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Surface Andreev Bound States of ^{3}He-B by Transverse Acoustic Impedance Measurements

YUICHI OKUDA, Tokyo Institute of Technology

Complex transverse acoustic impedance of the superfluid ^{3}He was measured at the frequencies of 10 to 80 MHz from 6 up to 25 bar by a CW bridge method. The observed temperature dependence of it was well explained by the quasi-classical theory with random S-matrix model for a diffusive surface. The impedance was influenced by pair breaking and by quasi-particle density of states at the surface, which was drastically modified from the bulk one by the formation of surface Andreev bound states. In B phase, an additional gap in SDOS opened between the upper energy edge Δ^* of the surface Andreev bound states band and the bulk energy gap Δ. Temperature dependence of Δ^* was measured and was about 30% smaller than theoretical values. In A phase, flat and gapless SDOS was confirmed experimentally for the first time. It is demonstrated that the present spectroscopic method is a good tool to investigate the surface microscopic state, which has not been possible for the charge neutral P-wave superfluid.