the 3D ^{4}He films. So as to study the critical behavior of the heat capacity peak, heat capacity was measured precisely around T_C. We found heat capacity peak for all of the films with T_C from 0.1 to 0.95 K. When the molar heat capacity C_m of the ^{4}He fluid is plotted against the reduced temperature $t = (T - T_C)/T_C$, all of the data are collapsed in a universal peak curve around T_C. Deviation from the universal curve above the reduced critical temperature occurs at higher reduced temperature for the films with lower T_C. Hence, the observed heat capacity peak of the 3D transition becomes large with decreasing T_C. It is understood that the universal 3D superfluid transition peak appears when the correlation length $\xi_+(t)$ becomes longer than the 3D period with approaching T_C.

[1] R. Toda, et.al., Phys. Rev Lett. **99**, 255301 (2007).